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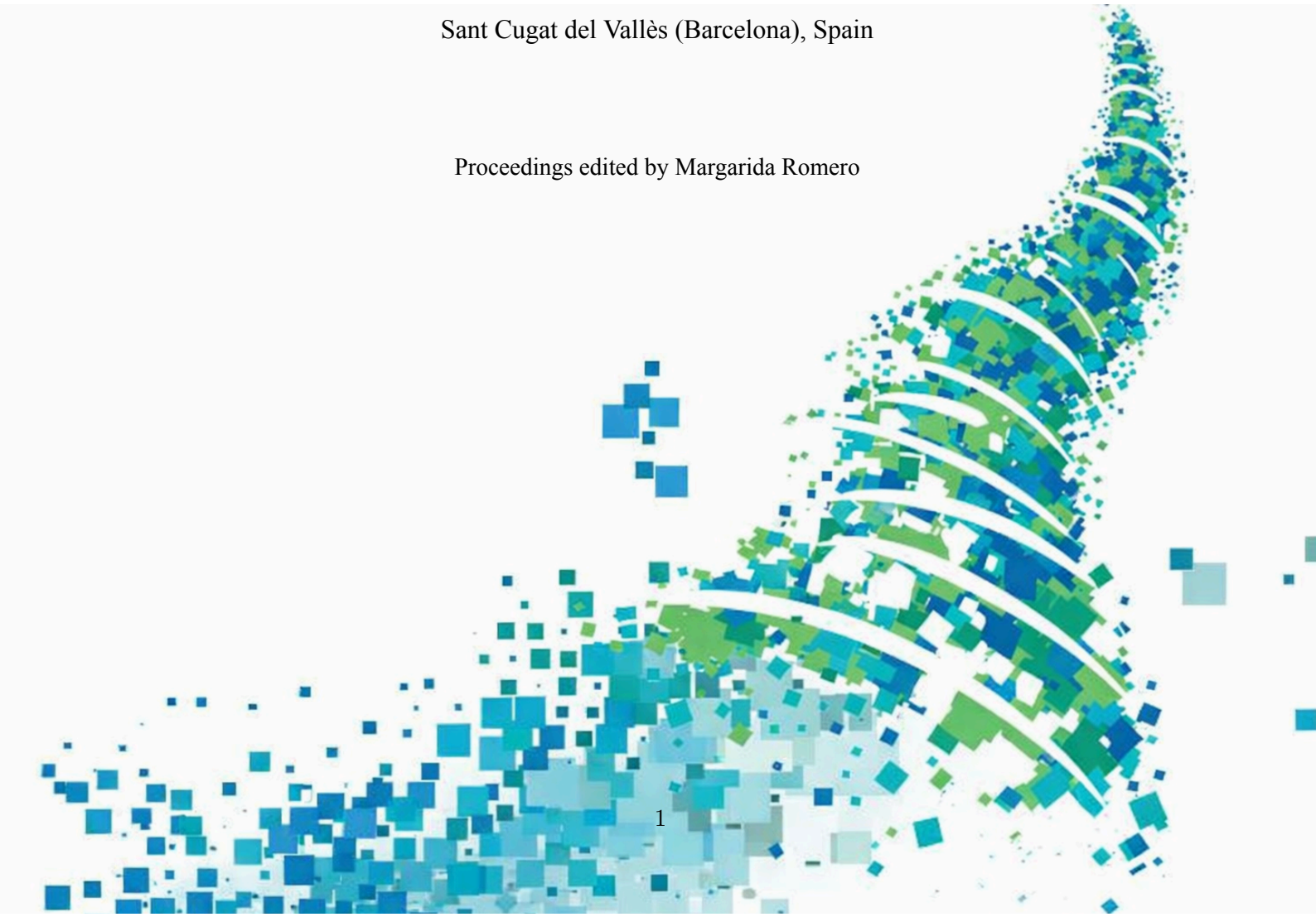

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Teacher Agency and Generative AI: A Cultural-Historical Analysis of Contradictions in Planning, Instruction, and Assessment

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Abstract: T Generative AI (GenAI) is being analyzed for its impact on student achievement through personalized learning, and concerns about the potential devaluation of educators' skills and expertise. Scholars traced diverse contradictions of GenAI's potential to seemingly both help and harm education back to the origins of AI in Education (AIED), thereby broadening the discussion to include a cultural-historical perspective. However few studies consider AIED's exchange value on teacher agency. This pilot study explores this subject by engaging primary school teachers in questions about AIED's influence on their agency during a) lessons planning, b) teaching and c) assessment. The answers were analyzed using Natural Language Processing (NLP) looking for the emotional valence (Sentiment Analysis) and symptoms contradicting teacher agency (Natural Language Inference). The final results were contextualised within three distinct activity systems, revealing that the activity of lesson planning had a positive perceived agency, while the activities of teaching and assessment displayed a neutral and a negative perceived agency. A primary contradiction of AI being perceived as a helpful tool in the delivery of learning while also being perceived as negating the development of teacher agency was found. As well as a secondary contradiction consisting of a dilemma between efficiency and autonomy.

Keywords: Teacher Agency, Contradictions, Artificial Intelligence in Education (AIED), , Natural Language Processing (NLP)

Introduction

The introduction of AI in education holds both the potential to mediate a strong sense of use value through the promise of personalised learning that "can take your average student and turn them into an exceptional student". (Khan, 2023, 1.47). And an exchange value, warning that such an instructionist approach is ignoring more than 60 years of pedagogical research in deep learning, active learning, productive failure and project-based learning (Holmes, 2022). From a historical perspective, this contradiction between personalised learning and a decline of open-ended constructivist human development is a classic debate that goes back to Anderson's cognitive design of Intelligent Tutoring Systems (Anderson et al., 1985) on one side and Seymour Papert's more exploratory, learner-centred approach of LOGO and Mindstorm on the other side (Mishra et al., 2025). This study aims to investigate Artificial Intelligence in Education (AIED) from a Cultural-Historical Activity Theory (CHAT) perspective. In its historical roots, teaching is not one singular event, so this study will also focus on the use of AIED in the so-called Tyler rationale (Tyler, 1949), which to this day can be found reflected in teacher training handbooks as the planning, instruction, assessment (PIA) cycle (*edTPA Secondary Handbook*, 2024; Grant et

al., 2013). By analysing AIED's role in each phase of this cycle, the study seeks to uncover how AIED enact or hinder teachers' agency in each of these phases.

Research Design

Rooted in the third generation of CHAT (Engeström, 2015), linguistic cues indicating manifestations, or symptoms, contradicting teacher agency are identified (Engeström & Sannino, 2011). The data was collected in a free-text format, thereby containing the different perspectives and opinions in the participants' own words. And while such qualitative data holds great value and depth, it remains a time-consuming and labour-intensive process to code and annotate it. Natural Language Processing (NLP, Chowdhary, 2020) has previously been used to code qualitative data in exploratory mixed-method research (Lennon et al., 2021), and also Engeström and Sannino suggest that "the relative ease of detecting rudimentary linguistic cues, for example, with the help of an appropriate computer program, makes their analysis a useful preliminary step" (2011, p. 375). However, NLP coding has also shown to lack the ability to find context and nuances on its own. While the combination of human and NLP coding has been shown to add detail and depth to the analysis (Guetterman et al., 2018), in addition to reducing the time for the preliminary linguistic analysis (Williams, 2024). The contextual understanding and interpretations of the linguistic cues indicating manifestations of contradiction are based on the researcher's judgement.

Methodology

Eleven pre-service primary school teachers were asked to fill out a survey asking them a total of 12 questions. The questions were clustered in three groups, asking them four questions in each group. This resulted in the matrix of questions shown in Table 1.

Table 1
Matrix of questions asked

	…you are planning your lesson	… you teach in the classroom	… you assess your students work
How does AIED effect your power to act when…			
How does AIED effect your power to influence the result when…			
How does AIED effect your power to make decisions and choices when…			
How does AIED effect your power to make decisions			

that reflect your values and beliefs about teaching and learning when you are…

Using NLP, the text responses from participating teachers were divided into single sentences, creating a dataset of 132 sentences to be analysed. Twelve answers were excluded due to either being empty or placed in a wrong category, resulting in a final dataset of 120 sentences. To systematically identify affective states, the dataset was analysed using Sentiment Analysis (SA,Medhat et al., 2014). Next, the identification of discursive manifestations or symptoms of contradictions was analysed in a twofold approach. First, linguistic cues of contradictions were extracted from the dataset using Natural Language Inference (NLI, MacCartney, 2009). Secondly, in line with Engeström and Sannino (2011), it was presumed that these cues could point towards any discursive manifestations of contradictions within the dataset. Then, the cues were interpreted by a researcher for identifying the discursive manifestations of contradictions.

Results

Results from SA, NLI analysis and human analysis showed that the main manifestations of contradictions in the three teaching phases were found on the axis between the subject (teacher) and the tool (AI). While a majority of the entailing symptoms were found on the axis of the tool (AI) and object (delivery of learning). This supported a primary contradiction with a use value of AI being perceived as helpful in the delivery of learning and an exchange value negating AI as useful in the development of teacher agency.Mapping all information into a network of activity systems in the three phases of teaching showed that AIED was perceived as a positive tool for lesson planning, while it was not perceived as helpful for teacher agency in the classroom and assessment. Such a secondary contradiction shows that AIED has a use value for teachers in the first phase of the teaching phase. While the exchange value is AI's neutral and negative effect on teacher agency, the two other phases are the teaching phase. This secondary contradiction is manifested through a dilemma between efficiency and autonomy.

Contributions

Through the use of both automated analysis and human coding, the researcher was able to triangulate the results by looking at the dataset from three different perspectives (SA, NLP, and human analysis). The NLP analysis was able to facilitate the human identification of a secondary contradiction, primarily through the use of SA. The interpretation of a primary contradiction required the researcher to map all linguistic cues of both contradictions and entailing manifestations to the axis of an activity system. Such methodological findings are in line with both Guetermman and colleagues (2018) and Williams (2024), which describe a shift towards a computational paradigm that is less time-consuming and labour-intensive, while leaving the final interpretations with the researcher.

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Should we ban one-to-one tablets? Analyzing Discursive Manifestations of Contradictions in Educational Technology Integration in Secondary Education

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Abstract: *The integration of digital technology in secondary education presents significant policy challenges for school leaders. While technology has been integrated in the last decade with the promise of supporting active learning pedagogies, it has produced tensions in the teaching-learning activity system, including increased distractions, potential cognitive impacts, and limitations for students with learning difficulties. This study examines the educational impact of technologies through an ecological observational study in two secondary schools with different technology integration policies. The study identifies contradictions in technology integration and their implications for policy recommendations for school leaders.*

Keywords*: Secondary Education, Contradictions, Educational Technology, Tablets*

Introduction

The widespread integration of technology in educational settings, driven by goals of digital literacy and active learning pedagogies (Sailer et al. 2024), has also raised concerns about its limitations and unintended consequences, such as significant distractions. Personal technology can be a substantial source of distraction (Flanigan & Babchuk, 2022). The introduction of one-to-one devices, through devices provided by the school or students' own devices, has raised tension in the teaching and learning activities in secondary education. This study evaluates the impacts of technology use through the lens of Cultural Historical Activity Theory (CHAT), aiming to identify the contradictions within the teaching-learning activity system in secondary education. In Cultural-Historical Activity Theory (CHAT), contradictions are central to understanding the dynamics of an activity system, serving as the driving force for change and development (Engeström & Sannino, 2011; Engeström et al., 2024; Isaac et al., 2022; Romero & Barma, 2022). Contradictions are historically embedded structural tensions within an activity system or between different activity systems. These underlying contradictions manifest as observable symptoms, which can include various forms of tensions in relation to the integration of technology in secondary education.

Method

This study employed a qualitative research design grounded in the principles of third-generation CHAT (Engeström, 2001). The research objective was to analyse the teaching and learning activity mediated by technological tools in secondary school classrooms, focusing on the potential contradictions that arise from their integration. Participants were involved from two secondary schools in Catalonia, both with a long-standing tradition since 1964. In School 1, teachers must request access to a computer lab or mobile devices for specific technology-dependent activities, as the school does not operate a one-to-one device programme. In contrast, School 2 implements a one-to-one tablet policy, providing each student with an iPad for use both inside and outside the school environment.

A two-phase methodology was carried out: an initial stage of intensive classroom observation and a second step involving a focus group. An observational coding grid, based on CHAT-based studies, was developed to capture and analyse interactions, integrating student actions related to direct engagement, collaborative, and individual learning. The coding schema was structured into three main dimensions: Social (XSK), Content (XCK), and Resources (XRK). The observations were naturalistic and non-interventionist, reported through the coding schema in 10-minute intervals. After the observational study, we organised focus groups, held in each school, including three learners, three teachers, two family members, and two teaching staff members. The recorded discussions were transcribed and analysed through the coding schema and by identifying discursive manifestations of contradictions (Engeström & Sannino, 2011).

Results

The study identified diverse discursive manifestations of contradictions arising from technology integration in educational settings. A significant tension emerged regarding technology as a learning tool versus a source of distraction. While participants acknowledged technology's value for research and fostering engagement, particularly in subjects like mathematics, its unstructured access frequently led to disengagement and distraction. This was evident in observations where students, despite having tools meant for learning, often diverted their attention to non-academic applications. Another manifestation of contradictions was observed around the controlled versus uncontrolled use of technology. Schools grappled with maintaining control over digital environments; even with strict device policies, constant supervision was required, and past incidents of misuse contributed to heightened teacher difficulties regarding the misuse of technology provided by the school. This challenge was particularly pronounced in School 2, which adopted a 1:1 tablet policy, leading to increased efforts to manage student digital behaviour. In School 2, the students' reliance on digital devices posed a significant issue due to the lack of readily available alternative non-digital learning tools. Despite the availability of tablets in School 2, their use was significantly limited by restrictive policies, leading to a tension between the devices' capabilities and their actual application in learning. A second tension emerged between the school's digital resources and the learning activity itself. Specifically, School 1's limited availability of digital devices necessitated advance planning for any technology-based activities. This constraint led to a more intentional and, as observed, positive use of technology, as its integration was always a deliberate choice. From a school-family perspective, the study revealed an underlying tension between family expectations and the school's utilisation of technology. Parents held divergent views; some advocated for stringent regulations on screen time and digital device use, while others strongly believed digital tools were fundamental for providing a "modern education". This disparity in parental perspectives created uncertainty for schools in establishing consistent and effective technology integration policies that could bridge the home-school divide.

Discussion

These results highlight the necessity of structuring technology regulation at the school level. While personal devices such as the tablets in School 2 can facilitate information access, they also introduce cognitive overload and distractions, requiring further regulation from teachers, families and the learners themselves. When school- or teacher-level regulation is not provided, learners must self-regulate, which is challenging for learners given their developmental stage. Without a well-defined digital policy at the school leadership level, teachers, families and learners struggle to regulate technology in secondary education. Parents' divergent perspectives on technology use further contribute to these tensions, with some equating technology with innovation and others concerned about screen time and distraction. For successful technology integration, policy must be created collaboratively with all stakeholders, including teachers, school staff, leadership, families and learners, to define the school policy on technology-enhanced learning and ensure alignment of family-school digital practices.

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A sociocultural perspective to highlight the social educators' expertise in practice. A case study.

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Abstract: In this contribution, the socio-cultural approach (Edwards, 2010; Gegenfurtner, Gruber, Lehtinen and Säljö 2024; Wertsch, 1996) is applied to analyze the social educators' expertise in their institutional practices, aimed at the development of children's potentialities in the circumstances of their real-life experiences. By referring to an in-service workshop programme, some relevant dimensions will be highlighted: the mediational role of "vignettes" to support the development of advanced insights about the educational practices; the transformative potentialities of educational expertise (Sannino, 2022) and the educators' institutional positionality that may impact on the development of their motives (Munk, 2020).

Keywords: social educators; expertise; relational expertise; vignettes; motives

Introduction

According to its classical definition, professional "expertise" consists in the capacity to recognize the conditions that characterize a class of recurring problems and to activate the appropriate intervention strategy. This definition can be applied only to static and repetitive tasks; however, in the welfare professions, problems evolve rapidly and cannot be easily interpreted by recurrent patterns. In their daily practices, social educators face multidimensional situations, in which each relevant factor evolves in relation to a series of other dimensions; it is not possible to have a single point of view capable of predicting the dynamics of complex systems.

An alternative definition of "expertise" refers to the dynamic adaptation to the evolving constraints of the emerging problems in the professional field; it implies high levels of awareness and creativity to recognize the relevant features of a particular event, to integrate them in a model of the situation, and to explore the consequences of alternative interventions (Gegenfurtner, Gruber, Lehtinen and Säljö, 2024). In this perspective, social educators' expertise consists in the recognition of the complexity of the evolving educational practices, the identification of the constraints on children's participation and the design of alternative pathways to increase the children's participation in the social life (Sannino, 2022).

Professionals develop their expertise in the light of their motives in the practice and it is constrained by the institutional goals and values, the protocols to interact with families and schools as well as the educators' motives within the educational field (Munk, 2020).

According to Wertsch (1996; 2007), the educational interactions between professionals and children are mediated by manifold dimensions of design and activity. Educators arrange the setting, select artefacts, and give structure to children's participation to achieve the institutional goals in practice.

As a consequence, educators develop motives that lead their practice, which are intertwined with the institutional mandate of their profession. The direction of their strategies is related to their interpretation of their institutional mandates.
To promote educational expertise, researchers and social educators can design workshops to align their specialized expertise to recognize the manifold conditions that impact on children's wellbeing and prosocial development. The process of "relational expertise" ensures that "as much of the complexity as possible is revealed" (Edwards, 2017, p. 1).

The case study

In the university-community engagement presented in this contribution[1], the "relational expertise" model was applied to promote social educators' expertise in developing playing activities to promote vulnerable children's wellbeing and prosocial behaviour. The in-service programme consisted of a two-strand collaboration between a research team composed by the authors and a group of educators working in a system of afterschool service.
In the first strand of the programme, the researchers entered the educational setting and kept notes on the children's participation in the daily educational activities. The fieldnotes underwent a complex reformulation to transform them in "vignettes", which are prototypical scenarios that capture the educators' agentic roles to promote children's wellbeing and prosocial behaviour as well as the constitutive role of the structure of children's participation in their daily activities in the afterschool, specifically, the design of the settings, the definition of the norms of interaction, the available tools and the scaffolding strategies that promote learning. (Erickson, 2004; Sorzio and Bembich, 2023). The vignettes depart from the original fieldnotes, as they focus on the essential dimensions of daily activities and highlight some critical obstacles that hinder the children's activities.
In the workshops which constituted the second strand of the programme, the vignettes are introduced to the educators, since they "resonate with participants for the purpose of provoking responses, including but not limited to beliefs, perceptions, emotions, effective responses, reflections and decision making" (Skilling and Stylianides, 2020, p. 542). By common reference to the situations as represented in the vignettes, participants can point out the relevant elements that characterise the complexity of the educational practices, give salience to the specific events that constitute the opportunities for children to grow, and envision alternative educational pathways.
The following vignette, drawn from an afterschool setting, provides a concrete example of children's symbolic play with natural materials. It has been analyzed in order to highlight the role of the environment, the educators' interventions, and the limits and possibilities for supporting more complex forms of dramatic activity
An example of vignette:

[1] The in-service workshop programme was based on an agreement between the University team and the Head of the Education Department of the Municipality, according to which: all the participants agreed on the goals and methods of the researchers' fieldwork; they had the right to read and comment on the written fieldnotes at any moment; they could withdraw from the activity at any moment; the children and their families were informed of the goals and methods of the programme and they permitted that it was a part of the daily educational activities; all the fieldnotes use pseudonyms to protect the personal privacy of the participants. It was well explained that the focus of the fieldwork was not a judgement of the professionals' competencies or an assessment of the children's achievements, but the rationale of the fieldwork was to highlight the conditions that impact on the transformative agency of the educators, to promote children's learning.

"Symbolic play: The Stone Age"
5 girls (7-8 year olds) and 1 girl (6-year old).
A "natural garden" was constituted inside an afterschool setting, composed by natural materials (tree branches of different sizes, stones and marbles, chestnuts, seashells), delimited by a settle, a large pillow, two wooden crates. At the outset, Erica (8-year girl) hits two stones simulating the production of fire. The girls say they are doing "the stone age with a cat" (the youngest girl stays on the pillow, sleeping as a cat. They decide that the large blue pillow is a lake. Erica proposes that the others do not know her, but they meet and discover to be sisters. "I don't remember you, but you remember me, although believing I have died" (she lies down on the settle as lying on a sarcophagus). (there is no plot, they improvise situations and events). Therefore, the play evolves by scattering from an imagined situation to another). Actions to find their lost sister unfold. Erica told me that her sisters arrived through the time machine from town and have found her living in the Stone Age. She teaches the sisters how to produce fire and to cook.

To better understand the opportunities and limits emerging from the vignette, the following table organizes its key elements across different analytical dimensions, highlighting how setting, norms, artefacts, goals, and assessment practices interact in shaping children's symbolic play (Table 1).

Table 1. Stone Age Vignette Analysis

Dimension	Elements in the vignette
Setting	The "natural garden" designed by educators with authentic materials (stones, branches, shells, chestnuts), offering an open and flexible play environment.
Norms	Rules promote a child-centred approach, with minimal intervention of the educators; Institutional norms remain in the background.
Artefacts	Natural materials function as mediational means, stimulating imagination and enabling multiple frames of meaning in children's symbolic play.
Goals	No explicit or shared goals emerge. Play evolves in a fragmented way without a common orientation or a stable plot.
Dynamic assessment	Limited: educators observe and occasionally scaffold behavior but do not engage in sustained shared thinking to support children in structuring more complex dramatic activities.

In the workshop discussion, the educators and the researchers worked out a joint discussion about some relevant elements in the vignette: the educators' agency that consists mainly in the proposal of natural materials which are not made up by a human design, promoting the children's imagination. The children elaborated intricated reciprocal "mind reading", expressed by a variety of mental verbs, within the imaginary frame of the Stone Age. However, their symbolic play goes on erratically since there is no opportunity to give a dramatic structure to their activity. The widespread model of child-centred education is based on minimal interventions by the educators, value each child's voice and initiative. During the workshops the educators emphasize their idea that school instruction overwhelms children's life and therefore free play with a minimal adult design may be a viable balance. However, the motives do not lead towards a constructivist approach to play, in which

educators promote the children's exploration of new meanings and connect levels of thinking. The setting and the natural objects may open children's dramatisation, which offers the development of a symbolic realm of interactions, characterised by a complex activity of "mind reading". However, the limited orchestrating role of the educators cannot give the children the opportunity to build more complex dramatization upon the children's initial stage of imagination.

The shared child-centred model of education, impacted on the development of motive orientation in the after-school system (Munk, 2020). The educators refer that the institutional mandate is the supervision of children's activities, the design of stable and safe settings, as opportunity to assume initiatives, to experience complex and often conflicting interpersonal relationships; the educators intervene to promote prosocial behaviour, and support children in developing their emotional stances. They do not share a "constructivist model" of education in informal settings, such as in the Reggio Emilia approach (ReggioChildren, 2011). As a consequence, they seldom develop motives to design with children more complex playing activities, and rarely support the children's-initiated play with a dynamic assessment to promote exchange of emerging ideas, the further articulation of the children's mind reading and the extension of vocabulary. Moreover, the institutional mandate does not require any form of narrative documentation to make visible the children's symbolic artefacts (externalisation). Children's symbolic play may remain tied to early initiatives. In the Reggio Emilia Approach, "microstories" aim to make learning visible and share constructivist strategies, but workshop constraints (mandates, schedules, and funding) prevented full implementation.

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Working with a Key Community Engaged in the Transformation of Work: Historical Analysis and Key Challenges

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Abstract: Ergonomic interventions aim to improve or adapt work situations, enhancing both health and performance. Ergonomists operate within evolving organizations and must adjust their methods to address emerging health risks. This proposal explores the learning challenges and historically rooted contradictions in ergonomic interventions. It draws on a workshop inspired by the change laboratory methodology, involving 75 consultant ergonomists and trainees. Key tools such as the history wall, activity system, contradictions, and "four fields models" are mobilized. The presentation highlights the importance of historical analysis, the future-oriented nature of the laboratories, and the potential for expanding the scope of ergonomic practice.

Keywords: Cultural-Historical Activity Theory; formative intervention; anthropocene; historicity

Introduction

Faced with the challenge of the Anthropocene, the radical transformation of work is essential, insofar as work and its organisation are underlying causes of the climate crisis (Lémonie, 2025). In the context of a fourth generation of work within cultural-historical activity theory (CHAT), it becomes necessary to identify communities with whom to act. The community of ergonomists constitutes such a community, having historically formed around issues related to workplace interventions.

This communication aims to identify the learning challenges and historically inherited contradictions of ergonomic interventions, based on a workshop inspired by the change laboratory methodology (Engeström, 2007; Lémonie & Grosstephan, 2021). Within this framework, we conceptualise ergonomic intervention as an activity system that has evolved through historically situated contradictions. This perspective is not new (Blight, 2024; Vilela et al., 2020). In this context, ergonomic intervention is shaped by a contradiction between academic discipline and professional practice. Initially focused on individual work situations, recent developments call for a radical transformation of ergonomic practice to align it with the challenges of the Anthropocene (Pueyo, 2022). This developmental approach implies involving participants in the redefinition of their activity and in the reconceptualisation of its object.

Following an invitation to co-organise two study days on ergonomics and CHAT in April 2025, a design group was created to help ergonomist participants appropriate the concepts and tools of change laboratories and reflect on the history and future of ergonomic intervention. The objective was to provide an opportunity for participants

to experiment with these tools and support the collective transformation of ergonomics practices through intergenerational learning.

The research questions were: (1) What developmental periods of ergonomics do participants identify?; (2) What areas of development do they see for ergonomic intervention?; (3) How do participants use the tools of the change laboratory?

Methods

Seventy-five participants—students in a Master's programme in ergonomics and professional ergonomists—were divided into three groups of 25, each working in subgroups of 4–5. Each group was tasked with creating a historical frieze to represent developmental periods in ergonomics, using selected mirror data (e.g. themes of the French ergonomics society, changes in work organisation, workers' roles in interventions, evolution of ergonomics research). Each group then produced a summary of their discussions.

In the afternoon, a collective discussion focused on identifying historically inherited contradictions, key challenges, and a proximal zone of development using the "four fields model". Data collected included workshop discussions, group outputs, Master's student reports, and field notes from informal exchanges.

Results and Discussion

Results showed heterogeneity across group syntheses, but all identified development trajectories for ergonomics, such as:

- Increasing stakeholder participation, from observation to active engagement. E.g., a participant said: "With the change laboratory, it's the operators who are involved in the analysis – that's a huge shift!"
- A shift from focusing on isolated work situations to broader work organisation and societal issues.
- Moving from task-level adaptation to the transformation of collective work to address major challenges.

Key concerns identified were the Anthropocene and ageing at work. From these, participants collectively proposed a new, broader object for ergonomics, termed *"political ergonomics"*, characterised by:

- The need for interventions beyond company boundaries.
- Empowering workers to take control of the transformation process.
- Contextualising interventions at the local level.

Results will be discussed through three lenses: the role of history in constructing a desirable future; the challenge of facilitating change with large groups; and the methodological contributions to the change laboratory approach within the framework of a fourth-generation CHAT.

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Unfinished symphony: interpretations and dissonances of Vygotsky's theory of concept development

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Abstract: Lev Vygotsky's work underwent a series of shifts and changes that gradually led to the formation and systematisation of what we currently identify as cultural-historical theory. Unfortunately, his early death due to a chronic battle with tuberculosis, left no time for completing one of the "masterpieces" that he and his colleagues were working between 1927 and 1934: a theory of how concepts form and develop. This presentation attempts to: (1) place Vygotsky's theory on concepts within the frame of the historical development of his research programme; (2) summarise the key points and make comparisons between the two main phases of Vygotsky's work on concept formation; (3) critically review some of the interpretations found in the literature and; (4) pose key questions that could enable Vygotskian scholars to re-conceptualise and extend Vygotsky's theory of concept development.

Keywords: Vygotsky; concept development; everyday concepts; scientific concepts

Introduction

Characterised as the "Mozart of psychology", Lev Vygotsky's work underwent a series of profound transformations that gradually led to the formation and systematisation of what we currently identify as cultural-historical theory (CHT). In *Thinking and Speech* (Vygotsky, 1987), a significant shift in Vygotsky's thought is captured: a change from a phase of using the double-stimulation method to identify the developmental stages of "artificial" concepts (Chapter 5) to a phase of studying how the instruction of scientific concepts restructures and expands everyday concepts (Chapter 6). Why did Vygotsky make this transition and how does it fit into his developing research programme?

Periodisations of Vygotsky's research programme and the placement of concept development theory

The periodisation of Vygotsky's scientific efforts is a well-documented issue in the literature. This problem stems mainly from a lack of a complete list of his works and the chronology of their creation as well as a mismatch between the dates of writing and publication (Dafermos, 2018). Although the proposed periodisations have several differences, most scholars identify crucial "moments" in Vygotsky's creative endeavour, "points" in time during which his thought shifted radically. One of these shifts can be roughly placed around 1930. For example, Dafermos (2018) suggests that the primary appearance of CHT occurred during 1927–1930, after which Vygotsky formed and systematised CHT. In a more granular manner, Zavershneva and van der Veer (2018) suggest that Vygotsky went through a short period (1930–1931) during which he criticised his earlier work. For them, this transitional period

led to the final chapter of his work (1932–1934), a period during which a theory of dynamic, semantic systems and the psychology of perezhivanie were developed.

Vygotsky's work on developing concepts was carried out during the last eight years of his life and can be divided into two main phases (van der Veer & Valsiner, 1991). During the first phase (1927-1930), Vygotsky and his colleagues attempted to replicate and expand upon Ach's work. However, during the second phase (1931-1934), he criticised his previous line of inquiry and attempted to replicate and extend Piaget. Considering the periodisation of Vygotsky's theory and the above phases, it is clear that the development of his theory on concepts reflects the developing character of his research programme: the first phase (1927-1930) corresponds to the primary appearance of CHT, while the second (1931-1934) coincides with the period during which Vygotsky formulated and systematised CHT.

Interpretations and dissonances

So, how do Vygotskian scholars view the theoretical content developed by Vygotsky during these two phases? A significant part of the literature draws connections between the two phases by equating an ontogenetic stage (the first phase) with either everyday or scientific concepts (the second phase). For example, while Wertsch (1985) discusses the stages that Vygotsky and Sakharov identified, he introduces for the first time elements of Vygotsky's subsequent work with Shif and equates the last stage of concept development with scientific concepts. In a similar manner, Zavershneva (2014) makes a leap from presenting the three ontogenetic stages to equating conceptual thinking with scientific concepts. This is done by incorporating parts of Vygotsky's work with Shif (namely the law of concept equivalence) into her summary of his work with Sakharov. In our view, these interpretations are quite problematic for four main reasons; the first two have been put forward by Clarà (2017), and two of which are discussed in this paper.

First, given that the empirical work carried by Vygotsky and Shif was focused on school-age children and the third ontogenetic stage begins not before adolescence, choosing school children as subjects to study an ontogenetic stage that occurs in adolescence seems as an inappropriate methodological decision.

Second, Vygotsky believed that everyday and scientific concepts always work with each other and their interaction is crucial for development. However, in his work with Sakharov, Vygotsky proposed that the third ontogenetic stage substitutes the previous stages. Thus, the idea that different ontogenetic stages coexist is highly problematic.

The third reason relates to an implicit assumption about the nature of (concept) development. If we equate scientific concepts with the third ontogenetic stage (or everyday concepts to the stage of complexes for that matter) we are then making the assumption that a subject's development follows a trajectory comprised of a finite, non-repeatable number of stages (syncretism, complexes, concepts).

The final reason relates to neglecting the decisive role of instruction in transforming everyday concepts. By introducing the notion of scientific concepts, Vygotsky clearly made a critical distinction from his previous work by highlighting the importance of instruction in restructuring a child's spontaneous meanings into scientific concepts. This process introduces children to a system of historically and

culturally developed meanings. On the other hand, the ontogenetic stages identified by the double-stimulation method did not include an instructional phase.

Considering the developing nature of Vygotsky's research programme (Dafermos, 2018), the challenging conditions in which he completed Thinking and Speech and, the problematic interpretations of his theory of concepts, this paper aims to raise key questions that might help us to envision a "crescendo" of Vygotsky's "unfinished symphony".

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A Cultural-Historical Perspective on the Epistemological Foundations of Artificial Intelligence

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Abstract: This paper critically explores the epistemological challenges posed by the widespread proliferation of Artificial Intelligence (AI) through the lens of Lev Vygotsky's culturalhistorical theory. It highlights how AI's persistent metatheoretical blind spot—particularly its ontological and epistemological commitments—arises from an overreliance on methodologies that overlook the sociohistorical dimensions of cognition. The paper contrasts two major AI paradigms: symbolic AI, grounded in rationalism, and connectionism, based on empiricism. Despite methodological differences, both approaches are limited by dualistic ontological and epistemological commitments that fail to account for the complexity and developmental nature of cognition. Drawing on Vygotsky's conceptualisation of cognitive development, the paper argues for an epistemological shift in AI research. Vygotsky's dialectical method, which views cognition as socially mediated and historically evolving, offers a more integrated model of intelligence, moving beyond the constraints of the empiricism-rationalism dichotomy. The paper concludes that a dialectical approach is necessary to rethink the epistemological foundations of AI and to understand the complexity and developmental orientation of cognition.

Keywords: Artificial Intelligence, dialectics, empiricism, rationalism

This paper presents a critical examination of the epistemological foundations of artificial intelligence (AI) through the theoretical framework of Lev Vygotsky's cultural-historical theory. Despite the unprecedented technical achievements of AI, we argue that the field remains epistemologically underdeveloped, operating within largely unexamined philosophical frameworks. This paper argues that the epistemological frameworks underpinning AI research remain largely implicit and unexamined, creating a theoretical vacuum that limits both our understanding of AI's capabilities and its limitations. The field's metatheoretical blind spots - particularly regarding ontological and epistemological assumptions - stem from methodological approaches that fail to account for the sociohistorical embeddedness of both human cognition and AI systems.

The paper addresses the need for AI to redefine its subject matter and methodology. Unlike established scientific disciplines with a clearly delineated object of study, AI's domain often overlaps with psychology, neuroscience, linguistics, and philosophy of mind, creating ambiguity about its precise focus. This definitional ambiguity has important epistemological implications. Without a clearly articulated subject matter, AI research runs the risk of conflating distinct processes - human cognition, animal intelligence, and computational processes - under the generic banner of 'intelligence'. Moreover, the lack of disciplinary boundaries allows AI to appropriate concepts from other fields without necessarily engaging with their theoretical contexts. Concepts such as ‘learning’, ‘knowledge’ and

‘dialogue generator’ are routinely applied to computational systems without adequate attention to their different meanings in different epistemological traditions. This conceptual importation, while pragmatically useful, often results in theoretical imprecision that hinders deeper understanding.

Contemporary debates in AI can be situated within the classical philosophical opposition between rationalism and empiricism. This dichotomy manifests itself in two dominant research paradigms: symbolic AI and connectionism. Symbolic AI emerged from the 1950s computational metaphor of the mind, conceptualising cognition as rule-governed symbol manipulation and formal logical operations. The computational metaphor of the mind has a distinctly Cartesian legacy, maintaining a strict mind-body dualism in which cognitive processes (software) are treated as functionally independent of their material implementation (hardware). Symbolic AI's emphasis on rule-based reasoning and formal logic is consistent with traditional rationalist epistemological traditions that privilege innate structures. In contrast, modern neural network approaches represent a revival of empirical epistemology, emphasizing bottom-up learning through statistical processing of large data sets. This approach parallels 19th-century associationism, which views learning as the progressive strengthening of connections between sensory inputs and behavioural outputs. Critics have aptly described connectionism as “behaviourism in computer’s clothing” (Papert, 1988, p. 9). Despite its impressive pattern recognition capabilities, connectionism remains epistemologically limited by its fundamentally reductionist view of intelligence.

By treating cognition primarily as pattern recognition across statistical regularities, connectionist approaches struggle to account for conceptual understanding, conceptual change and creativity. While they excel at reproducing patterns encountered in training data, these systems demonstrate fundamental limitations in understanding the semantic content of the patterns they manipulate and generating genuine conceptual innovations. Despite their opposition, both symbolic AI and connectionism maintain fundamental ontological and epistemological dualisms—between mind and body, innate structure and sensory input. These dualisms reflect a shared mechanistic worldview that fails to capture the dynamic, developmental, and dialectical nature of cognition that Vygotsky's work illuminates. To overcome these limitations, AI requires more than technical innovation - it requires a fundamental epistemological shift. Based on the study of complex, dynamic and historically evolving systems, Vygotsky's dialectical method paves the way for a truly integrated model of cognition - one that overcomes the shortcomings of both symbolic and connectionist paradigms and dismantles the dualistic and reductionist assumptions that dominate contemporary AI research. The paper concludes by advocating a ‘dialectical turn’ in AI research, urging researchers to foreground the complexity, historicity, and social mediation of cognitive processes - a shift that is seen as essential to resolving the deeper epistemological and methodological challenges facing contemporary science.

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A Holistic Educational Approach to Science, Health, and the Environment for Sustainable Development

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Abstract: This research study focuses on the connection of Science Education, Health and the Environment through an educational program about water. The main purpose of the study is to investigate the contribution of an educational program on water in the direction of creating active citizens. Towards this direction, an educational program about water was developed using Cultural Historical Activity Theory as a theoretical framework. The educational program included activities from the three disciplines and was connected with the 17 Sustainable Development Goals and with the curricula of pre-primary school education. Quantitative and qualitative data were collected. Analysis of results showed the importance of the connection of Science with the Environment and Health in education, considering that these areas should be central units in the school curricula. Most of the students were willing to design and use a similar educational program in their future classrooms expressing their restrictions and limitations in the form of contradictions.

Keywords: Science Education, Health, Environment, Educational program, Cultural Historical Activity Theory

Introduction-Theoretical Framework

The rapid developments at a global level, in terms of health, economy, politics, society and culture have set a new context and a need for modernization in education in the 21st century. Educational policies follow the lines of the globalized society and introduce innovations in their educational systems while at the same time reform their curricula at all levels of education. In this context, the necessity of developing skills related to scientific issues and active participation of citizens arises, and furthermore, the correlation of scientific concepts and the use of technology with social issues. This study focuses on the connection of Science Education with Health and the Environment through an educational program about water. The basic idea for connecting Science Education with the Environment and Health is based on the common benefits that arise for education from the combination of all three scientific fields. This specific approach is characterized as a new pedagogical approach, which connects Science Education, Environment and Health (Zeyer et al., 2021; Zeyer & Kyburz-Graber 2012).

The main purpose of the study is to investigate the contribution of an educational program on water, which connects Science Education, Environment and Health in the direction of creating active citizens. Furthermore, it seeks to find the common process skills that arise from this connection and the contradictions that come up in a possible implementation of the educational program. The educational program is linked with the 17 Goals of Sustainable Development and the Agenda 2030 as well as the curricula of pre-primary school education, which promote the development of skills such as communication, creativity and critical thinking, social skills as well as skills related to citizenship. It was implemented through a series of 4 laboratory courses and at the same time all the material of the courses were available to university students on a distance learning educational platform. The first part introduced the subject of water and the connection to the pre-primary school curriculum. The second part included water experiments combining Science, the Environment, and Health. The third part concerned experiential activities related to the 17 Sustainable Development Goals and the fourth part involved activities using a short film about water.

Cultural Historical Activity Theory (CHAT) was used as a theoretical framework and more specifically the SCOPES methodology (Kolokouri & Kornelaki, 2019). Within this frame, research focused on studying the Systems of activity involved, the contradictions that arose, the Outcome of the results, the connection theory and practice (Praxis). Furthermore, the research follows the phases of an Expansive learning cycle (Engeström, 2020) for the development of educational material in the field of Science Education, the Environment and Health. In this sense, the field of Science teaching-learning process is expanded through a socio historical cultural perspective, so as to include new approaches and concrete initiatives combining science teaching with environmental and health issues.

Methods

Participants to the educational program were 185 students from the Department of Early Childhood Education at the University of Ioannina, who attended the course "Teaching of Science Concepts in Early Childhood Education I", in the 3rd year of studies, during the winter semester of the 2021–2022 academic year. Quantitative and qualitative data were collected, including questionnaires about students' views, program evaluation questionnaires as well as educational material that pre-service teachers developed at the end of the program. At the beginning, a questionnaire was used to investigate students' views on issues concerning the connection of Science with the Environment and Health and at the end, a second questionnaire was used as a means of evaluation after the completion of the program. The open-ended questions from the questionnaires, as well as the students' assignments, were analysed qualitatively. The quantitative data were coded and analysed using SPSS, while the qualitative data were processed with the qualitative data analysis software Nvivo 9. The research questions connected with this paper mainly concern the Science Process Skills that can be developed according to pre-service teachers as well as the contradictions that arise during the design and implementation of an educational program that combines Science Education, Health and the Environment. The learning activities of the educational program were developed in an expansive cycle (Engeström, 1999).

Results

The analysis of results showed that participants supported the connection of Science with the Environment and Health in education, considering that these areas should be central units in the school

curricula, as the current school curricula do not seem to include subjects related to Health Education and the Environment to a large extent. The contradictions that appeared during the implementation of the educational program brought about changes in the entire activity system. They were expressed as conflicts, difficulties and dilemmas but also as phases of development of the educational program. From the four levels of contradictions of Engeström (1987) three levels were identified, as shown in the table below (Table 1):

Table 1: Observations and findings of contradiction analysis

Contradiction Level	**Engeström's definition (1987)**	**Findings of analysis from this study**
Primary Contradiction	"...the inner conflict between exchange value and use value within each corner of the triangle of activity."	Concerns about the role of participants in the design and implementation of an educational program based on all three areas. More specifically, they mentioned the didactic transformation of scientific concepts for early ages, the theoretical background on science, time availability, the experience, the structure and the effectiveness of the educational program and finally, the motivation of the early years' learners.
Secondary Contradiction	"…are those appearing between the corners. The stiff hierarchical division of labor lagging behind and preventing the possibilities opened by advanced instruments is a typical example."	During the implementation of the educational program of the present research, issues arose regarding the mandatory laboratory courses and the workload related to them. The division of labour created conflicts as in the groups of participants some members were less active, which affected the functioning of the group as there was a need to redefine their framework.
Tertiary Contradiction	"…appears when representatives of culture (e.g., teachers) introduce the object and motive of a culturally more advanced form of the central activity into the dominant form of the central activity.	Tertiary contradictions between the new teaching practices introduced into the activity system as Science Education was for the first time linked to Environment and health in the educational curriculum.

The science process skills commonly identified in all three disciplines were: Experimenting, Communication, Observation, Inferring, Formulating Hypotheses, Interpretation, Predictions, Mathematical Expressions, Measurement, Sorting, Identification and control of variables and Formulating models. These skills, developed through an educational program that connects Science Education, contribute to the scientific literacy of citizens who have the opportunity to participate in global issues by utilizing their knowledge and experience within sociocultural context in which they live.

Conclusions-Discussion

Designing within a Science Education, Health and Environment approach for educational learning environments raises a number of questions about the state of environmental health issues in schools, with the skills to be developed in school for environmental health, the interpretation of these competencies in schools, books, and the assessment at the end of compulsory education, of the skills acquired by the students. These questions raise important issues in the design of educational programs that connect the three areas and open new fields of research. The common science process skills that

were developed through the educational program, made participants familiar with the scientific way of thinking as well as the scientific method of organizing teaching and learning.

The development of expansive learning offers a new methodology to organized learning in which the learners' context is associated with the implementation of new didactic strategies and evaluation processes. All in all, the methodological framework of CHAT points out the socio-cultural dimension of learning in which the teacher is not a simple transmitter of knowledge but a dynamic mediator of teaching and learning. Despite the difficulties that emerged with the form of contradictions, participants responded that the educational program of the present research met their expectations. In addition, they seemed to have been helped through the assignment of tasks, in which they had the opportunity to interact, develop participatory work methods, create educational materials that they can use as a basis to develop other educational programs in their future profession.

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Interpreting systemic contradictions through a clinical analysis of activity: a situated case in the AEFE network

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Abstract: This contribution explores how the articulation between the Clinical Activity Approach and Cultural-Historical Activity Theory can illuminate the professional tensions experienced by educational trainers working in transnational contexts. Based on research conducted within the Agency for French Education Abroad, the study analyses a video-recorded remote training session and autoconfrontation interviews with two trainers supporting locally recruited early-career teachers. The analysis identifies professional gestures that are constrained, suspended, or reconfigured in response to dilemmas and impeded activities rooted in systemic contradictions. By examining these gestures as expressions of both subjective inhibition and structural tension, the study highlights how symbolic asymmetries, logistical constraints, and failures in instrumental mediation affect the capacity to sustain pedagogical presence in a digital environment. These tensions reflect broader contradictions within transnational activity systems, including disparities between expatriate trainers and local recruits. The trainers' decision to deviate from the prescribed session structure is interpreted as a situated gesture of transformative agency, enacted in response to the inadequacy of digital artefacts to support meaningful interaction. Rather than being merely adaptive, this reconfiguration reflects an attempt to reclaim their capacity to act by engaging with and partially transforming the systemic contradictions shaping their activity. Impeded activity thus acts as an analyser of underlying systemic contradictions within the activity system.

Keywords: impeded activity; systemic contradiction; Cultural-Historical Activity Theory; Clinical Activity Approach

Introduction

This paper addresses the theoretical challenge of conceptualising professional dilemmas that cannot be reduced to either individual hesitation or systemic contradiction. Drawing on the Clinical Activity Approach (Clot, 1999, 2008, 2009) and Cultural-Historical Activity Theory (CHAT; Engeström, 1987, 2015), it proposes a cross-analysis of subjective inhibition and structural tensions in professional training contexts.

Although both frameworks originate in the Vygotskian tradition, their combined application in empirical research on professional development remains relatively limited. This contribution argues that mobilising both the concept of impeded activity from the Clinic of Activity and the analysis of systemic contradictions from CHAT enables a deeper understanding of the tensions structuring professional development work in transnational education settings.

Rather than treating these frameworks as contradictory or redundant, this paper engages them in a complementary dialogue – one reaching outward and upward to analyse interconnected activity systems (Engeström, 2015), the other descending inward and downward to capture subjectivity, dilemmas, and situated agency (Clot, 1999). This dual perspective makes it possible to access not only what is said and done, but also what is prevented, silenced, or rendered invisible in the course of work. In doing so, this paper seeks to expand CHAT's methodological repertoire by showing how clinical analysis can illuminate the interplay between subjective inhibition and systemic contradiction – particularly in professional contexts marked by persistent structural asymmetries.

The empirical material stems from a research conducted within the Agency for French Education Abroad (AEFE), focusing on a remote training session and autoconfrontation interviews with two educational trainers (EF2D) supporting locally recruited early-career teachers (Neo) under the "Teachers to be Professionalised" (PàP) programme. The analysis reveals professional gestures that are (1) impeded by subjective constraints, (2) modulated to preserve relational balance, or (3) reconfigured in response to systemic contradictions – suggesting that interpersonal hesitations can signal deeper tensions in the symbolic and material mediation of remote pedagogical activity.

We now examine how such breakdowns – in tools, environments, and interactional routines –constitute not mere operational issues but situated expressions of instrumental contradictions where artefacts fail to mediate the intended pedagogical relation.

1. A Dilemma as Symptom of a Systemic Contradiction

A professional dilemma cannot be reduced to individual hesitation or indecision. It emerges at the intersection of historically sedimented structures and situated modes of engagement, where the subject is compelled to navigate between competing norms, rules, and expectations. Drawing from the Clinical Activity Approach (Clot, 1999), we consider the dilemma as a manifestation of conflict within the activity itself – not merely between the subject and the task, but between different dimensions of what is prescribed, enacted, and possible, constraining the subject's capacity to act (Bonnemain & Clot, 2017; Matteï-Mieusset, 2013). Such tensions often manifest as dilemmas, which, far from being mere personal hesitations, should be analysed as symptomatic expressions of underlying systemic contradictions (Ianeva, Séguret, & Clot, 2021).

From a convergent theoretical register, Cultural-Historical Activity Theory (CHAT; Engeström, 1987) also conceptualises dilemmas as symptomatic expressions of systemic contradictions. As noted by Ianeva et al. (2021), these symptoms do not directly disclose the contradiction itself but serve as heuristic entry points for its reconstruction. The analytical task, in both traditions, involves a dialectical movement from the manifest disruption to the underlying structure – a shift that links the subject's experience to systemic tensions embedded in the activity.

In the case analysed here, the dilemma arises during a remote professional development workshop facilitated by educational trainers within the AEFE network. As he reintroduces the object of the session – formative pupil assessment – he is interrupted by a novice teacher expressing uncertainty about his place in the group. Instead of reaffirming the institutional framework, the trainer responds with humour and tact. In subsequent self-confrontation, he evokes a sense of discomfort linked to his dual positioning – simultaneously a peer and a figure of authority – navigating a tension between collegiality and dissymmetry. This hesitation is not symptomatic of indecision or lack of professional clarity. Rather, it constitutes a situated effort to regulate a contradiction between two poles of the division of labour: on one side, the formal authority conferred by his institutional mandate as trainer; on the other, the informal norm of horizontality that underpins peer relationships in the field. His decision to refrain from asserting his position does not reflect a diminished capacity for agency, but a deliberate modulation of it – a compromise aimed at preserving relational equilibrium in the face of symbolic dissymmetry. Moving from such a dilemma to the identification of a systemic contradiction requires interpretive reconstruction, through which the visible symptom is analysed as a possible manifestation of deeper tensions (Ianeva et al., 2021). In this instance, we interpret the dilemma as the situated expression of a secondary contradiction (Engeström, 1987) between the division of labour –which legitimates the trainer's hierarchical position –and implicit rules of peer cooperation based on horizontality and trust. To manage this tension, the trainer mobilises interactional tactics – humour, status withdrawal, empathy – which may serve to maintain engagement despite internal dissonance (Clot, 1999).

He retrospectively describes this position as "*schizophrenic*," using the term colloquially to signal not merely discomfort but a deeper conflict between incompatible logics of action: the institutional imperative to lead, and the interpersonal imperative to remain equal. This disjunction is not solely pedagogical. It is entangled with latent socio-professional inequalities between expatriate trainers and

locally recruited teachers. During autoconfrontation, the trainer alludes to the jealousy elicited by his significantly higher salary, contrasting with that of the Neo – a disparity he describes as "*a real chasm*." This awareness informs his relational style, which implicitly seeks to soften symbolic asymmetries that training does not formally address. These latent tensions – expressed through ironic remarks or micro-aggressions – may constrain his power to act and partially structure his dilemma. Thus, the dilemma cannot be fully understood without reference to the broader contradictions that underlie the symbolic and material organisation of work – particularly the unequal distribution of resources and recognition between expatriate and locally recruited personnel.

What initially appears as a relational dilemma thus reveals a deeper systemic logic: one where the trainer's agency is shaped not only by pedagogical dynamics, but by enduring institutional asymmetries embedded in the organisation of transnational training. This symptomatic experience reveals the limits of local regulation and calls for expansive transformation of the training activity itself (Engeström, 2015; Clot, 2008). The gesture of withdrawal is not the endpoint of agency, but the visible trace of a constrained power to act – one that signals a contradiction exceeding individual adjustment.

2. Impeded Activity as an Analyser of Instrumental Contradictions in Professional Training

This systemic perspective is deepened through the cross-analysis of autoconfrontation interviews (Clot, 2009), which reveals a pattern of impeded activity symptomatic of a failure in instrumental mediation within the remote support system provided to the Neo on the topic of formative pupil assessment. In this method,

> "*confrontation of the professional with the video recording of his or her activity in the presence of the researcher is called simple autoconfrontation. Confrontation of the same professional with the same video recording in the presence of the researcher and of a colleague […] is called crossed autoconfrontation*" (Ibid., p. 300).

Two interconnected impediments are observed. First, the absence of an integrated digital tool for roll call – since the dedicated ATENA feature was only made available several months later. Second, the inability to establish stable visual contact, due to the systematic deactivation of trainee cameras and the recurring partial disappearance of one trainer's face (EF2D2) when screen sharing with his colleague. These impediments obstruct the trainers' capacity to regulate interaction and sustain presence in a distributed setting.

EF2D1 explicitly acknowledges this limitation, stating his decision not to request camera activation to avoid time-consuming justifications from participants. This withdrawal, however, cannot be reduced to a pragmatic choice: it signals an impeded activity, wherein the subject's power to act is partially constrained (Clot, 1999, 2008). The action that could have structured a more embodied training relation remains suspended, unrealised.

EF2D2, in turn, describes the logistical difficulties encountered by trainers themselves: working from home, lacking access to institutional premises, relying on unstable personal internet connections. He describes their status as "*wandering trainers, with no assigned room.*" Yet this account does not reflect a personal complaint but rather reveals a broader systemic compromise: ensuring continuity of professional training for the Neo, who are geographically dispersed across an entire educational zone, while keeping the costs of training operations within feasible limits. A face-to-face format would require substantial logistical and human resources – such as releasing both trainers and trainees from teaching duties, funding travel and accommodation, and mobilising physical infrastructure – which are challenging to sustain, especially in transnational contexts.

Paradoxically, the very format that makes support possible (online, synchronous) also undermines its pedagogical quality, depriving trainers of the symbolic and material resources required to maintain a strong formative presence. At the same time, this session plays a critical role: it supports the Neo as they engage with the training modules on M@gistère – the platform that centralises content, tasks, and

assessment leading to certification via open badges. These digital badges are essential to the progressive validation of the two-year PàP training pathway to professionalisation.

The trainers are thus caught in a *double bind* (Engeström & Sannino, 2011): either accept a degraded pedagogical relationship, or risk leaving novice teachers unsupported. The persistence of this dilemma indicates that the issue lies not only in the surface-level constraints of remote interaction, but in the systemic failure of instrumental mediation – a dimension we now explore through the lens of impeded activity.

In this configuration, the artefact does not reach the status of an instrument (Rabardel, 1995), leaving mediation structurally deficient. The failure of instrumentalisation exposes an activity that cannot stabilise its own mediating structure – a case of incomplete instrumentalisation revealing deeper systemic contradictions. What appears as a breakdown in use is, in fact, a trace of impeded activity (Clot, 1999), where the subject's power to act is constrained by the absence of collectively shared rules and institutionalised norms. The artefact, deprived of the socio-institutional conditions required for its operationality, reveals the unfinished and internally fragmented nature of the activity system itself.

Thus, impeded activity acts as an analyser (Clot, 2008), rendering visible the structural incompleteness of the mediating configuration. In the absence of stabilised norms and collective rules, the artefact's failure to mediate the pedagogical relation is not incidental, but rather diagnostic in itself – revealing a contradiction that exceeds local adjustment and demands reconfiguration of the systemic conditions for formative presence.

3. Transformative agency in tension: a situated professional gesture within contradictory activity

In the situation analysed, the two trainers deliberately diverged from the prescribed session structure by shortening the autonomous work phase on M@gistère in favour of an extended synchronous exchange. While the institutional framework specified a sequence of 30 minutes of presentation followed by 90 minutes of self-directed work, this reconfiguration reflects more than a circumstantial adjustment: it constitutes a situated professional gesture grounded in the practical arbitration of conflicting constraints.

M@gistère – the digital platform officially used by the AEFE to structure remote tutored support for the Neo, particularly in the context of open badge certification – prescribes individual progression through a modular sequence. However, the trainers perceived a tension between this model of autonomy and the need for real-time pedagogical interaction.

Confronted with this contradiction, they opted to transform the implicit rules of the activity to preserve its systemic object – the development of professional competence among the Neo, through sustained dialogic engagement. This gesture marks a regained capacity to act (Clot, 2008), where the subject reappropriates the conditions of their activity rather than submitting to its limitations. The impeded activity – that of a support process deprived of its interactive dimension – is converted into a springboard for transformation. In this sense, the reconfiguration exemplifies a form of transformative agency (Engeström & Sannino, 2010): the actors are not merely pursuing their task but acting upon the systemic contradictions that shape the conditions of their own engagement.

By reframing the balance between autonomy and guided support, they do not simply substitute one pedagogical format for another. Rather, they open a space of conflictual rationality (Sannino, 2010) in which alternative conceptions of what constitutes meaningful training emerge and are negotiated. However, such situated gestures also reflect the systemic conditions that enable or constrain professional agency – pointing to broader possibilities for reconfiguring the activity system itself.

Conclusion

This study has shown how the combined use of the Clinical Activity Approach and Cultural-Historical Activity Theory can illuminate both the subjective inhibitions and systemic contradictions that shape professional training activity in transnational contexts. Within the AEFE support framework for the Neo, the empirical analysis identified professional dilemmas and impeded activities that cannot be reduced to individual hesitation. These tensions reflect broader structural misalignments between institutional norms, symbolic asymmetries, and the material and relational conditions of remote support.

The trainers' gestures – whether constrained, suspended, or reconfigured – revealed not only a partially inhibited power to act, but also a capacity to act upon the very contradictions of the activity system. In this sense, the clinical and systemic perspectives do not compete, but converge: one makes visible what is prevented or unspoken in the course of work; the other reconstructs the latent tensions within and between interconnected systems of activity.

This contribution has examined the heuristic potential of a dialogue between the Clinic of Activity and CHAT, showing how the articulation of situated experience with systemic contradictions can reveal dilemmas, impeded activities, and professional gestures as potential vectors of transformative agency.

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The Development of Scientific Thinking in Early Childhood: A Case Study of Personalized Learning in a Playful Context

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Abstract: International literature has shown that young children are natural explorers, curious about the world, and explore concepts and phenomena from the natural world. According to Vygotsky's cultural-historical theory, play has a critical role in children's learning and development and is the dominant and guiding activity in early childhood. Although the literature indicates that preschoolers do learn science during play, we still do not know much about how they learn and how they form their personalized learning pathways in science. This study focuses on documenting and unpacking how preschool children's learning pathways in science are formed within play-based settings. A set of cultural-historical concepts has been used as an analytical tool. The findings illustrate the turning points that formed children's learning pathways in relation to their play and highlight how the interrelation between the individual and the collective forms conceptual learning in science. Capturing the individual along with the collective, it is shown how even if children started from the same point and arrived at the same goal, the learning pathway they developed was personalised and unique.

Keywords: early childhood education, preschool science, play and science learning

Extended Abstract

The role of play in science learning in preschool children is important as it provides a natural process for the development of curiosity, experimentation and exploration (Gomes & Fleer, 2020; Akman & Özgül, 2015). Vygotsky (2004) argued that play was not just a fun activity, but a rich resource for children's learning and development. However, the learning and teaching of science frequently appear to have cognitive and conceptually centered characteristics, thus creating distance from children's play and overlooking the dominant role that play should have during educational activities in preschool children.

According to the findings of international literature (Fragkiadaki et al., 2021; Bulunuz, 2013), children learn through play and form scientific concepts, but there is a gap in our understanding about the way children learn within play-based settings. Recording data before and after a scientific activity is necessary to conduct some inferences and generate evidence about the knowledge children had before and after the intervention and the development of this knowledge (Albin-Clark, 2021). However, what seems to be missing from the literature is the mapping of play-based learning and the documentation of the whole process of learning and development in science during play. While there is some research showing how this is documented, it is mostly fragmentary and usually comparative (Bulunuz, 2013; Schulz, 2015). Ways of mapping and documenting the entire learning and developmental pathway that a child follows during their scientific play should therefore be explored more deeply.

From a cultural-historical theoretical perspective, the study also utilizes Galperin's theory, which is interrelated and works in a complementary way with the vygotskian theory, as it highlights how the interaction between individual and collective processes enhances conceptual development. Galperin's

theory provides a detailed framework for understanding how learners can effectively engage with tasks across varying contexts (Engeness & Lund, 2020). Galperin proposed that individual mental actions are internalized versions of external, collective activities. Children first engage in shared, external tasks (often guided by adults or peers) and gradually internalize these actions to form independent mental processes. This aligns with the idea that individual cognition arises from collective experiences, mediated by cultural tools and interactions (Arievitch & Haenen, 2005).

Considering all of the above, this study seeks to provide better insight into recording and mapping the learning processes that preschool children follow during play-based learning activities, filling the above gap in the literature. It will also determine how we can document preschool children learning through play, and the process of forming science concepts.

Based on the above, the following research question arises:

1. How are preschoolers' personalized learning pathways formed during their scientific play in early childhood educational settings?

Two hundred preschool children from 6 kindergartens in Northern Greece participated in the study. Empirical data were collected and generated in various phases of children's play. The overall process of qualitative data generation and data collection lasted 3 months. Children's play, ideas, and thoughts were recorded through over 160 hours of video recordings, over 300 drawings, and children's scientific narratives during their play. Data generation was conducted through a series of visits to preschool centers and support of EC teachers who participated in a professional development program and planning sessions. Data were collected before, during and after the play-based teaching intervention.

The study design followed the play-based Conceptual PlayWorlds (CPWs) model of practice for teaching and learning science in the early years, developed by Fleer (2019). The overall study followed the educational experiment method, as defined by Hedegaard (2008, 2012), according to which the participating teachers collaborate with the researcher to create the appropriate developmental conditions for each child to form science concepts and phenomena through play.

Through the cooperation of the researcher with the EC teachers, an educational design for each preschool center was created. The teachers used a storybook, a fairy tale, which they read with the children of their classroom, and within each story, some problems arose, which could be solved through scientific play, requiring children to explore science concepts by collectivelly constructing and experimenting with artefacts.

As basic tools of analysis, a set of cultural-historical concepts has been selected and used such as play, everyday and scientific concepts, collectiveness and individuality, which function as a conceptual system. Another important concept is the turning points that are identified in children's personalised learning pathways. A turning point is defined as a qualitative change in participant's discourse and a step in the quality and quantity of their expressions of transformative agency (Fragkiadaki, 2020; Haapasaari et al., 2016). The analysis follows Hedegaard's dialectic-interactive method (2012). The first level of this method "*common sense interpretation*", is based on the researchers' comments about children's playful experiences. At the second level of analysis "*situated practice interpretation*" we searched for conceptual links of the results produced at the first level. And at the third level, "*thematic analysis*" a theoretical analysis is conducted so that patterns can emerge and explain how the science pathways are formed.

Currently, the data analysis is at an early stage. The first findings already show a better understanding of how we can document how preschool children learn through play and form scientific concepts. The unique and complex ways in which personalized learning pathways were developed through collectivity were made visible. The presentation will focus on the case example of two 5-year-old children from two different preschools. The two children were engaged in the same scientific concepts. All phases of the children's personal learning pathways were recorded, and there was a strong emphasis on the process and duration of the activities they took part in. Based on the children's initial (pre-test) and later representations (post-test), these two children appeared to begin their pathway from the same point, with similar representations of the concepts. At the end of the teaching intervention, it appeared that they both reached the final teaching and learning goals. However, the emphasis was placed on the 5-week intermediate educational process, as it was observed that children's individual and personalized pathways were created through group participation and collectiveness in completely different and diverse ways. Among the two children's pathways, dynamic turning points were detected.

The study aimed to explore how children's learning pathways are being developed during their scientific play and give better insight into recording and mapping the learning processes that they follow. The main research question focused on how children's learning pathways are formed and the route they followed to reach the learning goal. The study adds to the literature by highlighting the complexity inherent in the learning process when it involves the formation of scientific concepts and takes place in play-based settings. Implications that inform practice about dialectically interrelating play and learning are discussed.

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Building Scientific Agency Within the Collective during the Early Years

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Abstract: This study seeks to explore how children build scientific agency within the collective in early childhood educational settings. Focusing on the phenomenon of clouds formation, we showcase how preschoolers can collaborate effectively to form the scientific concept through successive phases of interactions and with no typical teaching intervention. The cultural-historical concepts of real and ideal forms, everyday and scientific concepts, intra and inter-psychological functioning are used as analytical tools. The findings map a child's learning pathway within the collective from the difficulty of forming an explanation for the phenomenon, to the formation of an explanatory model based on artificialism and human causality and finally, to an explanation compatible with the scientific model used in early childhood science education. A set of turning points in the interactions between the child and his peers is highlighted. The study concludes by emphasizing the significance of institutional pedagogical practices that cultivate collective science cultures.

Keywords: agency; collectiveness; science; early childhood

Extended abstract

This cultural-historical study positions young children as agentic science learners and scientific agency as a social practice (Arnold & Clark, 2013) during the early years. Capturing the dialectical interrelation between the individual and the collective in science learning and development, the study explores how children build scientific agency within the collective in early childhood educational settings. Focusing on the phenomenon of clouds formation, we showcase how preschoolers can collaborate effectively to form the scientific concept through successive phases of interactions and with no typical teaching intervention. The study is part of a widen research project exploring science concept formation as a social and cultural process during the early years. The initial sample of the project involved one hundred and thirteen preschool students in Greece, within the age range of 4.5 to 6.5 years old (with an average age of five years and three months). In this study we thoroughly present the personalized learning pathway of one child with the pseudonym Odysseus. The research procedure was organized as a science-oriented activity integrated into the child's everyday educational reality in preschool settings. During this activity, the child participated in three semi-structured conversations centered on the natural phenomenon of clouds, and particularly the process of clouds' formation. The three conversations were carried out at three different phases over time. During the first phase, Odysseus and the early childhood teacher participated in the conversation. During the second phase, that followed a week after the first phase, one child named Nestor joined the conversation between Odysseus and the early childhood teacher. During the third phase, that followed a week after the second phase, a small group of four children, including Odysseus, and the early childhood teacher participated in the conversation. The same central question was addressed to the child or children in each phase. The question was "How clouds are formed?". Empirical qualitative data arose from the digital recordings of the conversations through the three phases and the child's initial drawing from the first phase and the following two co-drawings (Areljung et. Al, 2024, Fragkiadaki, Fleer & Ravanis, 2021) with his peers during the second and the third phases. Following a dialectical analysis a set of cultural-historical concepts (Vygotsky, 1987, 1998) were

used as analytical tools. These concepts are the interrelation between real and ideal forms, everyday and scientific concepts, intra and inter-psychological functioning. The findings map Odysseus's learning pathway within the collective from the difficulty of forming an explanation for the meteorological phenomenon, to the formation of an explanatory model based on artificialism and human causality and finally, to an explanation compatible with the scientific model used in early childhood science education. A set of turning points in the interactions between the child and his peers is highlighted and analysed. The findings suggest that children's agency in science is promoted when children constantly interact and effectively navigate themselves within diverse social situations where they are encouraged to engage in discourses and take ownership of their learning pathways in science. Co-drawing, as a collective process that promotes interactions and negotiations, appears also to be critical in this process. The study concludes by emphasizing the significance of institutional pedagogical practices that cultivate collective science cultures.

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Reflexive masculinity: A theoretical framework of men “in-between” and alternative masculine dispositions

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Abstract: We propose a new theoretical model, the theory of reflexive masculinity, to consider the process whereby men may come to reflect on and alter their masculine dispositions. A process of socialization and subsequent reflexivity leading to changes in masculine dispositions is outlined, utilizing sociological and organizational literature to demonstrate how this process may occur. We apply the concepts of Habitus, personal, institutional, and historical conversion factors, reflexivity, hegemonic and complicit masculinity, and capital to denote the tenets of this process. It is envisioned that a process of reflexivity and incorporation of alternative masculine expressions into Habitus may contribute to changes in hegemonic masculinity. The theory of reflexive masculinity provides a framework through which change in men’s masculine expression can be considered, and the progression of hegemonic masculinity may be theorised.

Keywords: masculinity, reflexivity, flexibility, conversion factors

Introduction: The “men in-between” and the challenge of masculinity

The study of men and masculinities has evolved significantly since its inception in the 1970s, with growing attention to the intersection of work, family, and masculinity. The dominant theoretical paradigm, hegemonic masculinity, posits a culturally exalted ideal of what it means to be masculine, which varies across contexts but consistently encourages adherence to specific behaviors. Traditionally, hegemonic masculinity has been linked to notions of financial provision and engagement with paid work. While new concepts like "caring masculinities" - which embrace values of care, positive emotion, interdependence, and a rejection of domination - have emerged as potential alternatives, their capacity to fundamentally shift the prevailing hegemonic form remains debated.

Crucially, Connell's concept of "complicit masculinity" describes men who do not fully embody hegemonic ideals but nonetheless benefit from the "patriarchal dividend" by appearing to align with dominant masculine practices (Connell, 2005; Connell & Messerschmidt, 2005*)*. These "men in the middle" represent a significant but often overlooked group whose decisions to either maintain complicity or challenge the status quo are vital for theorizing gendered change. This article addresses this theoretical gap by proposing a process-oriented framework that explains why and how these men might engage in reflection and choose alternative masculine expressions

Central concept of Reflexive Masculinity Theory

Our theoretical model integrates several key concepts to explain the process of reflexive masculinity:

Gender Order and Gender Regimes: Men's masculine identities are formed and expressed within specific individual, social, and organizational contexts, termed "gender regimes" (institutional) and "gender order" (societal). These contexts reinforce culturally accepted masculine forms (Addis et al., 2010). We argue that while norms generally encourage and reward adherence to traditional behaviors, the interaction between individual agency and sociocultural context can disrupt existing notions of masculinity and foster new expressions. For instance, men may perceive challenging hegemonic masculinity (e.g., using flexible working arrangements for caregiving) as risky, weighing potential gains against losses, as suggested by prospect theory.

Habitus: Rooted in Bourdieu's theory, Habitus is the mechanism linking structure and agency. It represents a set of internalized historical, cultural, and familial relations, shaping mental schemas, judgments, perceptions, and inclinations to act (Bourdieu, 1977). Our model posits that masculine practices are part of a man's Habitus, meaning that the way men practice masculinity is influenced by the incorporation of various forms of capital acquired in different contexts. Therefore, men socialized in traditional gender orders are more likely to exhibit "traditional masculinity," while those in non-traditional contexts are more likely to practice "non-traditional masculinity". Changes in Habitus are complex but not impossible, and are necessary for alternative masculinities to be practiced.

Conversion Factors: These are influences within the gender order and gender regimes that can prompt individuals to make specific choices regarding their masculinity. These factors can be understood at different levels. At the personal level, they may involve life events such as becoming a father (Brandth & Kvande, 2020*)* or facing a serious illness. At the institutional level, they include circumstances like the introduction of a father’s quota or organizational policies that support flexible working arrangements (FWA) (Vandello et al., 2013). Finally, at the historical level, they reflect broader societal transformations, such as movements toward a more egalitarian society (Meil, 2013) .

These factors act as "invitations" for men to reflect on their masculine practices and consider the potential gains and losses of altering their dispositions. Men who experience high-intensity or opportune conversion factors are more likely to engage in this self-reflection and change their practices, whereas those with low-intensity or no conversion factors are less likely to do so.

Reflexivity: Drawing on Archer's concept of analytical dualism, reflexivity is defined as the "internal conversation" that mediates between social structures and agency, making structural and agentic transformations possible (Archer, 2003, 2012). It is during this period that men "evaluate" the gains and losses of changing their masculine practices, particularly within an organizational setting.

Position in the Field (Capital): Our model incorporates Bourdieu's concept of "field" as a social space where individuals compete for various forms of capital (economic, social, cultural, symbolic). The volume of capital a man possesses influences his capacity to appropriate new forms of capital and his power within a given field (Bourdieu, 1986). We propose that men with higher levels of capital are better positioned to challenge traditional masculine expressions that align with hegemonic masculinity, potentially revealing new forms of masculinity. Conversely, men with low capital may feel less empowered and choose to remain complicit rather than express alternative masculinities. Even men from non-traditional backgrounds might remain complicit in traditional organizations if their capital is low, while those with high capital are more likely to practice new forms, including caring masculinity.

Applied Example: Flexible Working Arrangements (FWA) and Masculinity

Men's utilization of flexible working arrangements (FWA) for family reasons serves as a compelling case study for our theory. Despite the potential for greater work-life integration, men often face significant stigma when seeking or using FWA for family care. Research shows that men who request FWA may experience career stagnation and be perceived as less masculine. Unsupportive organizational cultures and societal norms often signal to men that their desire for flexibility for family reasons is illegitimate, reinforcing traditional notions of male breadwinning and disengagement from "feminine" caregiving roles. Our framework explains how the interplay of socialization, conversion factors (e.g., fatherhood, FWA policies), reflexivity (weighing career costs against caregiving desires), and capital (the power to resist stigma) influences men's decisions to either adhere to traditional work norms or challenge them through FWA use. This application highlights how the "men in the middle" possess the potential to shift masculine expressions away from the current hegemonic form and towards caring masculinities. In future, we plan to explore how this theoretical model may apply in the area of men's utilization of FWA, and the processes which are at play in any shifts in masculine expression. In this exploration we will consider comparative organizational analyses to determine what organizational factors may influence reflexivity and shifts in masculine expression.

Limitations

In this model we take a broad approach to social context, which may overlook the nuanced impacts of context on individual behaviour. Similarly, the broad nature of theories generally allows the organization of complex information and provision of a framework for understanding large areas of knowledge, however this often means that theories are boundaried in how much they can explain of varied instances of identity expression and behaviour. Further research and specific empirical testing of the model will allow a more in-depth examination of the utility of the theory.

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University students' perceptions of caregiving

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Abstract: This paper presents university students' perceptions of caregiving. From a participatory and inclusive research perspective, we developed 50 learning trajectories in collaboration with university students from Catalonia and the Basque Country. These trajectories were created based on discussions held during multiple meetings (typically four with each student). Using the transcripts of these meetings and the documents produced by each participant, the researchers drafted their respective learning trajectories, which were subsequently validated by the students. The findings are drawn from these trajectories. The main conclusions indicate that students particularly value self-care and social relationships involving caregiving. Additionally, the study confirms that caring for oneself, others, and the environment positively impacts students' personal and academic well-being, fostering their learning and health.

Keywords: higher education, university students, care, learning

Extended Abstract

In general, a deficiency in care has adverse effects on health (Jones et al., 2023; Runacres et al., 2021). Recently, health issues have been on the rise, highlighting the need for young people to develop tools and strategies to navigate complex situations. Consequently, it is crucial to deepen our understanding of university students' perceptions of caregiving (González et al., 2020; Meyers et al., 2012; Walker, 2022).

Therefore, the obligation to care extends beyond the private sphere and assumes a public dimension, where everyone should be a caregiver—not just healthcare professionals. As a result, recognizing the importance of caregiving across all organizations and institutions is gaining significance (Babarro et al., 2023; Bieto, 2021).

In this report, we present one of the research directions that emerged within the R&D&I project "Learning trajectories of young university students: conceptions, strategies, technologies and contexts" (TRAY-AP), involving two research groups from different autonomous communities in Spain: one from the Basque Country and the other from Catalonia. TRAY-AP is funded by the Spanish Ministry of Science and Innovation.

Specifically, we assess university students from these regions regarding caregiving in their personal and social lives, as well as during their academic experiences. Our goal is to explore questions such as: How do students engage in self-care? Who influences their well-being when caregiving is involved, and in what ways? Why is it important for universities to foster more caring environments to support student learning?

In TRAY-AP, we view university students as active agents with valuable knowledge and experiences. Accordingly, we adopt a participatory and inclusive research approach (Nind, 2014). Young people participate in the research and recognize themselves (Hernández-Hernández & Domingo-Coscollola, 2017). A total of fifty university students from Spain participated in this study, 22 from the University of the Basque Country and 28 from Catalan universities. Among them, 30 were women and 20 were men, aged between 18 and 25 years. Participants were recruited through chain referral sampling (Penrod et al., 2003).

The research design necessitated collaboration with participants residing near the research team. Thus, only students from the two autonomous communities involved in the project participated. The sample reflects the ontological, epistemological, pedagogical, and ethical perspectives of the study, as well as the high level of commitment required from each student collaborator. Participants committed to attending four meetings with researchers, sharing their perspectives and experiences related to learning, and documenting their lives and learning strategies visually or textually.

Using transcripts from meetings and personal documents created by each participant, researchers constructed individual learning trajectories, which students then validated. The findings presented here are based on these trajectories. We organized the results into three sections: students' perceptions of how they are cared for, how they care for others, and how they experience being cared for both inside and outside the university.

The main findings reveal that students particularly value self-care and social relationships involving caring interactions. Engaging in self-care, caring for others, and caring for the environment positively impact students' well-being, enhancing their learning and health. Therefore, caring for others should be a fundamental aspect of any social setting.

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Using participatory design tools for the improvement of patient experience in geriatric care: an affordance analysis

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Abstract: This study explores the perceived affordances and utility of patient journey mapping as a participatory design tool to enhance patient care, especially in geriatric and palliative settings. Twenty-one participants from seven healthcare organizations in France, Spain, and Portugal took part in a multiphase study to develop, evaluate, and refine journey mapping tools. Findings suggest that journey mapping effectively identifies care process issues and supports interdisciplinary communication, with a Net Promoter Score (NPS) of 48. Common uses included pinpointing pivotal care points and recognizing disease trajectory patterns. However, challenges with ease of use and tool confidence highlight the need for further training and support. Recommendations include improved digital infrastructure and structured templates. Future research should examine the tool's long-term impact on patient outcomes and its adaptability across healthcare settings. Overall, the study underscores the potential of journey mapping to promote more patient-centered care.

Keywords: patient journey maps, participatory design, patient-centered design, affordances

Introduction

The digital transformation of healthcare has highlighted the importance of user participation in designing products and services, driving interest in Participatory Design (PD). Rooted in Cultural-Historical Activity Theory (CHAT), PD involves all stakeholders to ensure tools meet real-world needs and remain usable (Simonsen & Robertson, 2012). A key PD method, journey mapping, visualizes user interactions with healthcare services—emphasizing patient actions, feelings, and pain points—to help identify improvement areas (McCarthy et al., 2016).

Affordance theory supports understanding how tools enable action possibilities (Pucillo & Cascini, 2014). In healthcare, affordances arise from interactions between users and environments (Bardenhagen & Rodiek, 2016). For instance, collaborative affordances in medical records enhance clinician coordination, while environmental affordances improve family involvement in care (Bardram & Houben, 2018).

Patient-centered experience design, building on PD principles, emphasizes patient needs and preferences, and is linked to better health outcomes and care efficiency, especially in palliative care (Stewart et al., 2000).

Patient journey mapping has proven effective in capturing patient experiences, improving communication among stakeholders, and revealing systemic issues (Trischler & Scott, 2016). These visual tools support comparative analysis and reduce misinterpretations in care planning and delivery.

Methodology

This study was conducted as part of the HENKONET project, aimed at improving palliative care across institutions in France, Portugal, and Spain. Twenty-one participants from seven healthcare organizations—including administrators, healthcare professionals, and decision-makers—took part in a multiphase study exploring the perceived value of patient journey mapping.

Phase 1: Design of patient journey maps

Participants created journey maps using a structured template divided into sequential sections. For each, they described patient actions, thoughts, feelings, pain points, and areas for improvement.

Phase 2: Testing the maps through a journey mapping exercise

Over four months, participants tested the tool in their institutions through focus groups guided by a standardized session plan. An online alignment workshop followed, where organizations presented their maps and shared challenges, needs, and improvement ideas. This led to a collaborative ideation session focused on common issues identified.

Phase 3: Evaluation of journey maps

An online questionnaire was used to assess the perceived utility of the tool, including a Net Promoter Score (NPS) and open-ended questions on effectiveness, benefits, and challenges (Reichheld, 2003). Following completion of all journey maps, an online alignment workshop was conducted where each organization presented their maps while others identified challenges, needs, and improvement opportunities. This led to an ideation activity where participants collaboratively brainstormed solutions for collective pain points.

Data analysis

A mixed-methods approach was applied. NPS responses were categorized per Reichheld's model (Promoters: 9–10, Passives: 7–8, Detractors: 0–6). Due to the small sample size, quantitative data were analyzed descriptively, while open-ended responses underwent thematic analysis.

Results

The Net Promoter Score (NPS) was calculated based on 21 individual responses. The resulting NPS is +48, indicating a strong proportion of Promoters (scores 9–10) relative to Detractors (scores 0–6). This suggests a generally positive attitude toward the product/service among respondents.

Analysis of Likert-type questions revealed strong perceived effectiveness, with nineteen of twenty-one participants agreeing or strongly agreeing that journey mapping effectively improves patient care. Remarkably, no participants disagreed that journey maps help identify issues in current patient care processes, demonstrating strong belief in their utility for identifying systemic or procedural problems.

Regarding ease of use, sixteen participants expressed positive sentiments, though five participants either disagreed or remained neutral, suggesting potential usability challenges requiring additional training or support. Confidence levels showed similar patterns, with fifteen participants expressing strong confidence while six remained neutral.

Perceived affordances analysis revealed that 85.7% of participants identified potential pivot-points of care as the most common application, highlighting journey mapping's value in isolating critical decision-making points for care pathway improvements. Additionally, 66.7% noted its potential for facilitating communication of patient information among healthcare professionals, enhancing interdisciplinary collaboration. Recognizing patterns in disease trajectories was cited by 42.9%, while 33.3% highlighted journey mapping's use in clinical practice.

Participants provided improvement suggestions including strengthening digital infrastructure with secure technology for privacy protection, incorporating qualitative analysis programs, using flowcharts to guide mapping processes, training to use such tools and providing clear objectives with structured templates.

Discussion, Limitations & Future Work

Patient journey mapping appears to be a valuable participatory design tool for improving care, especially in geriatric and palliative contexts. A positive NPS of 48 and broad agreement on its effectiveness highlight its practical relevance. Its main use—identifying critical care "pivot-points"—supports decision-making and strategy development, while secondary uses include enhancing communication and recognizing disease patterns.

However, usability and confidence issues suggest a need for better design, digital infrastructure, analysis tools, and templates. The small sample size (21 participants, 7 organizations) limits generalizability, and long-term impacts on patient outcomes remain unassessed.

Future research should involve larger, more diverse samples, evaluate long-term effects, and explore training approaches to improve adoption across healthcare settings.

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Teaching play skills to children with autism by mothers in their homes

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Abstract: This study investigated the effectiveness of a curriculum for teaching three mothers of children with autism spectrum disorder to develop playful activities with their daughters during social isolation due to COVID 19. The curriculum offered two types of play, functional play and games with rules, divided into three stages. Demonstration videos and written instructions were sent to participants, who were also monitored weekly with synchronous guidance and cell phone messages. The dependent variable was the skills to be taught to mothers, including: selecting toys that interest the child and that can have a function in play; gaining the child's attention and promoting eye contact through social involvement; social engagement, represented by changes in expressions and laughter with their daughters; and praise, which mothers could give during play. The independent variable was the application of the Curriculum to achieve the objectives. The results indicated the effectiveness of the Curriculum, as mothers learned to promote new games and expanded interactions with their daughters.

Keywords: Mother; Children; Play; Autism

Children with neurodivergent development, diagnosed with Autism Spectrum Disorder, may have limited play repertoires due to restricted interests and repetitive patterns directed at certain objects, which can impair social interactions (Akers et al., 2018). Given this context, for many parents, getting the attention of their children with ASD and promoting diverse play becomes a challenging process, which can impact emotional well-being and maternal expectations (Cipriano, Araujo & Satler, 2025). During the COVID-19 social isolation period, in-person clinical interventions were interrupted, and reflection on the continuity of treatment turned entirely to parents, who would be the main agents of change to promote the well-being and development of their children in the family environment, with monitoring and guidance from the team through telehealth (Blanco et al., 2020).

Therefore, given the need to promote knowledge among parents and provide new proposals for interaction and play with their children in the family environment, this study sought to investigate the effectiveness of a teaching procedure to teach three mothers of children with Autism Spectrum Disorder to develop playful activities with their daughters, using resources available in their homes, within a context of social isolation. The procedure consisted of applying a structured curriculum, written with step-by-step instructions for developing a game, videos with practical demonstrations of the application, and weekly synchronous meetings with the mothers about the applications. At the same time, during the meetings, the mothers would also receive instructions on how to promote interactions and engagement in the games.

Methods

The participants were enrolled in a service at a university in Brazil that offers free treatment to children with disabilities. Due to the pandemic, treatment was provided via telehealth, explaining the modality and their participation in mediating playful activities with their children. There were three participants: P1 (36 years old) and her child C1 (2 years and 5 months old), ASD level 2 support; P2 (36 years old) and her child C2 (2 years and 10 months old), ASD level 2 support; and P3 (29 years old) and her child C3 (4 years and 6 months) with ASD level 1 support and comorbidity with Oppositional Defiant Disorder). To assess teaching needs, mothers were asked to send three videos of moments of play with their daughters. From this, it was possible to identify the type of play and list the main teaching objectives, which would be: selecting toys that interested the child and that could have a function in play; getting the kid's attention and promoting eye contact through social involvement, like changing expressions and laughing with their daughters and giving compliments during play. For P1-C1, the type of play we decided on was Functional Play with her favorite stuffed animals. For P2-C2, the established curriculum was Functional Play with cars, trains, and Lego pieces that she liked. For P3-C3, the established curriculum was Games with Rules, and since C3's interest was drawing on paper, the proposal was to teach a tic-tac-toe game. In this study, the experimental design was a single subject with repeated measures.

The curriculum was based on the process of developing repertoires of play skills described by McKinnon and Krempa (2002) and offered two types of play: functional play with objects and rule-based games, structured in three stages with a gradual increase in complexity. In the first phase of functional games, the mother teaches motor movements; in the second phase, she also teaches sounds and onomatopoeia; and in the last phase, she may invite a family member to participate. In rule-based games, the child was expected to have already developed verbal communication skills and an understanding of rules. In the first phase, the mother teaches the rules of the game; in the second phase, the child initiates and directs the game with the mother; and in the last phase, the mother can invite a family member to participate.

To corroborate the written material, videos were recorded demonstrating the practical application of the steps, with professionals giving guidance and examples of how to play with children. The videos were made available free of charge on a video platform, which mothers could access freely and practice with their children throughout the research process. In addition, each participant had a weekly synchronous meeting with the researcher, in which they received feedback on the applications and new guidance, as well as access via email if they had questions or needed any emotional support or encouragement during the week.

Results and Conclusion

The data analysis for this study was based on videos sent by mothers and synchronous meetings. All participants demonstrated gains in new interaction skills with their daughters within 4 to 6 weeks. As the mothers learned to gain their children's attention, engage them, and use step-by-step play in a fun way, they felt more confident and part of the moment with their daughters. P1 and P3 managed to include C1's sister and C3's father, which contributed to family play. P2 lived alone with her daughter at home, but both developed new repertoires of play with multiple objects.

The materials used provided guidance and confidence to the mothers in the applications, but synchronous guidance and text messages were essential for emotional support and encouragement in their achievements, especially during a period of social isolation due to the pandemic, when the whole family was together, seeking solutions and emotional support. It is hoped that this study will contribute to expanding new possibilities for mothers and family members of children with ASD to develop new proposals for interaction and social engagement through playful mediation, also contributing to the strengthening of emotional bonds between them.

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Between Necessity and Will: Rethinking Agency in Everyday Work through CHAT

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Abstract: This paper sketches a conceptual framework for analysing wilful agency as a continuous, subject-defined phenomenon within broader activity. Grounded in a case study of employee participation in a Swedish preschool, the framework is developed in dialogue with cultural-historical activity theory (CHAT). A key analytical challenge addressed is how to distinguish between actions shaped by necessity and those that express the subject's will. The framework conceptualises agency not as defined by its external form or observable outcomes, but by its meaning for the subject and the evaluative stance they take in relation to their activity. The broader research aims to understand how employees already exercise influence in their daily practices. In doing so, the research seeks to build a knowledge base that can support efforts to democratise workplaces from the bottom up – by making visible the subjective and situated ways in which power is negotiated and enacted.

Keywords: agency, freedom, marx, leontiev

Extended abstract

As part of a case study which follows the work of a team of preschool teachers, it became crucial to develop a theoretical and methodological framework to analyse employee participation from the point of view of the employees as democratic subjects (Karlow, 2022). This work is now being further elaborated within my doctoral research. The research aims at contributing ideas on how to develop a democratic bottom-up management which breaks with prevailing utility maximising ideals of New Public Management. This effort builds on the assumption that in order to increase employee power within preschools, and other workplaces, we need to understand to what extent employees already have power and what concrete circumstances that curb this power from further developing.

In order to study participation, in ways that challenge utility maximising reductionism, the research needs to investigate the workplaces from within, starting from the employee's perspective – based on employees as subjects of change. Within the activity theoretic tradition, it is emphasised that learning and agency should not be assessed based on predetermined criteria - but understood as expansive phenomena that move beyond the predetermined (Engeström, 2015; Stetsenko, 2008). This research orientation contains important qualities that are essential for finding ways to an emancipatory organisational development – partly because it highlights the employees´ own subjective perspectives and partly because it deals with how these perspectives are expressed in ongoing activities. However, there are major challenges in conducting research based on such premises without mixing what expresses *necessity* and what expresses *will* in the activities. To address this challenge, I propose the concept of wilful agency as an analytical lens for examining the extent to which, and the ways in which, activity reflects and expresses meaning and will from the horizon of a specific subject. This concept frames agency not in terms of observable outcomes, but through the meaning that actions hold for the subject and the evaluative stance they take toward their activity.

During recent years scholars have been engaged in theoretic and methodologic developments that address broadly acknowledged limitations within the CHAT-framework regarding its ability to understand power

asymmetries, subjective dimensions of activity and individual actions (Hopwood & Sannino, 2024). These contributions build on and develop the traditional CHAT model of Engeström (2015). But for the purpose of understanding employee agency as a constant feature of workplace activity in ways that clearly differentiates between the subjective perspective and will of the employees and pressing necessities the model still has its limitations contingent on the foundational notion of agency that the model builds on. Within the foundational theoretical grounds of CHAT there is, however, another way in which agency also is being understood. This duality is pointed out by Jones (2009) who stresses the importance of not confusing agency as it is conditioned within historically specific social structures and a more fundamental notion of agency as "the simple relation between man and nature". These two aspects are illustrated in the difference between how Engeström (2006) describe agency as a breaking away from the current frame of action and the way Stetsenko (2019) elaborates on human agency as an ontological condition of our lives as an "inalienable feature of human knowing-being-doing".

These conceptions of agency – whether as a rupture or as existential condition – are both grounded in Marx's ideas on human labour. While Engeströms (2015) notion of the activity system relates to the way Leontiev (1977) describe an activity as being distinct from other activities due to its object – the notion of wilful agency, that I develop, builds on the broader view of activity as a human existential life condition. Leontiev, drawing on Marx (1993), describes activity in this later sense as a process of mutual transformation between subject and object. Kaptelinin (2005) highlights the duality in Leontiev's (1977) writing by pointing out how the word object in English refers to two different Russian terms; *predmet* and *objekt*. My work aligns with the latter. In contrast to the standard CHAT approach, which often links agency to organisational change, my conceptualisation relates agency more directly to the question of human freedom. This accords with Gould's (1978) notion of *concrete freedom*, which she defines, following Marx, as "the active relation between the subject's will or desires and the external conditions for their fulfilment." This portrays freedom "not as an a priori philosophic definition" but as a psycho-material process that needs to be understood empirically (Chaiklin, 2012).

In line with these ideas my research design entails on the one hand dialogical interviews aimed at understanding the personal, wilful perspective of the employees and on the other hand observations of activity as an external, material process. This dual gaze enables an analysis of the extent to which developments in the preschool reflect or contradict the staff's will. In a second analytic step, I examine how the actions of staff and other actors – together with organisational arrangements and constraints – mediate whether and how wilful development is enacted or suppressed within the overall system of activity. Importantly both the subjective view and the objective development of the activity are understood as being part of the same phenomenon of wilful agency. The experience of will and meaning is interpreted as human activity, and the objective circumstances to which the subjective perspective relates are themselves understood as co-constructed by the individuals involved.

Given these conceptual groundings, the question of whether individuals succeed in enacting agency is not analytically relevant – it is already assumed. Rather, attention is directed toward how agency is expressed and oriented within the overall activity. My study showed that the staff's wilful agency was largely directed toward managing immediate circumstances – damage control and choosing between undesirable alternatives (Karlow, 2022). This form of agency was, on the one hand, essential for keeping everyday operations afloat, yet on the other hand, it inadvertently reinforced the very structural challenges that staff were attempting to navigate in the short term. The value of such findings lies in their capacity to offer a grounded and nuanced understanding of agency from the point of view of the employees – one that moves beyond celebratory rhetoric and instead provides insight into the actual conditions under which a genuinely democratic work organisation can be developed and sustained.

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Transforming Science Education: Exploring Shifts in Attitudes Toward Artificial Intelligence

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Abstract: This study investigates shifts in early childhood education students' attitudes towards Artificial Intelligence (AI) and chatbots within science teaching contexts. Making use of Engeström's Activity Theory framework, pre- and post-intervention data from 289 university students reveal statistically significant positive changes in perceptions of AI as effective science education teaching tools. Over a semester, lectures and workshops demonstrated AI's applications in preschool science education, particularly emphasizing the role of chatbots like ChatGPT. The Wilcoxon signed-rank test indicated substantial improvements ($p<0.001$) in students' beliefs regarding AI's efficacy in enhancing pedagogical methods. This research contributes to understanding how structured technological interventions can reshape educational practices, specifically in the science education domain.

Keywords: Artificial Intelligence, Science Education, Chatbots, Activity Theory

Introduction

The integration of Artificial Intelligence (AI) in education marks a significant shift in pedagogical practices, particularly in early childhood settings (Holmes, Bialik, & Fadel, 2019; Zawacki-Richter, Marín, Bond, & Gouverneur, 2019). This research explores changes in university students' attitudes toward AI tools, specifically chatbots, within the context of science education for preschool children. Engeström's Activity Theory (Engeström, 1987) serves as the theoretical lens, examining the interactive development between human actors and technological artifacts. The exploration aligns with broader discourses on AI's transformative potential and its ethical implications for teaching and learning (UNESCO, 2021).

Theoretical Framework

Activity Theory, proposed by Vygotsky and expanded by Engeström, is a conceptual approach for studying learning processes and human interaction through mediated activities. It includes six interconnected components: subjects, objects, tools, community, division of labor, and rules and serves as the foundational framework guiding this study (Engeström, 1987). Each component interacts dynamically within a specific activity system, facilitating learning and development. Tools, mediate the relationship between subjects (learners) and objects (learning outcomes). In the context of AI integration in education, chatbots represent advanced cognitive tools capable of enhancing teaching methodologies and learning experiences. Theoretically, this study seeks to explore how AI-driven tools influence educational practices, reshape roles within learning communities, and modify interactions between teachers, learners, and technology. Activity Theory highlights how new tools can disrupt traditional educational practices, leading to innovation, new practices, and shifts in community dynamics (Kaptelinin & Nardi, 2006; Barab, Evans, & Baek, 2004). It provides a comprehensive

perspective to understand the transformative potential and the complexities involved in integrating emerging technologies like AI in educational settings.

Methodology

This research was realized using a pre-post-test design to assess the impact of an AI-focused educational intervention on students' attitudes toward AI and chatbots. Participants included 289 undergraduate students from the Early Childhood Education Department at the University of Ioannina, Greece. Engström's Activity Theory provided a framework for structuring the learning environment as well as for the design of the intervention. Each component of the activity system was considered: the subjects (early childhood education students) engaged with tools (AI chatbots such as ChatGPT) in pursuit of the object (developing pedagogical knowledge and attitudes toward AI in science education). The intervention of the study was realized within a community of peers and educators, guided by rules of responsible AI use and ethical considerations, and involved a division of labor between students, educators, and AI tools. Implementing the study in this way ensured that the intervention was a systemic configuration aimed at transforming educational practices. This theoretical orientation also guided the interpretation of results, enabling us to view changes in attitudes as indicators of transformations within the activity system.

The study collected quantitative data through structured questionnaires administered before and after the intervention period. Attitudes toward AI's potential in educational settings, specifically in science education, were evaluated using Likert-scale items, facilitating statistical analysis to identify significant shifts in perceptions. The semester-long intervention consisted of lectures and workshops explicitly designed to introduce AI concepts and demonstrate practical applications. Data were statistically analyzed using the Wilcoxon signed-rank test to evaluate the significance of attitudinal shifts. The Wilcoxon signed-rank test was employed to analyze the statistical significance of attitudinal shifts, following recommended practices for non-parametric data analysis in educational research (Zawacki-Richter et al., 2019). This methodological approach ensured reliable data collection and analysis, providing evidence of the intervention's effectiveness. Ethical standards were upheld throughout, ensuring informed consent, confidentiality, and voluntary participation.

Intervention Overview

The intervention was designed to provide students with both theoretical insights and hands-on experiences with AI tools, emphasizing their applicability in science education (Luckin & Cukurova, 2019). Lectures initially introduced foundational concepts of AI, including its history, categories (narrow and general AI), and real-world applications across various sectors such as marketing, economics, arts, and education (Luckin et al., 2016). Workshops specifically highlighted chatbots, particularly OpenAI's ChatGPT, showcasing their capacity to facilitate science education through interactive dialogues with the Chatbot and dynamic content generation. During this study, students used the free version of GPT-4o of OpenAI's ChatGPT. At this time OpenAI had started offering unlimited prompts in the free version. Students engaged actively with AI-generated prompts, designed educational activities, and created tailored lesson plans that integrated chatbot technology. The intervention also included hands-on exercises aimed at building skills in effective prompt design and response verification strategies (Luckin & Cukurova, 2019). Ethical considerations, including accuracy, transparency, and human oversight, were thoroughly discussed, fostering critical awareness among students about the responsible use of AI in educational contexts. By embedding AI tools in practical teaching scenarios, the intervention aimed not only at enhancing technical competence but also at reshaping pedagogical beliefs and community interactions.

Results

Statistical analysis using Wilcoxon signed-rank tests revealed significant positive shifts in attitudes regarding the effectiveness of AI tools in science teaching (Wilcoxon Statistic = 3811.0, $p < 0.001$). This marked improvement underscores the intervention's efficacy, indicating enhanced student recognition of AI's pedagogical potential. Detailed analysis of pre- and post-test responses demonstrated increased comfort levels, reduced skepticism, and greater perceived educational benefits

of AI integration. Quantitative findings were complemented by qualitative feedback, which revealed students' appreciation for AI's ability to deliver personalized educational experiences, immediate support, and interactive learning environments. Participants reported feeling better equipped to integrate technology into their teaching practices effectively, showing heightened enthusiasm for incorporating AI-driven resources into their future educational roles. Overall, the results clearly demonstrate that structured interventions significantly impact perceptions, competence, and openness to embracing innovative educational technologies (Zawacki-Richter et al., 2019) Discussion

The results indicate that AI tools, particularly chatbots, significantly enhance educational practices by shifting traditional roles and introducing innovative pedagogical methods. Students' increased receptivity towards AI integration reflects broader educational trends emphasizing technology-enhanced learning environments (Holmes et al., 2019; Luckin et al., 2016). The intervention can be hypothesized as a reconfiguration of an activity system since it was implemented regarding the Activity Theory. The subjects (student, educators) engaged with AI chatbots as mediating tools to achieve the object of developing new pedagogical knowledge and attitudes toward technology integration. This process took place within a community of peers and instructors, under evolving rules concerning responsible AI use, and involved a shifting division of labor, as chatbots assumed tasks such as generating examples or explanations that are traditionally teacher-led.

Furthermore, the findings validate Activity Theory's utility in examining and understanding the integration of technological innovations in education, demonstrating how AI mediates learning activities and transforms interactions within educational communities (Kaptelinin & Nardi, 2006). Critical engagement with ethical considerations throughout the intervention helped students navigate potential challenges, reinforcing responsible and effective AI use in education.

The statistically significant positive shifts in individual attitudes thus represent more than personal preference change: they illustrate how a technological artifact mediated and transformed collective educational activity. Importantly, the intervention surfaced contradictions between traditional science teaching practices and AI-mediated approaches. These tensions enabled expansive learning, as participants collaboratively redefined the roles of teachers, learners, and AI tools in early childhood science education. In this way, the findings demonstrate how technological interventions can mediate not only individual attitudes but also broader systemic transformations in pedagogical communities.

Conclusion

This research highlights the transformative potential of AI in science education, highlighting significant shifts in future educators' attitudes towards integrating AI technologies in pedagogical practices. Applying the Activity Theory, this study illustrates how technological interventions can mediate and enhance educational activities, not only at the level of individual attitudes but also within the collective and historical dynamics of the activity system. By inserting AI tools as mediating artifacts in science education workshops, students reconsidered their pedagogical practices, discussed the rules of responsible technology use, and experienced shifts in the division of labor between educators (humans) and AI. The changes in attitude therefore signal a broader systemic transformation, where contradictions between traditional and AI-supported teaching practices promoted expansive learning and the development of innovative pedagogical communities. This strengthens the case for continued research on AI's role as a transformative mediator in early childhood education, capable of reshaping both individual outlooks and collective professional practices. The positive changes documented, towards attitude, in this study support the ongoing integration of AI tools in early childhood education curricula, suggesting their potential to enrich teaching methodologies, enhance student engagement, and improve learning outcomes. Continued research and practical exploration of AI applications in educational settings are vital to fully utilize the benefits and address the complexities of this evolving pedagogical landscape.

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Stimulating teacher agency through co-design : a study in a food education context

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Abstract: This study, currently at the beginning of its data collection, is a doctoral research project that proposes an exploratory study of teacher agency through a co-design process aimed at developing a food education learning situation. Grounded in cultural-historical activity theory, this study examines the emergence and the development of transformative agency as a way to overcome contradictions generated by the introduction of a non-mandated curricular innovation. Preliminary findings from the co-design process – including the co-analysis of a problematic situation and the modelling of a didactic approach – will be presented. The relevance of co-design in school settings will also be discussed as a fruitful path to explore conditions that support the emergence of transformative teacher agency in the context of contemporary challenges related to adolescent health and well-being.

Keywords: transformative agency, co-design, food education, science teachers

Introduction

In Quebec, food education was for a long time the focus of home economics course, which was integrated into the curriculum until its abolition in the early 2000s. Since then, although there is a growing consensus in the scientific literature on the importance of developing food literacy from adolescence onwards, food education remains largely absent from the formal curriculum, particularly at secondary level. Yet numerous studies demonstrate its positive effects, both on physical health and on civic engagement, social equity and environmental sustainability (Food and Agriculture Organization, 2021; Dunn et al., 2019).

However, the integration of food education in secondary schools continues to face several systemic obstacles, such as curriculum overload, the relatively low academic status attributed to food as an object of knowledge, the scarcity of pedagogical resources, teachers' limited sense of self-efficacy, and the lack of institutional recognition and support (Stage et al., 2016; Dunn et al., 2019). These challenges often constrain teachers' capacity to innovate and hinder the sustainability of food education initiatives within formal schooling. In this context, it becomes essential to investigate approaches that not only provide teachers with concrete tools and resources but also create spaces for reflection, collaboration, and professional growth. Supporting teachers in the design and appropriation of new pedagogical practices requires moving beyond prescriptive models and engaging them as active co-constructors of educational innovation. Our research therefore aims to analyze how co-design processes can foster the emergence and development of teacher agency in a context of non-prescribed curricular innovation, with particular attention to the conditions that enable teachers to negotiate systemic constraints, transform their practices, and position themselves as agents of educational change.

Theoretical framework

This research is grounded in the third generation of cultural-historical activity theory (CHAT) (Engeström, 2001), which conceptualizes learning as a collective transformation of an activity system marked by internal and systemic contradictions. Within this framework, we draw particularly on the principle of double stimulation (Sannino, 2015), according to which transformative agency arises when individuals, confronted with a problematic situation (first stimulus), mobilize a conceptual or material tool (second stimulus) to reconfigure their activity and create new possibilities for action. This perspective emphasizes the dialectical interplay between structural tensions and the creative responses of actors, making contradictions not simply obstacles but potential drivers of change.

In this context, co-design is employed as both a methodology and a pedagogical stance of co-construction. It enables the active and reflective involvement of participants, not only in addressing immediate problems but also in shaping the conditions of their professional practice. Consistent with the principles of CHAT, the aim is not limited to producing educational artifacts or curricular materials. Rather, it is to engage participants in a collective process of problematization, the development of new mediating tools, and the cultivation of transformative agency (Engeström, 2011; Haapasaari & Kerosuo, 2015). Through this process, co-design becomes a powerful means of jointly developing tools and practices that extend beyond the classroom, fostering broader cultural and institutional transformations within the activity system.

Methodology

This multiple case study is conducted with science teachers from two different secondary schools in Quebec: one school located in a coastal community and the other school in a rural area. In both settings, the participating science teachers demonstrate a strong interest in integrating food education into their teaching practices. Their engagement stems not from external mandates, but from a personal and professional commitment to promoting healthy eating habits among adolescents. This voluntary involvement underscores their motivation to explore innovative pedagogical approaches and to position food and nutrition as meaningful entry points into the science curriculum.

The co-design unfolds in two complementary phases:

1. An interventionist phase, based on the principle of double stimulation, during which mirror datas from a survey on teenagers' eating behaviors and knowledges are analyzed with the participating teachers to prompt critical reflection on their activity.

2. A co-construction phase, in which the teachers, in collaboration with the researcher, co-design a didactic proposal and initiate its implementation.

Data are collected through a triangulation of methods designed to capture both the process and its effects: the researcher's logbook, participant observations, audio and video recordings of design sessions, semi-structured interviews with teachers, and an analysis of the artifacts produced (e.g., notes, diagrams, prototypes, and didactic materials). This combination of data sources enables a nuanced

reconstruction of the ways in which teachers engage with contradictions, mobilize mediating tools, and begin to reconfigure their activity.

Results

As this doctoral research has just entered the second phase, the findings presented are preliminary and pertain to the interventionist phase. These include the identification of teachers' expressed needs, the first manifestations of transformative agency, the institutional tensions perceived by participants, and the mediating tools created and mobilized during the process. Together, these elements shed light on the dynamics underpinning the appropriation of a posture of pedagogical innovation and the conditions that support teachers in engaging with curricular challenges.

The paper will also reflect on the contributions of co-design as a methodology for supporting change in educational contexts. In particular, it will highlight how co-design fosters collective reflection, generates new mediational tools, and creates spaces for agency to emerge. Beyond immediate outcomes, these insights point to the potential of co-design to act as a catalyst for longer-term transformations of teaching practices and professional identities.

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Tracing Teachers' Transformative Agency in the Pedagogical Change Laboratory

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Abstract : This study examines how card-based co-design of technology-enhanced learning (TEL) scenarios supports teachers' transformative agency within the *pedagogical change laboratory* (PCL). As a CHAT formative intervention, the PCL combines the Change Laboratory methodology with the Learning by Design approach to address the persistent challenge of integrating digital technology into teaching and learning. Four secondary teachers of French from an international school in Switzerland participated in three sessions featuring four episodes of card-based co-design, incorporated within the cycle of expansive learning actions. Using the transformative agency by double stimulation (TADS) model, we conducted both quantitative and qualitative analysis of video recorded sessions. Findings reveal that all TADS instances were observed throughout the intervention, with card use consistently co-occurring with all four TADS steps. The analysis traced a warping process revealing teachers' progressive collective construction of their second stimulus. The study contributes methodologically by demonstrating how to trace the warping process through fine-grained analysis and offers practical implications for teacher professional development.

Keywords : Transformative agency, Teacher professional development, Change Laboratory, Design of TEL

Background

This study aims to address the ongoing challenge of integrating digital technology into teaching and learning (Abel et al., 2022; Lai et al., 2023) by approaching the issue through the lens of transformation (Engeström, 2009; Lund & Hauge, 2011; Pettersson, 2021). It proposes experimenting with a formative intervention called the *pedagogical change laboratory* (PCL), which combines two approaches: the Change Laboratory methodology, where participants collectively develop a new concept for their activity system (Virkkunen & Newnham, 2013), and the Learning by Design approach, in which teachers co-design technology-enhanced learning (TEL) scenarios and are expected to develop their Technological Pedagogical Knowledge, known as TPACK (Duret & Romero, in press; Mishra, 2019; Yeh et al., 2021). The interventionist introduces episodes of card-based co-design of TEL in the cycle of expansive learning actions (Engeström, 2014). It aims at facilitating expansive visibilization

(Engeström, 2018), which, as "an integral part of expansive learning" (p. 199), is a deliberate strategy to make "troubles, contradictions, future visions, and novel solutions [...] visible, so that the practitioners could transform their activity in conceptually mastered and practical" (p. 198).

Within the PCL, co-design is considered a creative activity (Glăveanu, 2015, 2020; Romero, 2019) , likely to foster teachers' transformative agency (Sannino, 2015, 2020) and support their collective efforts to transform teaching and learning practices in response to didactic and pedagogical challenges (Duret & Romero, 2022).

Purpose

This paper aims to answer the following research question: How does card-based co-design of TEL scenarios support teachers' transformative agency in the *pedagogical change laboratory (PCL)*?

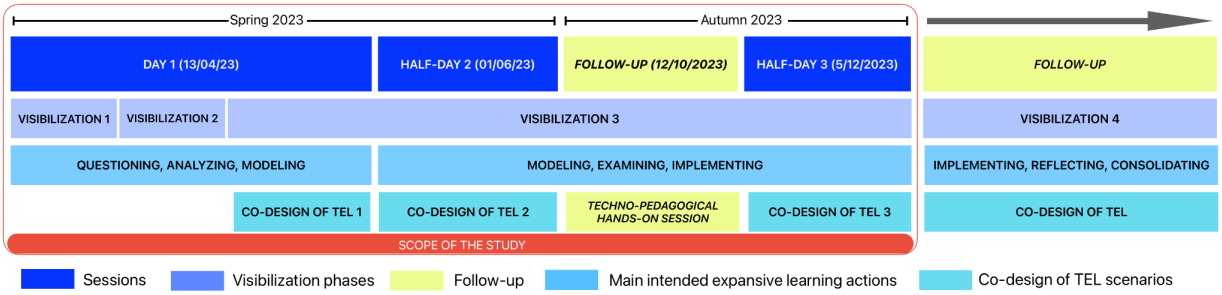
Methods

The study involves four secondary teachers of French from an international school in Switzerland. They aimed to overcome instructional challenges associated with teaching canonical literature while effectively integrating digital technologies.

The PCL is conceptualised as an augmented methodology (Winberg et al., 2023). It combines the conceptual tools of the Change Laboratory (Sannino et al., 2016), expansive learning (Engeström, 2014) and transformative agency (Sannino, 2020), with the Learning by Design approach (Yeh et al., 2021). The intervention consists of three sessions that include four episodes of card-based co-design of TEL scenarios, starting from the modelling step of the expansive learning cycle (Figure 1) in visibilization 3.

Figure 1

Overview of the Pedagogical Change Laboratory



The data consists of video recordings that were transcribed verbatim. Our analysis draws on the model of transformative agency by double stimulation (TADS) developed Sannino (2020). Through an exploratory quantitative approach (Sannino, 2016), we begin by examining how TADS instances are distributed throughout the PCL and especially within the co-design episodes, to identify emerging patterns. Then, drawing on Sannino (2020) and Romero & Barma (2022), we conduct "a fine-grained analysis of discourse and action" (Sannino, 2020, p. 23) to carefully trace the process in the decision phase. Notably, we employ the "warping metaphor" (Sannino, 2020, p. 2) to visualise teachers' "anchoring forward movement" (p.22) and their transformative trajectory as they develop the second

stimulus to break out of the problematic situation. Our analysis takes into account participants' movements (Sannino, 2016) while interacting with the cards during the co-design episodes (Figure 2). Following Romero & Barma (2022), we examined how the artefact configurations evolved across the first two co-design episodes to better "understand the decision-forming process" (p. 19).

Findings

All TADS instances from Sannino's model (2020) were observed within the PCL. The second stimulus (step 2) showed the highest TADS instance frequency, while sticking to the second stimulus (step 3) was the least frequently observed.

The central conflict of motives emerged in exchanges preceding the first co-design episode, occupying over half the speaking turns devoted to the construction of the first stimulus (step 1). Second stimulus development unfolded in the first two sessions through a progressive warping process, where throwing successive "kedge anchors" (Sannino, 2020, p. 8) set in motion a dynamic chain-hauling system that simultaneously stabilised and drove teachers' prospective and transformative movement.

The analysis also showed that at the beginning of the co-design episode 4, teachers displayed uncertainty before implementing the second stimulus. The conflict of motives was reactivated, but they ultimately crossed "the threshold to implementation" (Engeström et al., 2023, p. 113). This process was revealed through two successive antithetical metaphors in teachers' discourse: first paralysis, then setting in motion.

The study showed that throughout the co-design episodes, card use consistently co-occurred with all four TADS steps. In proportion to TADS instance frequency within co-design episodes, cards were used least often in step 1 and most often in step 2.

Figure 2

Teachers Interacting with the Cards while Co-designing

Implications

The study contributes to understanding how TADS emerges within CHAT formative intervention (Engeström et al., 2023; Morselli & Sannino, 2021) and especially addresses the methodological challenge to trace the warping process as participants construct their second stimulus (Sannino, 2020). The study has implications for teachers' professional development. It proposes a CHAT formative intervention that could help them transform their practices through card-based co-design of new TEL scenarios as mediational means of TADS process (Hopwood & Sannino, 2023) within a cycle of expansive learning and visibilization. The PCL may serve as a replicable formative intervention both for pre-service and in-service teacher education programs seeking to support pedagogical transformation through collaborative design practices.

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An Expanded Theoretical Model for the Design Process Based on CHAT

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Abstract: This paper presents an expanded version of Cultural-Historical Activity Theory (CHAT) tailored to the analysis of collaborative design processes. Rooted in empirical studies of interdisciplinary teams working on product and service design, the model introduces six new components—collective subject, object-in-context, signs, design criteria, imagined community, and agreed process—that complement and extend the original CHAT framework. These additions provide a more fine-grained understanding of the dynamics of design activities, particularly the co-evolution of problems and solutions, the formation of shared goals, and the influence of contextual and human-centered factors. Positioned as an outer layer to the classic CHAT triangle, the expanded model serves as both a theoretical and methodological tool for analyzing design practice. It also supports the development of data collection, an instrument used by designers themselves in real-world settings. This work aims to make design activities more visible and interpretable, ultimately contributing to improved design education, practice, and research.

Keywords: Expanded AT; Designerly Activity Theory; d.AT; Design Process; Design Education

Introduction

This paper introduces an expanded version of Cultural-Historical Activity Theory (CHAT) (Engeström, 1987), adapted to the design process. The proposed model, rooted in CHAT, emerged from research on collaborative design and knowledge construction within teams, during framing and idea generation in the context of product and service design. As both a theoretical and methodological framework, it supports data collection, in-depth analysis, and the interpretation of design activities. Additionally, the model contributes to design education by fostering reflection-in and -on-action (Schön, 1983), particularly in complex, collaborative and multi-disciplinary projects.

Theoretical foundation

To explain the rationale behind the expanded model, we begin with a reflection on the nature of "design." Herbert Simon (1969) offers a well-known definition: "Everyone designs who devises courses of action aimed at changing existing situations into preferred ones." The World Design Organization similarly defines design as a "strategic problem-solving process […] that leads to a better quality of life through innovative products, systems, services, and experiences."

The design process and the collaborative construction of knowledge are inherently complex. Design is user-centred, involves an iterative way of thinking and doing (Cross, 2011), and goes through cycles of co-evolution of problems and solutions (Maher & Poon, 1996; Dorst & Cross, 2001). As Bucciarelli (1988) notes, design is fundamentally a social activity. Moreover, as Schön (1983) and McDonnell (2015) observe, design projects are often uncertain, unstable, and unique.

Several reasons led us to explore CHAT as a framework for design research. Both CHAT (hereafter referred to as AT) and the design process share key characteristics: they adopt a systemic view of activity, are context-sensitive, human-centred, and focused on transformation. Both are also inherently social activities, mediated by tools and governed by rules. With the interest in design processes—especially in collaborative settings where problems and solutions evolve together—the original Activity Theory model was mobilized to better understand how designers and collaborators navigate projects. Specifically, the research aimed to identify tensions and contradictions, common challenges in problem framing and reasoning, and how the design process unfolds toward a satisfactory outcome.

Furthermore, as noted by Engeström, Miettinen, and Punamäki in Perspectives on Activity Theory (1999), AT offers a relevant lens for today's complex, open-ended challenges: "Activity theory should not be regarded as a narrowly psychological theory but rather as a broad approach that takes a new perspective on and develops novel conceptual tools for tackling many of the theoretical and methodological questions that cut across the social sciences today" (Engeström et al., 1999, p. 8). The expanded model was developed in alignment with this perspective.

Methodology and emergence of the expanded model

The data were collected from five collaborative design workshops conducted in a controlled setting. Each workshop brought together four recent graduates forming a multidisciplinary team to address the same complex project brief. Using the AT framework as an exploratory lens, we analyzed the data to examine whether the theory provides a structural basis for coding and interpreting interactions and contradictions within a design activity system. Close analysis of the empirical data revealed the need for more precise codes to account for design-specific processes. This led to the emergence of a new dimension specific to design reasoning through interaction of six additional components that enable a more nuanced interpretation of design activity (see Zahedi & Tessier, 2018; Zahedi, 2019). The resulting theoretical expansion, termed Designerly Activity Theory (d.AT), aims to more deeply depict the processes of co-construction of understanding and framing within design teams.

The d.AT model is briefly presented below and illustrated in Figure 1. The first distinctive component that appeared through the analysis was "**design criteria**," which reflects team-defined constraints that frame the project. While its function is similar to "rules" in AT model, design criteria differ in that they are internally generated by the team, rather than externally imposed.

The concept of "**collective subject**" was identified next. A collective subject refers to a team with a shared mental model, global understanding and vision. To act as a collective subject, team members build a common language and align on a unified outcome.

Then, the analysis revealed the component "**object-in-context**." Object-in-context refers to the team's evolving understanding of the design object within its anticipated context of use, including socio-cultural and historical dimensions. This interacts dynamically and iteratively with the "object" within the design space, where the co-evolution of problems and solutions takes place, leading towards the outcome.

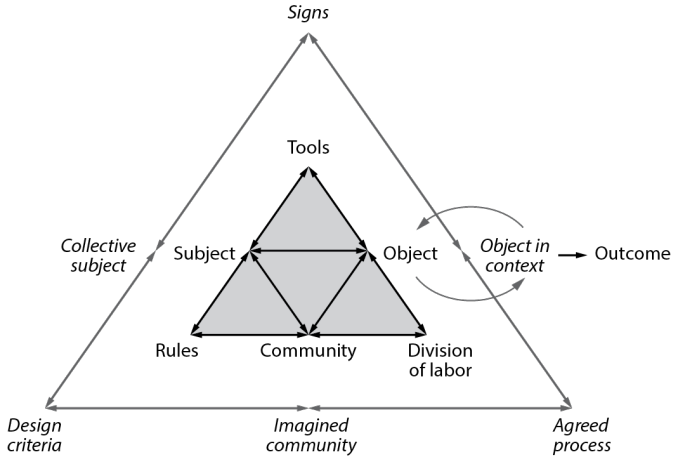

Figure 1 The d.AT (Designerly Activity Theory) model is proposed as an expansion of Activity Theory for the design process. It integrates six additional components specific to product and service design, each conceptually aligned with components of the original AT framework.

The component "**signs**" was added next to "tools" to refer to intangible and internal influences—such as team members' reflections, experiences, and expertise—that shape and enrich the design process. Although "signs" has always been included in the activity system model, the expanded model makes a distinction between signs and tools, by keeping tools as tangible and instrumental mediators, while reserving signs to play a subtle yet critical role in shaping the team's understanding and framing of the object and object-in-context.

Two final components completed the expanded model. One is "**Imagined community**" and the other "**Agreed process**." These components were not visible during early analysis of data but were identified during the development of the model. "Imagined community" is closely related to "community." It captures how teams consider stakeholders through personas, stories, scenarios, and journey maps, enabling them to interpret information from a human-centred perspective. In product and service design, insights from the community are gained through direct interactions and research (i.e., observation, interviews, etc.), while insights from an "imagined community" are based on the construction of a hypothetical community by team members. The "imagined community" serves designers in their creative and innovative efforts as well as in evaluating the possible "object" or "outcome".

The other component, "Agreed process," relates to "division of labour." It represents the team's consensus on how to approach the design project, including decisions on strategies, modes of collaboration, and ways of addressing uncertainty and ambiguity. This component is often reflected through the adoption of a "design attitude" (Boland et al., 2008) by the collaborators.

These six elements add a new dimension to the AT model. Each relates to a corresponding component of the original AT structure but has been adapted to reflect the specific dynamics and realities of product and service design practice.

Conclusion

As shown in the visual representation, these components form a second, outer triangular layer surrounding the original AT model. Each plays a distinct role in supporting the team's processes of

framing, ideation, and decision-making throughout a design project. This expanded representation enhances the model's clarity and usability, making it more accessible and applicable for both design education and design research.

The proposed model has been evaluated for its relevance and effectiveness in product and service design research, as well as for its potential application for design education. In research, it contributes to a deeper understanding of the subtleties, tensions, and contradictions inherent in collaborative design practice. It also makes team design processes more visible and explicit, enabling members to reflect on and enhance their practices. More recently, the model has been developed as a tool for practice-based research (research-through-design), allowing designers to collect data themselves during their practice (Zahedi & Tessier, 2025). This approach aligns with the widely accepted view that the dynamics of design are best understood when observed and reflected upon by practitioners within real, ongoing situations (Jonas, 2006; Findeli, 2014; Godin & Zahedi, 2014).

In education, the model provides a structured framework for collaborative learning and designing, particularly in multidisciplinary contexts. It supports students in adopting a designer-researcher posture, fostering awareness of the complexity and systemic aspects of design projects, while strengthening their ability to act as reflective practitioners. Future research involving partitioners and students (acting as designer-researchers to collect data from their own practice) across diverse design fields and within complex collaborative projects is planned, with the potential to contribute to both the methodological and epistemological advancement of research.

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Transforming Social Practices Through the Change Laboratory:A CHAT-Based Intervention on Marginality in Varese, Italy

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Abstract: This paper explores the application of the Change Laboratory (CL) methodology, grounded in Cultural-Historical Activity Theory (CHAT), within the context of the "Marginality Working Group" of the Municipality of Varese. The objective was to initiate a participatory and collaborative transformation of local activity systems to respond more effectively to situations of extreme social marginality. Between November 2024 and February 2025, six sessions were held involving professionals from public institutions, social cooperatives, and local associations. Through collective analysis and design, participants identified key challenges and co-developed new strategies. The CL process enabled the shared reconstruction of work objects, the surfacing of systemic tensions from concrete cases, and a reflective analysis of the historical development of each organizational activity.
Throughout the process, participants exercised individual and collective transformative agency, taking an active role in questioning existing practices, envisioning alternatives, and initiating change. Two main development trajectories and a zone of proximal development emerged from the collaborative work. Guided by CHAT, the group addressed structural contradictions and experimented with new models of inter-organizational coordination. These included the redefinition of the network of actors and services involved, the creation of a multidisciplinary team to foster integrated approaches, and the conceptualization of a shared physical space aimed at meeting users' needs and enhancing service coordination.
The outcomes highlight the potential of Change Laboratory to foster expansive learning and reconfigure professional practices. The initiative demonstrates a viable and transferable model for social innovation, reinforcing the connection between global theoretical frameworks and local policy action.

Keywords: Change Laboratory; Social marginality; social innovation; Educational Community

Introduction

The Change Laboratory (CL), rooted in Cultural-Historical Activity Theory (CHAT), is an intervention method aimed at fostering innovation and expansive learning within organizational and social systems. Its application within the Working Group on severe social marginality in Varese—a Northern Italian city with around 80,000 inhabitants—offered a strategic opportunity to reconsider support practices and experiment with new forms of coordination among roughly 30 stakeholders engaged in services for marginalized individuals.

Purpose

Carried out between November 2024 and February 2025, the intervention sought to reshape how the municipality addresses extreme marginality. The approach centered on the co-construction of innovative strategies, emerging from a systemic analysis of both historical dynamics and current challenges.

Method

A cornerstone of the CL process was the use of the double stimulation principle, which made underlying contradictions visible and enabled participants to respond using conceptual and practical tools aimed at fostering collective change. The intervention unfolded across six sessions, led by a team of five researchers from the University of Insubria and the Catholic University, under the guidance of A. Sannino.

In this framework, the role of researchers is not to apply a predefined protocol, but rather to initiate and support processes of reflection and transformation on the part of the participants.

The methodological framework included:

1) The use of the principle of double stimulation, which consists of presenting participants with two types of stimuli:
    a) a first stimulus (primary stimulus), represented by a task, problem, or real situation that generates uncertainty, conflict, or difficulty.
    b) a second stimulus (secondary stimulus), namely a conceptual or material tool (such as diagrams, models, languages, or symbolic objects) that participants can adopt and transform in order to reframe and address the problem.

The central aspect does not lie in the mere provision of the tool, but in the process through which participants appropriate it, reinterpret it, and actively use it to reorganize their actions and generate new solutions.

2) The construction of a reflexive setting in which professionals and local actors were enabled to critically analyse their activities, recognise internal tensions and co-design new ways of working. The methodological steps included:
    a) Identifying systemic tensions: participants analysed misalignments between existing practices and the evolving needs of the marginalized population.
    b) Conducting historical reconstructions: conceptual tools supported a reflective analysis of how current practices developed over time (historical wall).
    c) Discussing real-world cases: concrete and unresolved situations provided a basis for shared analysis and learning.

Early sessions revealed fragmented service provision, limited collaboration among stakeholders, and user needs that had changed significantly over time.

Using the activity triangle as an analytical lens, the group examined relationships between subjects, mediating tools, and division of labour, uncovering how the lack of a shared framework hindered coordinated interventions. A zone of proximal development was outlined to guide future action, while shared work objects were defined to support short-, medium-, and long-term service innovation.

Findings

The process led to three key innovations:

- A new dynamic system for mapping local stakeholders and services was developed to increase visibility of community resources and promote more effective linkages between service providers and citizens.
- A multidisciplinary team model was co-designed, encouraging collaboration among professionals and volunteers to bridge current gaps and overcome organizational silos.
- A physical center dedicated to inclusion was conceptualized as a space where users and professionals can interact, access services more easily, and co-create coordinated responses.

Over time, this inclusion space is expected to contribute to broader community transformation, by fostering civic involvement in tackling marginality and by positioning itself as a recognized and authoritative point of reference for territorial actors.

Conclusions

The Varese intervention demonstrated the transformative capacity of CL in renewing practices related to social support and inclusion. A central insight was the need to transition from an intervention model based on informal practitioner experience and voluntary effort toward a structured, strategic approach that encompasses emergency response, preventive action, and long-term planning.

Moreover, the use of double stimulation tools enabled the emergence of systemic contradictions, guiding the development of new operational logics and service coordination strategies. The findings confirm that the CL methodology can serve as a powerful driver for innovation in social service systems. The Varese experience offers a promising, adaptable model that could inform similar initiatives in other local settings, supporting the advancement of inclusive and sustainable welfare policies.

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Development of a Mobile Writing Application to Support Inclusive Primary Education

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Abstract: This study was conducted within the scope of a scientific research project. In the first phase of the project, existing mobile applications available in Android and iOS markets were examined, and needs were identified regarding adaptability, accessibility, and pedagogical appropriateness. In the second phase, a mobile writing application was developed to support the writing skills of first- and second-grade primary school students, including those with special educational needs (SEN). Based on expert and teacher opinions, features such as content customization, simultaneous visual-auditory feedback, and gamification were integrated into the application design. The design aimed to enhance students' attention and motivation through a gradual prompt reduction method and the use of reinforcers. The application is intended to provide teachers with the ability to determine the number of repeated responses for a skill, monitor student performance, and report progress. Upon completion of this study, the developed application is expected to serve as an effective tool for supporting the writing skills of SEN students and contribute to inclusive educational practices.

Keywords: Special Education, Mobil Application, Writing Skills, Inclusive Education

Introduction

Writing, as defined by UNESCO (2025), is a complex process that involves producing, describing, interpreting, and creating written texts. Literacy performance in primary school, which is fundamental to academic achievement, is influenced by many factors (Reed & Lee, 2020; Sun & Yin, 2022). Studies emphasizing the integrated teaching of reading and writing highlight that developing fluency in writing requires specific support (Graham et al., 2024; Shanahan, 2023). However, in this process, students may experience difficulties with letter formation, alignment, and combination (Sparaci et al., 2023); reduced legibility due to deficiencies in fine motor skills and hand–eye coordination (Fogel, 2022); difficulties with writing speed and spelling (Maurer, 2024); and deterioration in writing quality, such as letter size and spacing (Seo, 2018). Developmental coordination disorder and learning difficulties have also been shown to negatively affect legibility, organization, and fluency in writing, leading to handwriting inconsistency (Jolly et al., 2024).

To overcome these difficulties, approaches tailored to student needs, multisensory instruction, explicit and systematic teaching, modeling of skills, and guided practice have emerged as effective strategies (Keesey, 2020; Moats, 2020). Nevertheless, research focusing on writing skills and support strategies within the context of inclusive education remains limited (Graham et al., 2024). While some studies have shown the integration of mobile technologies in supporting writing development, most existing applications remain inadequate in terms of accessibility, inclusivity, and multisensory learning (Polat et al., 2023). In particular, the focus of applications on only one dimension of writing highlights their shortcomings in supporting multidimensional development. Therefore, the present study focuses on the development of an inclusive mobile writing application for both typically developing and special needs students. The application is designed not only to support writing skills but also to enable the monitoring of students' developmental processes.

The limited availability of mobile applications that support students with special needs in learning to write clearly demonstrates the need for inclusive solutions that foster writing development. Accordingly, this study aims to fill an important gap in the literature by developing a two-way support mechanism that addresses individual needs and allows the evaluation of developmental and instructional processes. This application is expected to contribute to inclusive education and technology integration at both national and international levels.

Method

The study was conducted within the framework of a design-based research approach, guided by Reeves' (2000) development research model. The application was developed through iterative cycles of analysis, design, development, implementation, and evaluation, with continuous feedback collected from classroom teachers, special education teachers, and field experts (Wang & Hannafin, 2005).

In the first phase of the study, 34 existing mobile applications targeting writing skills were reviewed, and the findings from this review were published (Polat et al., 2023). In the second phase, based on these findings and the relevant literature, a mobile writing application was designed for first- and second-grade primary school students.

Results

The findings from the first phase of the study revealed that existing applications were limited in content, insufficient in interactivity, and not customized according to age, type of disability, or developmental level. Expert opinions further emphasized that for individuals with writing difficulties, diversified interactions, content adapted to individual differences, inclusive design, usability, and sustainability are of critical importance. Moreover, the integration of gamification as a motivational factor and the alignment of applications with instructional objectives were highlighted as essential (Polat et al., 2023).

In line with these findings, the developed mobile writing application was designed to address the identified shortcomings. The application functions both as a supplementary instructional tool for teachers and as a platform that enables students to practice independently. Specifically, it is intended to alleviate difficulties related to classroom overcrowding and limited teacher resources in inclusive settings, while also enhancing students' attention and motivation through the use of visuals and animations. These features collectively suggest that the application can make a significant contribution to the development of writing skills.

In conclusion, this study addresses a critical need in the field by introducing a mobile writing application designed for both typically developing children and those with writing difficulties. By adopting an inclusive perspective, the application not only responds to diverse learner profiles but also offers an innovative contribution to the literature. Examples of the developed mobile writing application interfaces are presented in Figures 1 and 2.

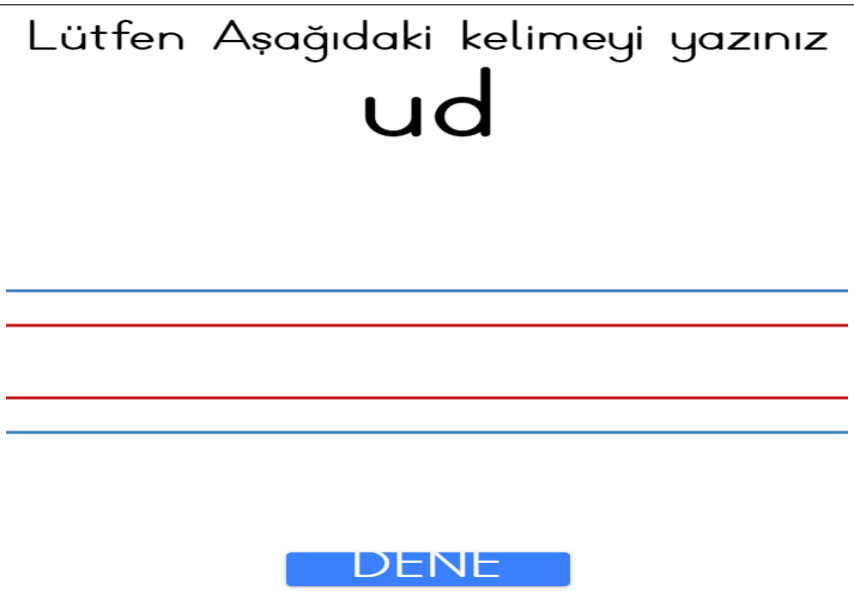

Figure 1. Writing Interface of the Mobile Application

Figure 2. Feedback Interface of the Mobile Application

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Transformative Learning Environments (PTLEs) from theory to practice: a pluralist approach to transforming VET through sustainability across Europe

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Abstract: This symposium addresses multi-level transformations across Vocational Education and Training (VET) organizations within a European consortium spanning Belgium, Estonia, France, Germany, and Spain. European VET systems face persistently high student dropout rates, which impact qualification levels. A central solution is to promote student engagement through transformative pedagogy and student-centered learning environments, known as Powerful Learning Environments (PLE). This symposium explores two interconnected topics: (a) the creation of PTLEs, and (b) the professionalization of VET educators to sustain these environments. Drawing on the concept of boundary-crossing, PLEs are shaped through collaborations among learners, teachers, workplace mentors, and other stakeholders. The symposium bridges theoretical frameworks—particularly Cultural-Historical Activity Theory (CHAT)—with trait-based approaches, offering a pluralistic research perspective that aligns with Sustainable Development Goals (SDGs). The first presentation introduces the BRIDGE framework for effective VET teacher professionalization, integrating it with transformative learning and learning for sustainability. The second presentation adopts a systemic, developmental approach to explore collective learning and multi-level transformations, addressing how PLEs evolve into Powerful Transformative Learning Environments (PTLE) at micro (school), meso (interprofessional), and macro (cross-national) levels. These environments are seen as tension-reducing systems where best practices are constantly renegotiated. The project's empirical study, conducted across its network, identified exemplary cases of PTLE development, which will be analyzed and discussed in the third presentation. Overall, the symposium aims to foster constructive, cross-epistemological dialogue, contributing to the understanding and advancement of transformative educational practices within VET and beyond.

Keywords: powerful transformative learning environments, professional development, sustainability, vocational education

The symposium presents the EU-funded ProVEST project, which tackles the lack of coordination in dual learning in European vocational education by promoting student engagement through Powerful Learning Environments (PLEs) and teacher and mentor professionalization. The present proposal addresses the topic of multi-level transformations across multiple Vocational Education and Training (VET) organizations in a consortium of five European countries (Belgium, Estonia, France, Germany, Spain). Vocational students across Europe suffer from high dropout rates (Lamb et al., 2010) with dramatic impact on qualification levels (Van Landeghem and Van Damme, 2011). However, one defining factor of academic achievement in VET is to promote student engagement (Finn et al., 1995) through pedagogy and curricular modifications and transformations; in particular, student-centric learning environments and quality teaching and learning may represent fruitful leads to overcome this issue (Macleod et al., 2015). In this symposium, representatives of the European Union-founded

project ProVEST (Professionalisation of VET educators to create powerful transformative learning environments for a sustainable transition) will focus on articulating the different levels of transformative changes required to address the many challenges related to the collective creation, implementation and potential transfer of Powerful Learning Environments (PLE). To achieve this purpose, participants will present two literature reviews focusing on different levels of transformation highlighting the importance of student agency. This symposium focuses on two inter-related topics: (a) the creation of PTLE and (b) effective professionalization processes within VET in labor market-oriented programs. Both topics are strongly interconnected as PLE may be described as emerging from interactions in heterogeneous collectives of learners, teachers and teaching staff (Arnou et al., 2022) while also involving mentors and participants from the workplace, through a type of collaborative learning described as boundary-crossing (Bouw, 2021; Bouw et al., 2021). Additionally, the design of PLE itself may be considered as a professionalization initiative in its own right with lasting effects in both teaching quality and student outcome (Merchie et al., 2016). In this respect, the emergence of PLE relies on a multidimensional collective dynamic initiative involving behavioral, emotional and cognitive dimensions (McCormick, Kinzie, and Gonyea, 2013). To a certain extent, PLE may be best described as emergent phenomena involving teacher, labor market and student, engaging the latter through the following defining criteria: higher-order thinking skills, high quality instruction, adaptive teaching, challenging learning tasks and classroom management (Placklé, 2020; Van Peteghem et al., in press). The present symposium offers a bridge between factorial and traits approaches and a Cultural-Historical Activity Theory (CHAT) (Engeström, 2005; 2015) approach as a twin focal point to connect assessment and research questions in a pluri-epistemological scientific collective: from our point of view, the ProVEST scientific community provides a unique opportunity to address the following subthemes of the conference : Constructive Theoretical foundations and epistemological flexibility in CHAT research in a constructive dialogue with other theoretical frameworks addressing a transformation process aiming at clarifying perspectives on environmental and social sustainability while contributing to Sustainable Development Goals (SDGs).

The first presentation will address the theoretical underpinning of PTLEs for sustainability through the presentation of the building blocks of effective professionalization and training of teachers in vocational Education, the integration between the BRIDGE framework which will put in perspective effective teacher professionalization initiatives in VET (Pauwels et al., 2023), the transformative learning process framework (Sari et al., 2022), and the learning for sustainability framework (Mulvik et al., 2024). The second presentation will take a collective approach on systemic and multi-level transformations by taking a developmental object-oriented approach and a dialectical focus on collective learning efforts in heterogeneous collectives (Engeström, 2005, 2015; Engeström & Sannino, 2021). As the focus of understanding and assessment of the project widens, it takes into account contextual elements of PLE as they become Powerful Transformative Learning Environments (PTLE). In this respect, the notion of good practice, team learning and interactions, preconditions and triggers for the emergence of PTLEs as well as postconditions may fruitfully be discussed through the notion of collective learning (Engeström, 2013) and double stimulation processes (Romero & Barma, 2022; Sannino, 2016) on three potentially transformative scales (Morselli, 2021): at school level (micro), in interprofessional interactions (meso) and across countries and beyond (macro). From this perspective, PTLE may be understood as tension-reducing devices which are submitted to constant evolution as germ cells which are constantly renegotiated across boundaries. To identify these practices, the ProVEST project partnership implements an empirical study across Europe that

collected a number of sample cases from the network and beyond. In this symposium, authors briefly present the research approaches and selected procedures to identify practices highlighting the centrality of student agency and its unfolding in the context of PTLE for sustainability in VET. Finally, two early analyses of PTLEs from partner institutions will be offered and discussed according to previously-established theoretical landmarks. The present symposium therefore aims at fostering constructive cross-epistemological perspective as the ProVEST scientific collective itself is transforming, questioning and analyzing continuously-evolving artefacts and concepts in the contexts in which they emerge as intents to resolve and reduce uncertainty while facing real-world problems.

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Artificial Intelligence in STEM Education

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Abstract: The workshop aims to define and outline new approaches for leveraging AI to modernize education and professional development for both future and current STEM educators. Bringing together a diverse group of scholars and practitioners, the workshop will foster a collaborative dialogue on the epistemological, instructional, and pedagogical boundaries shaping the use of AI in educational settings. Participants will share initiatives, experiences, and research findings, highlighting methods and best practices for the effective integration of AI tools into school classrooms for STEM teaching. The discussion will be around mapping the current needs of educators, resources, tools, implementations and policy impact.

Keywords: AI in Education; STEM Education; CHT; CHAT

Introduction

The workshop seeks to explore innovative strategies for harnessing the potential of AI in modernizing education and training for both future and current Science Technology Engineering and Mathematics (STEM) educators. In response to the evolving challenges of the digital age, the project will lay the groundwork for the development of a Pedagogical AI within educational settings. Central to the discussion will be an examination of the epistemological, instructional, and pedagogical boundaries for utilizing AI tools within educational contexts. The workshop will highlight effective methods and best practices for AI integration into school classrooms, emphasizing the alignment of these tools with STEM teaching objectives.

A key aspect of the workshop will be mapping the current needs of educators regarding the use of AI in teaching STEM. It will also identify the skills and knowledge areas that need to be developed to support their professional development in this field. Further, the workshop will:

- source educational resources, digital tools, and learning environments that integrate AI, tailored to the specific needs of education. These tools will be pedagogically sound, user-friendly, and aligned with STEM teaching objectives;
- share some implementation of these AI-powered tools and practices in real classroom settings, gathering feedback from educators and students to refine the approach and ensure its effectiveness;
- examine the broader policy implications of integrating AI into early STEM education. This includes exploring how AI-based initiatives can influence educational institutions and inform future policy frameworks, particularly in relation to the adoption of AI in early STEM education.

Methodology

The objectives of this workshop proposal will be approached through the lens of Cultural-historical Theory (CHT) and Cultural-Historical Activity Theory (CHAT).

CHT emphasises how the environment acts as the source of a person's development and underlines the importance of social situations that may or may not become developmentally significant. In this view, learning is understood as a process that has a dialectical relationship with development; on the one hand, learning is based on a certain level of development, and on the other, learning guides development. In the historical development of CHT, units of analysis that have emerged pertain to tool-mediation, higher psychological functions and word meaning.

CHAT focuses on how individuals learn through their interaction with their environment and with others engaged in socially and culturally situated activities. In this view, learning is understood as a socially mediated process, unfolding within a specific social, cultural, and historical context. CHAT posits that the unit of analysis is the entire activity system within which learning occurs, involving tools, rules, and divisions of labour that mediate the learning process. In a learning community, participants make use of tools that mediate the learning process in order to achieve a common learning objective (object). This community is governed by a set of rules, co-constructed by the participants themselves, defined either explicitly or implicitly, and within this community, the division of labour is organized in a particular way.

All these elements are in constant interaction, and this dynamic—especially when combined with change—can give rise to tensions or crisis situations, which manifest as contradictions. Within CHAT, contradictions are not regarded as obstacles, but rather as the driving force of activity, which evolves and expands through their resolution.

The expansive learning cycle is also a developmental intervention method that aims at transforming an activity system, guided by the principles of CHAT. It typically marks the transition between individual and collective learning, leading to the creation of new organizational practices within educational institutions and systems. A typical sequence of these stages is as follows:

1. Questioning
2. Analysis
3. Modelling the new solution
4. Examining the new model
5. Implementing the new model
6. Reflecting on the process
7. Consolidating the new practice

It is worth noting that these stages represent an indicative sequence rather than a rigidly structured path or a "universal formula." This implies that the process is inherently dynamic, and at each stage, reflection occurs within a dialectical perspective, which may alter the trajectory of the expansive cycle—by revisiting previous steps or even initiating a new expansive cycle altogether. This approach is particularly well-suited for teacher professional development as it promotes transformation through the dialectical co-construction of knowledge and practice. It also fosters interdisciplinary collaboration, empowering educators to rethink and reshape their teaching methodologies in response to emerging challenges in the digital age.

The workshop will follow a research-oriented format and will focus mainly on the first two stages of the expansive learning cycle (questioning, analysis). It will include two main types of activities, presentations and discussions among participants. The presentations will employ philosophical, conceptual as well as classroom applied foundations. In terms of the expected outcomes, we envision to work towards a publication capturing the interactions among participants and the issues raised during the workshop.

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Towards gender inclusion in computer science teaching and learning: articulating activity theories with the fabric of inclusion

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Abstract: This study aims at furthering the development of inclusion in computer science teaching and learning in secondary schools of the Vaud canton (Switzerland). Using the fabric of inclusion, Cultural-Historical Activity Theory (C.H.A.T) and two French-language approaches to activity, we question the relationships between practices promoting inclusion and with the activities and lived experiences of teachers and students. This communication will present our initial findings and discuss the next phase of the study. Our initial findings reveal different objectives of teachers, their dilemmas and appropriation of computer science teaching. It also reveal a variety of relationships between gender, inclusion and meaning for the teacher in action. The next phase will focus on the situated nature of inclusion in action during lessons. We will also launch meetings with the teachers community in order to address the developmental challenges arising between gender inclusion, teaching and learning computer science.

Keywords: Computer science, Education, Gender, Activity theory.

Introduction

Despite positive trends, gender inclusion in science and technology still deserves our full attention in order to advance social justice and economic performance (Charlesworth & Banaji, 2019). This communication focuses on computer science education in secondary schools. Gender differences persist among students concerning the extent to which they dare to envisage higher education in computer science and engineering (Charlesworth & Banaji, 2019), and their sense of legitimacy in computer science. In order to investigate gender inclusion and differences, studies have been focusing on various objects of inquiry. Our research focuses on activity and social practices (e.g., Hasse, 2002).

Theoretical Framework

Our approach uses the *fabric of inclusion*, *Cultural-Historical Activity Theory* (C.H.A.T) and two French-language approaches to activity. The *fabric of inclusion* (Collet et al., 2024) proposes that, in order to promote inclusion in the classroom, teachers and pupils can work on four main areas for practice: acquiring knowledge, learning with confidence, existing as individuals, and existing as a group. However, what are the relationships of these practices with the activities and lived experiences of teachers and students? How can we develop more inclusive practices of teaching and learning computer science? Our study draws on three complementary frameworks in order to advance these questions. The instrumental approach (Bationo-Tillon & Rabardel, 2015; Rabardel & Bourmaud, 2003) focuses on the constructive dimension of the individual subject's activity (productive and constructive) in a work situation. C.H.A.T (Engeström, 2015) conceptualises tensions and contradictions within the development of activity and developed the Change Lab methodology (Lemony & Grosstephan, 2021). It allows to conceive of the collective and développemental

dimensions of teaching and learning computer science in the classroom, in the teachers' teams, the schola or the canton. Finally, the *course-of-action* framework (Poizat & Martin, 2020) lead us to focus on the lived experience of activity in teaching and learning situations, as well as on collective activity in situ.

Methodology

This communication presents the first results of the exploratory phase mainly conducted in reference to the instrumental approach (Rabardel & Bourmaud, 2003). The objectives were to gain an overall understanding of the diversity of teachers' practices and career paths, of their appropriation of the computer science official syllabus and of the collaboration within the community. 9 semi-directive individual interviews with teachers (4 females, 5 males; avg. length 102 minutes) were conducted. During the interviews, gender was introduced indirectly through questions related to students' differences and differential teaching pratices. Then, teachers were asked wether they had already encountered situations in which differences between male and female students emerged. Videos and photos of practices and materials were also collected. We were in regular contact with teachers and trainers in computer science at our institution. The 9 interviews have been fully transcribed, presented and discussed within the research team.

Results

Our initial findings reveal different objectives of teachers: supporting all pupils, supporting certain pupils more closely, providing technical teaching in computer science, integrating the social challenges of digital technology, etc. Depending on their expertise, teachers may experience the relationships between these objectives as dilemmas or as integrated and appropriate to one another. Similarly, the integration of notions such as the « social challenges of digital technology » may have been difficult for some teachers but the difficulty seems to be gradually fading over the years. Our analysis reveals a variety of relationships between gender, inclusive practices and meaning for the teacher in action. The teacher may or may not perceive and experience the situation as one of gender inclusion. For example, *taking advantage of an interesting question asked by a pair of students to answer it and discuss it with the whole class* does not present a specific gender issue, but could produce positive outcomes according to the *fabric of inclusion*. Conversely, *refusing a female pupil's request to work alone by insisting on cooperation in project mode and the necessity of developing self-confidence* may produce inclusion in the long term. However, depending on how this action is actually performed in the situated interaction with the pupil, it may or may not be directly effective. Finally, our results demonstrate some emotions (anger, satisfaction etc.) experienced within these differents situations.

Discussion and conclusion

Further analyses and development are needed. Detailing the individual and collective actions of teachers and students with the course-of action framework may help us to understand how inclusion in situ is performed (or not) and experienced (or not). Meetings with teachers of the community and the participatory identification of contradictions in activity systems will begin in october 2025 in order to address the important developmental challenges of taking gender inclusion, teaching and learning in computer science, to a new stage. We also wonder how this study could advance the field of activity-

centered studies addressing gender inclusion challenges of teaching and learning science and technology at school (e.g. Hasse, 2002).

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Making Information Accessible: Transforming Municipal Web Communications Through Inclusive and Participatory Practices

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Abstract: Many people face barriers in accessing public information due to complex language and predominantly text-based formats. These challenges particularly affect people with disabilities, limiting their social and civic participation. This research project, conducted in a municipality in Quebec, Canada, aimed to transform communication practices—especially web content—to make them more accessible and understandable. Grounded in a participatory action research approach, the study involved municipal staff as well as citizens with disabilities in evaluating the accessibility and clarity of content. The transformation was supported by tools such as a plain language guide, multimodal formats, and AI-based technologies. Using Cultural-Historical Activity Theory (CHAT) as a conceptual lens, the analysis highlights how a reorganization of work and the strategic use of tools contributed to a meaningful shift in public communication practices.

Keywords: accessibility of public information, participatory action research, persons with disabilities

Introduction

In times of social fragmentation, ensuring equitable access to public information becomes a fundamental issue for democracy. Yet many people continue to encounter barriers in understanding and using this information (OECD, 2016), particularly individuals with disabilities. This difficulty is particularly pronounced among people with low levels of literacy, representing about half of the adult population in Quebec (Langlois, 2025). Persons with disabilities are a group particularly affected by low literacy levels, which increases their risk of digital exclusion (ATN, 2020). Among vulnerable adults, several other groups are also affected: older adults, those living in economic vulnerability, and immigrants.

This research presents a participatory action research project (Camden & Poncet, 2021) carried out in a mid-sized municipality in Quebec, Canada. The project sought to transform public communications—especially those on the city's official website—to make them more accessible and understandable, with a particular focus on people with disabilities. Based on the principles of Cultural-Historical Activity Theory (CHAT), the analysis considers the transformation of communication practices as a collective activity shaped by tools, rules, roles, and community participation. It explores how actors, including municipal staff, accessibility experts, and people with disabilities, redefined communication strategies and reorganized their practices through an iterative process of learning and adjustment.

Context and Problem

Previous research (Grenon et al., 2021) has shown that the complexity of language, the dominance of text-based formats, and limited digital adaptation contribute to informational exclusion. These barriers are especially significant for people with low literacy skills. Municipal websites, often the first point of contact with public institutions, are rarely designed to meet the needs of people with disabilities (ATN, 2020). To address this gap, a participatory action research initiative was launched to support municipal staff in transforming communication practices. This research focuses on the process of revising the city's official website.

Theoretical Framework

Cultural-Historical Activity Theory provided a framework for analyzing the systemic and transformative dimensions of the work. In this project, the **subjects** were municipal employees responsible for drafting public communications. The **object** of the activity was to make municipal information more accessible and understandable. **Tools** included the guide *Communiquer pour tous. Guide pour une information accessible*, AI-based simplification tools, multimodal formats (infographics, explanatory videos), and a verification checklist for accessibility. Among the tools used, four practical memos were relied upon to highlight the key points to keep in mind. They focus respectively on writing, oral communication, images, and websites (Allaire et Ruel, 2023). The **community** involved an expert in plain language, a legal communication specialist, a web accessibility consultant, people with disabilities, elected officials, administrators, and researchers. **Rules** included institutional policies, accessibility standards, legal obligations, and branding guidelines. The involved **division of labor** collaboration between municipal departments, consultants, and people with lived experience of disability. The **expected outcome** was the creation of municipal communications that are more inclusive and comprehensible.

Methodology

The project was carried out using a participatory approach (Camden & Poncet, 2021) structured in four key stages. It began with an **initial assessment**, during which a web accessibility expert reviewed the most frequently visited pages of the municipal website. The analysis revealed that much of the content exceeded average literacy levels and lacked features supporting access for people with disabilities.

Following this diagnostic phase, **consultation activities** were conducted. Focus groups and interviews were organized with individuals in situations of disability and representatives from advocacy organizations. The decision to primarily involve persons with disabilities in the lived experience testing is justified by the fact that they represent a group particularly affected by low literacy levels and, consequently, by the risks of digital exclusion (ATN, 2020). These discussions highlighted the importance of using plain, simple language, visual cues to support understanding, and offering alternative formats such as audio or video.

The third stage focused on **implementation**. Drawing on feedback from consultations and recommendations from the *Communiquer pour tous* guide (Ruel et al., 2018), selected web pages were revised. Changes included simplifying the language, adding visual elements, and producing explanatory infographics and videos. To assist with drafting, artificial intelligence tools generated initial simplified versions aligned with accessibility guidelines.

Finally, the **validation** process involved two complementary methods. Individuals with disabilities reviewed the revised content and assessed its clarity and accessibility based on their lived experience. In parallel, a checklist based on recognized standards was used to compare the content before and after revision, ensuring that the changes were effective and measurable.

Results

The analysis shows that the transformation was made possible through material, human, and cultural mediation. Several key findings emerged. First, the use of tools such as artificial intelligence and the guide (Ruel et al.,

2018) enabled staff members to rethink their practices and develop new models of communication. Second, the active participation of individuals with lived experience of disability strengthened both the quality of the content and the relevance of decisions made. This participatory engagement also contributed to a redistribution of decision-making power. Third, contradictions arose, particularly between the desire of some staff to produce communications in a more formal style and the need for clarity and accessibility, essential for reaching the broader population. These tensions led to constructive dialogue and creative compromises, supporting the evolution of practices. Finally, although the use of an AI tool proved helpful, it required careful human validation to ensure the accuracy and appropriateness of the content.

Conclusion

This project illustrates how Cultural-Historical Activity Theory (CHAT) can illuminate the collective transformation of professional practices through tools, community engagement, and shared objectives. It also reflects a shift in communication practices within a municipal institution. The study reinforces the idea that information accessibility is not simply a technical issue, but a social and cultural process requiring collaboration, reflexivity, and continuous adjustment. This approach could serve as a model for other public organizations aiming to improve their communication practices and advance accessibility.

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Analyzing Educational Practices mediated by digital technologies through Activity Theory

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Abstract: This study, developed within the EDSSE project, applies Activity Theory (AT) to analyze educational practices mediated by digital technologies. The methodological process followed five phases: (1) the components of AT were defined as initial categories; (2) a systematic review identified recurring didactical and pedagogical criteria, which were organized into subcategories with observable indicators; (3) we conducted a three-round Delphi study where we prioritized and validated the subcategories, resulting in an observation guideline with two indicators per category (with a total of 14 indicators); (4) data are being collected through the validated observation guideline and a complementary interview and (5) the current stage applies a deductive thematic analysis, guided by the predefined subcategories, to identify tensions within and across categories. These tensions are conceptualized as contradictions that can reveal both barriers and opportunities for innovation. Expected outcomes include insights to guide the design of more inclusive and sustainable digital learning ecosystems.

Keywords: Educational practices, Digital technologies, Thematic analysis

Introduction

The progressive incorporation of digital technologies (DT) into educational contexts has transformed the conditions of teaching and learning (Mhlongo et al., 2023). Digital resources enable new forms of participation and interaction but also generate tensions when they intersect with existing pedagogical goals, institutional rules, or students' competences (Coker, 2020). To study these dynamics, it is necessary to adopt theoretical approaches that do not merely describe practices but also explain how they evolve. AT provides such a perspective, as it conceptualizes human activity as a system mediated by tools, norms, and community relations, while emphasizing the central role of contradictions in driving change (Grimalt-Álvaro & Ametller, 2021; Karasavvidis, 2009).

This study is framed within the EDSSE project and aims to develop a rigorous analytical process that allows the application of AT to the study of educational practices mediated by DT. By combining systematic review, expert validation, observation, and thematic analysis, the project seeks to build a methodological bridge between the theoretical categories of AT and their empirical manifestations in educational practice.

Objectives

The primary objective of this study is to analyse educational practices mediated by DT through the lens of AT, focusing on how tensions and contradictions within activity systems shape innovation. More specifically, the study aims to operationalize AT categories into observable indicators, validate these indicators with expert consensus, apply them in real educational contexts and conduct a deductive thematic analysis to identify tensions across categories and subcategories

Methodology

The methodological process was structured into five phases. In the first phase, the seven components of AT were defined as initial categories, providing the conceptual scaffolding for subsequent steps. The second phase involved a systematic review of the literature, which identified recurring pedagogical and didactical criteria associated with digital practices. From this review, subcategories and observable indicators were extracted to refine the analytical framework.

In the third phase, these subcategories were submitted to validation through a three-round Delphi study with experts in educational technology and pedagogy (Cabero-Almenara & Infante-Moro, 2014; Goldfisher, 1993). The iterative consultation process resulted in the prioritization of the most relevant criteria and the validation of indicators. The result was an observation guideline containing two indicators per category, for a total of fourteen indicators, ensuring a balanced representation of each category and a manageable total number of indicators. This instrument was subsequently piloted to confirm clarity and feasibility.

The fourth phase focused on data collection. Empirical information is currently being gathered through the validated observation guideline, which allows for systematic analysis of classroom practices. To complement these observations, a semi-structured interview protocol was designed to revisit and expand on certain subcategories, adding depth and capturing teachers' perspectives.

The fifth and current phase consists of a deductive thematic analysis (Clarke & Braun, 2017). This analysis is guided by the predefined subcategories and aims to detect tensions both within and across categories. These tensions are interpreted as contradictions that not only constrain but also potentially transform activity systems.

Expected results

The study is expected to generate several contributions. First, it will deliver a validated framework of fourteen indicators that operationalize AT for the study of educational practices. Second, it will provide empirical evidence on how tensions shape the evolution of digital practices mediated by DT, thus informing strategies for innovation. Third, it will generate recommendations for the design of inclusive and sustainable digital learning ecosystems that are responsive to the challenges identified. Finally, the methodological process itself represents a contribution, as it illustrates how AT can be systematically operationalized through the integration of systematic review, Delphi validation, structured observation, and thematic analysis.

Conclusions

This research highlights the potential of combining AT with systematic and participatory methods to analyse the complexity of educational practices mediated by DT. By operationalizing theoretical categories into observable indicators, the study bridges the gap between abstract concepts and empirical application. By focusing on tensions, it recognizes contradictions not only as barriers but also as productive elements that can lead to innovation.

The findings of this study will contribute both to the use of AT in education mediated by DT and to the practical design of strategies that support integration of DT in schools and universities. Ultimately, the project demonstrates that contradictions are essential lenses for understanding the dynamic and evolving nature of educational ecosystems.

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Emotional Intelligence and Sustainability Education: A Case-Based Approach to Promoting Transformative Competencies in Higher Education

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Abstract: The growing complexity of sustainability challenges requires educational approaches that integrate cognitive, emotional, and ethical dimensions. Higher education is increasingly called to prepare students not only to understand sustainability but also to act responsibly for collective well-being. Responding to this need, a pilot intervention was carried out within the 2024/2025 Design Thinking course at LUMSA University (Rome, Italy), involving 150 undergraduates. The program combined two tasks: an individual reflection on sustainability and the SDGs, and group projects where teams of 3–5 students co-designed practical solutions to global challenges. Findings show that students enriched their conceptual understanding of sustainability, prioritized social SDGs such as gender equality and quality education, and reported greater awareness of the consequences of everyday actions. Yet behavioral change remained limited, highlighting the persistent gap between awareness and action. The study points to the value of emotionally engaging, collaborative learning for fostering equitable, peaceful, and sustainable practices in higher education.

Keywords: Emotional Intelligence; Sustainability; Consumption Behaviors; SDGs.

Education for Sustainable Development (ESD) requires approaches that combine cognitive, affective, and behavioral learning outcomes (UNESCO, 2021; Stern, 2011). Emotional Intelligence (EI)—the capacity to perceive, understand, and regulate emotions (Goleman, 1995; Mayer et al., 2008)—is associated with prosocial engagement, empathy, and motivation for collective well-being (Di Fabio & Kenny, 2016; Fernández-Berrocal & Extremera, 2016). Neuroscientific evidence (Damasio, 1996; He et al., 2018) underscores how emotion scaffolds reasoning, foresight, and ethical action. Despite growing awareness, sustainability education often shows a persistent knowledge–action gap (Colombo et al., 2023). Interventions relying solely on cognitive transmission are insufficient to shift behaviors. We explore whether an EI-informed, design-thinking-based educational activity can foster a deeper, more action-oriented engagement with sustainability issues among university students.

Research question: Can emotionally oriented reflection and collaborative design projects enhance students' sustainable consumption orientations and bridge the awareness–action gap? Evidence suggests EI training improves emotional regulation and prosocial outcomes (Held et al., 2023; Poveda-Brotons et al., 2024). In sustainability education, transformative learning, especially when experiential and affective, has been linked to longer-term behavioral engagement (Lovren & Marušić

Jablanović, 2023). Design Thinking offers an empathic, iterative framework to integrate head (knowledge), heart (values), and hands (action) in ESD contexts (Razzouk & Shute, 2020; Lehtonen et al., 2023). A pilot intervention was conducted during the first semester of 2024/2025 with 150 undergraduates in a Design Thinking course at LUMSA University.
Two activities were implemented:

1. In-class reflection using three poster prompts on sustainability definitions, preferred SDGs, and everyday sustainable actions.
2. Group project (teams of 3–5) addressing SDGs through the Design Thinking cycle (empathy, problem framing, ideation, prototyping, storytelling).

Activities were intentionally non-graded to foster intrinsic motivation. Data collection included post-it notes (qualitative), pre-post questionnaires (quantitative, n = 52 matched), and group project outputs. This abstract reports qualitative findings from the reflection activity only.

Sustainability Conceptualizations:

Category	Description	Representative Example
Intergenerational Equity	Fairness toward future generations	"The art of living today without compromising tomorrow"
Environmental Stewardship	Ecosystem protection and biodiversity	"Protecting forests and biodiversity"
Social Responsibility & Equity	Justice, inclusion, solidarity	"Gender equality and social solidarity"
Sustainable Lifestyles & Innovation	Everyday practices, urban/systemic solutions	"Smart cities and sustainable lifestyles"

Out of 113 valid SDG justifications, students prioritized SDG 5 (20%), SDG 4 (12%), and SDG 3 (9%), followed by SDG 8 and SDG 2. Socially oriented goals clearly dominated.

Category	Description	% of total	Example
Ethical values	Fairness, justice, equality	37%	"Because gender equality is a human right"
Intrinsic motivation	Self-determined interest	28%	"Because health is important for everyone"

Systemic vision	Holistic awareness of interdependence	19%	"Education can reduce inequalities"
Personal experience	Biographical/lived engagement	16%	"I grew up by the sea, so protecting the marine environment…"

Students proposed 125 feasible sustainable everyday actions:

- 33 on waste reduction (e.g., reusable containers, 3Rs),
- 21 on water conservation,
- 18 on sustainable consumption,
- 14 on energy saving,
- 13 on sustainable mobility,
- 11 on awareness/information,
- 9 on sustainable nutrition,
- 6 on other creative ideas.

While awareness increased, behavioral intentions were not accompanied by measurable short-term CO_2 reductions, echoing the well-known attitude–behavior gap. The intervention surfaced rich conceptualizations and value-based motivations, showing that even brief EI-informed activities can stimulate multidimensional reflection. However, increased cognitive and affective engagement alone was insufficient to trigger immediate behavioral shifts.

This aligns with research emphasizing the role of emotional resonance, feedback loops, and peer support in facilitating habit change (Wang et al., 2025; Colombo et al., 2023).
Key implications include:

- embedding iterative experiential tasks rather than one-off interventions,
- integrating structured peer accountability (e.g., team challenges),
- providing immediate feedback on environmental impact (e.g., carbon tracking dashboards).

This pilot case highlights the value, and limits, of brief EI-informed interventions in sustainability education. Students articulated ethical, social, and environmental conceptions of sustainability and proposed concrete actions, but behavior remained largely unchanged in the short term. Future cycles will introduce emotionally engaging, participatory formats to bridge the awareness–action gap and strengthen transformative competencies. This abstract reports only qualitative findings from one intervention. Quantitative pre–post data and analyses of group project outcomes will follow. The broader doctoral project includes five emotionally oriented, experiential sessions to be implemented in Italy and Spain, designed to foster sustained behavior change.

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Exploring the relationship between carbon footprint and internal personal factors in Spanish university students

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Abstract: This study explores the relationship between Spanish university students' personal carbon footprint (CF) and internal psychological factors—environmental knowledge, concern, and motivations—drawing on behavioral psychology frameworks such as the Theory of Planned Behavior, Norm Activation Theory, and the Value-Belief-Norm model. A quantitative, exploratory design was applied to a non-probabilistic sample of 111 students from four universities. Data were collected using a validated CF calculator and survey items assessing internal variables. Results revealed no statistically significant differences in CF based on students' self-perceived environmental knowledge, concern, or motivational worldview. Notably, students with anthropocentric, altruistic, or spiritual views of nature exhibited similar consumption patterns. These findings suggest that environmental awareness and values, while present, do not necessarily translate into sustainable behavior. The study highlights a generational disconnect between intention and action among Gen Z students, whose digital-native habits and post-pandemic consumption dynamics may override ecological values. These insights underscore the need for educational strategies that go beyond awareness, fostering normative activation and behavioral control to promote sustainable lifestyles.

Keywords: Carbon footprint · Behavioral psychology · Environmental concern · Sustainable consumption

Introduction

Reducing greenhouse gas emissions requires not only structural policies but also individual behavioral change (IPCC, 2022). In this context, personal carbon footprint calculators have emerged as tools to raise awareness about the environmental impact of consumption. However, the effectiveness of these tools depends on the psychological mechanisms that mediate awareness and action. Behavioral psychology offers several models to understand this gap, notably the Theory of Planned Behavior (Ajzen, 1991), the Norm Activation Theory (Schwartz, 1977), and the Value-Belief-Norm model (Stern, 2000). These frameworks emphasize that attitudes and values alone are insufficient to trigger behavioral change without perceived control and normative activation. As Onwezen et al. (2013) argue, "knowledge and concern are necessary but not sufficient" to promote sustainable behavior. This study applies these models to explore how internal factors—environmental knowledge, concern, and motivations—relate to the carbon footprint of Spanish university students. The findings contribute to understanding the behavioral dynamics of Generation Z, whose ecological awareness often coexists with consumption patterns shaped by convenience, digital culture, and social norms.

Acknowledgements

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Places and eco-anxiety in pro environmental behaviors: Renewable energy communities as possible way to foster sustainability

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Abstract: The climate crisis poses a profound challenge, affecting individuals, communities, and ecosystems at every level. One of its psychological consequences, eco-anxiety, is becoming an increasingly significant concern. Pro-environmental behaviors (PEB) are framed as both personal and collective strategies to cope with this crisis. This study explores how emotional and cognitive bonds with significant life places and eco-anxiety contribute to the promotion of individual and collective PEB. A total of 431 Italian participants completed an online survey measuring individual PEB, willingness to engage in initiatives related to renewable energy, civic pro-environmental engagement, eco-anxiety, place identity and attachment. Using Structural Equation Modeling, a multiple sequential mediation analysis was run. Findings indicate that eco-anxiety may function as a catalyst or as a mitigating factor for PEB, depending on the identification with and attachment to meaningful life places. Renewable energy communities (REC) are discussed as possible collective actions to foster sustainable transition.

Keywords: pro-environmental behaviors, eco-anxiety, renewable energy communities, community psychology

Extended abstract

The climate crisis has psychological and social repercussions, generating new forms of distress and emotional vulnerability (Fresque-Baxter & Armitage, 2012). Among these, eco-anxiety, defined as the negative emotional activation arising when one perceives their meaningful life places as threatened by climate change, has recently received growing attention (Hickman, 2020; Pihkala, 2018).

Given its pervasive impact, the climate crisis must be understood not only as an environmental issue but also as a social one. This perspective calls for innovative strategies to encourage both individual and collective pro-environmental actions (Rees & Bamberg, 2014). In this regard, pro-environmental behaviors (PEB) are recognized as fundamental tools to mitigate the crisis, reduce its consequences, and foster adaptation strategies (Kollmuss & Agyeman, 2002).

The present study aims to deepen the understanding of the psychosocial pathways that sustain the adoption of PEB, particularly focusing on the interplay among eco-anxiety, place attachment, and place identity. The research proposes an integrated theoretical model that addresses eco-anxiety as a potential mediator in the relationship between place-related dimensions and both individual and collective PEB.

The empirical investigation employed an online questionnaire administered to 431 Italian participants aged between 18 and 82 (M = 30.22; SD = 12.85). The survey included validated measures assessing individual PEB (Procentese et al., 2025), interest in taking part in initiatives about the use of renewable energy sources (Procentese et al., 2025), pro-environmental civic engagement behaviors (CEB; Doolittle & Faul, 2013), eco-anxiety (Ágoston et al., 2022), place identity, and place attachment (Jorgensen & Stedman, 2001).

A multiple sequential mediation model was tested using Structural Equation Modeling (SEM).

As to the direct effects, PEB and eco-anxiety showed a positive association with place attachment yet a negative one with place identity. Differently, pro environmental CEB showed a positive association with place identity yet no significant association with place attachment. Furthermore, the interest in taking part in initiatives about the use of renewable energy sources showed no significant association with both place ties.

As for the indirect effects, relationships are different. Place attachment has a positive indirect effect on PEB and the interest of taking part in initiatives related to renewable energy via eco-anxiety, while place identity shows negative ones in both cases. In the same vein, place identity shows negative indirect effects on PEB and the interest of taking part in initiatives related to renewable energy also via the sequential mediation of eco-anxiety and pro-environmental CEB, while place attachment shows positive indirect effects in this case too. Therefore, this study highlights that eco-anxiety can have a double effect: it can act differently, provoking paralysis and avoidance in some contexts, but working as a motivational trigger when supported by strong place bonds.

The results also underscore the importance of distinguishing between individual and collective PEB – e.g., civic-engagement-based ones – based on the different relationships and paths emerging. Indeed, both represent crucial strategies to face the current crisis: while private actions such as recycling are vital, collective actions appear more influential in shaping policies and fostering structural transformations (Fielding et al., 2014). The integration of both dimensions reflects the multifaceted nature of environmental responsibility, demonstrating that sustainable change requires simultaneous action at personal, community, and political levels.

Additionally, the role of life places emerges as particularly relevant. Along with serving as tangible contexts where the impacts of climate change are visible and emotionally experienced, life places within neighborhoods and local communities can also represent resources to face such crisis based on the type of tie individuals develop towards them.

This study provides new insights into the psychological and social mechanisms underlying pro-environmental engagement. It demonstrates that eco-anxiety, often regarded solely as a form of psychological burden, can also be reframed as a potential driver of sustainable behaviors, particularly when mediated by strong bonds to meaningful places.

Future research should extend these findings by exploring longitudinal effects, cross-cultural comparisons, and interventions designed to strengthen place bonds to maximize the constructive potential of eco-anxiety.

Lastly, a specific form of collective action is discussed. Renewable energy communities (REC) are identified as a bottom-up action crucial for sustainable energy transition (De Simone et al, 2025). This form of energy self-production and self-consume can foster sustainability in urban contexts through the active involvement of citizens.

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Experiences of online Change Laboratory research-interventions in miniature in doctoral education

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Abstract: This paper addresses the issue of fostering expansive learning in doctoral education using a Change Laboratory-in-miniature approach. Doctoral students face many problems when understanding activity-theoretical methodologies such as the Change Laboratory. While cutting-edge and promising, these are not easy to grasp for newcomers. In a practice context increasingly prioritising timely completion, such obstacles incentivise students towards adopting conservative, well-understood research approaches.

This paper explores how the Change Laboratory in miniature can provide doctoral students with a Change Laboratory experience, but emphasises that the success of this endeavour depends on such projects addressing genuine practice problems experienced by the doctoral students in their own lives. Two miniature projects are considered—each conducted online, over a few weeks, with globally distributed cohorts of distance doctoral students. The projects' objects, selected by the cohorts themselves, respectively concerned the informal mutual support provided by networks of online PhD students; and the use of Generative AI tools in academic research.

Keywords: Change Laboratory; activity theory; online intervention; doctoral education

Introduction

This paper addresses the issue of doctoral students experiencing expansive learning via the Change Laboratory methodology. The context of doctoral education is a nexus of intellectual and practical tension and possibility. The PhD is an intellectual journey of personal growth, where new researchers are forged individually and where the groundwork is laid for the next generation of scientific projects and epistemic communities—without which the latter would eventually wither through lack of generational reproduction. Yet the PhD is also a challenging time of crisis, with PhD students facing traditional issues of loneliness and intellectual uncertainty alongside challenges of financial difficulty, balancing research and paid work, and heavy pressure to complete within demanding deadlines. Against this context, there is an incentive for PhD students to choose "do-able" research projects using well-established principles and documented procedures. Cultural Historical Activity Theory (CHAT), with its reputation for intellectual ambition and a steep learning curve (Lémonie, 2025), can therefore seem an unattractive avenue. This is problematic, because CHAT is well-placed to address contemporary and urgent societal challenges (Engeström, 2016)—and it is often such challenges which motivate people to attempt PhD studies in the first place!

The basic idea discussed in this paper is to give PhD students the opportunity to participate, voluntarily, in a Change Laboratory-in-miniature within a doctoral training module. Doing so can, it is hoped, help such students appreciate the nature and purpose of the approach, understand how such a research-intervention can be designed and might unfold, and experience using second stimuli (such as the activity system) themselves. Yet such an attempt faces difficult challenges, including those of choosing a suitable object for the work and restrictions on timescale and workload.

Notwithstanding the antecedents of expansive learning in classroom research (e.g., in mathematics in the Soviet era), most Change Laboratory projects do not address objects of formal education (Engeström, 2016). This work is part of my research agenda to bring the approach into contact with higher education (Bligh, 2024; Bligh & Flood, 2015), where its activist and interventionist approach (cf. Sannino, 2011) might serve as a counterweight to neoliberal managerialism. Prior projects have explored the use of the Change Laboratory to help university students relate classroom knowledge to work on placements (Snowden, 2018) and to encourage more agentic participation in questioning teachers and curriculum knowledge (Reid, 2019).

Two Change Laboratory projects-in-miniature have been conducted to date, conducted in the same training module in successive academic years. The module is delivered via distance learning to PhD students domiciled around the world who study part-time while working. For this reason, the projects are designed as an online Change Laboratory (cf. Spante et al., 2023) using a range of online digital platform tools (cf. Obexer, 2024).

A range of issues have proven important across these two projects.

Topic selection

The Change Laboratory-in-miniature should be oriented towards an object in which the PhD students have a direct stake and, ideally, personal experience.

In the first year, participants worked on an object of the informal mutual support provided by networks of online PhD students; and in the second year on the use of Generative AI tools in academic research.

Workshop design

Simple outline designs (cf. Bligh, 2023) were produced and discussed with participants. Five 90-minute workshops were conducted twice each (meaning ten workshops in total), to accommodate participants in different time zones). The timescale was around 8 weeks in each case.

Expansive learning actions

The projects aim to focus in turn on questioning, analysis, modelling, examination and process reflection (see Figure 1). Other expansive learning actions cannot be addressed realistically, given the timescale.

Technical instrumentalities

The workshops are facilitated using Zoom for video conferencing and Miro for collaborative knowledge production (see Figure 2).

Project outcomes

Participants are able to undertake many expansive learning actions successfully and produce interesting ideas for the ZPD of the activity they consider. Many go on to use CHAT (and in some cases the Change Laboratory) in their own doctoral research.

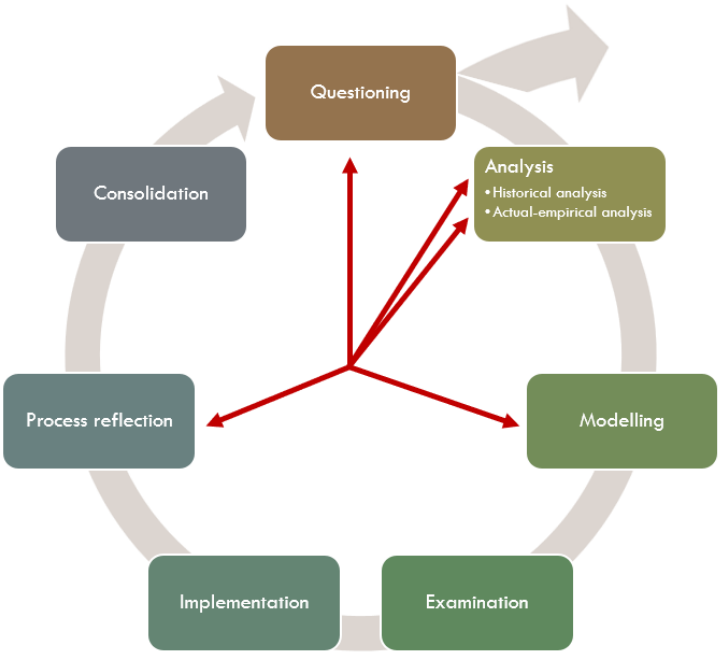

Figure 1 The expansive learning actions on which the Change Laboratories-in-miniature are able to focus.

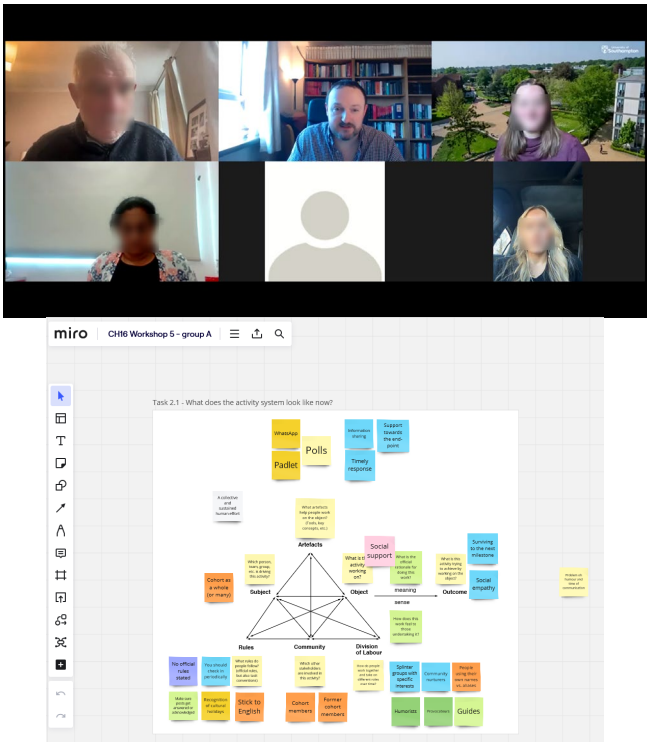

Figure 2 The use of Zoom and Miro for the online Change Laboratory workshops.

Difficulties

Difficulties arise from:

- time constraints and the need to conduct each workshop twice;
- sometimes from the nature of the Change Laboratory as an end-in-itself (despite the attempt to choose suitable topics); and
- from the lack of advance preparation and consequent inadequacy of mirror data.

Following my earlier conception of Change Laboratory projects as activity systems (Bligh, 2024), future work will seek to characterise these problems as contradictions in the activity system.

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Navigating AI Integration in TESOL: A Cross-Cultural Online Change Laboratory for Expansive Teacher Learning

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Abstract: This study presents a cross-cultural, online Change Laboratory (CL) pilot exploring how Teach English to Speakers of Other Languages (TESOL) practitioners collaboratively examine AI integration in adult blended language learning. Conducted with teaching practitioners in China and South Africa, the workshops aimed to assess the feasibility of online CLs, examine how cultural and linguistic diversity shapes expansive learning, and generate methodological insights for a larger future interventions. Using Cultural-Historical Activity Theory (CHAT) and expansive learning as a guiding framework, participants reflected on teaching practices, analysed systemic contradictions, and began modelling alternative approaches. Findings highlight the viability of online CLs in supporting collaborative reflection across cultural boundaries, while revealing important differences in how participants from distinct cultural contexts interpret critique, authority, and pedagogical change. The Activity System Model functioned as a shared mediating tool, enabling dialogue homogeneous linguistic groups. The study demonstrates the potential of online, culturally responsive CLs to foster teacher agency and deeper understanding in globalized, AI-enhanced TESOL environments.

Keywords: Change Laboratory; artificial intelligence; expansive learning; teacher agency

Introduction

The rapid integration of educational technologies, especially artificial intelligence (AI), is transforming teaching practices in language education. Teachers today are expected not only to use these AI tools but also to work collaboratively in AI-enhanced environments to improve instructional practices (Van Leeuwen & Rummel, 2020). However, this technological transformation often occurs through a top-down approach, led by institutional leaders, which creates a gap between the AI tool designers and the teachers who actually implement them (Lawrence et al., 2024; Wang et al., 2023). This gap can lead to misalignment between the tools' intended use and their practical application in teaching, diminishing the effectiveness of AI in education.

In online educational companies in China, where the pilot study took place, AI tools are deployed in various forms to create blended English learning experiences for adult learners. These companies, despite differing in how they design and use AI-based tools, share a common thread, inter-professional and collaborative teamwork. Based on the researcher's work experience in several online educational companies, the development of these tools involves a wide range of stakeholders and an elaborate division of labour, including product managers, content teams, designers and developers from IT, teaching professionals, sales teams and managers.

While this cross-departmental collaboration is aimed at fulfilling the needs of various stakeholders, some literature on this topic reveals that the needs of teaching staff are deprioritized or ignored, leading to misalignments between the intended use of the tools and actual teaching practices. As a result, teachers may use

AI tools differently from what was expected, which can negatively impact teaching and learning outcomes (Felix, 2020). Therefore, to improve the readiness of teaching staff to adopt and effectively use AI, they require cross-departmental and institutional support in terms of resources, knowledge, and cultural alignment (Jöhnk et al., 2021). Furthermore, active participation in the design and implementation process is essential to ensure that the tools meet the practical needs of teaching staff (Wang et al., 2023; Holstein et al., 2019), calling for a bottom-up, exploratory intervention.

A key objective of the pilot study was to examine how cross-linguistic and cross-cultural factors might impact online Change Laboratory workshops about the use of AI in TESOL. The participants included a tutor and six TESOL teachers, some of whom were native Mandarin speakers working in China, while others were native English speakers working from Johannesburg, South Africa. The study aimed to investigate how these groups, who share similar roles but come from different cultural backgrounds, reflect on their teaching practices, identify areas for improvement, and propose new work practices involving AI technologies. This study sought to understand how cultural and linguistic diversity can create both opportunities and challenges in Change Laboratory collaboration, which will be a significant factor in the researcher's larger Ph.D. project.

This study employed the Change Laboratory method, grounded in Cultural-Historical Activity Theory (CHAT), to foster participatory change through the collaborative reconfiguration of work practices. The Change Laboratory provides a framework for understanding and resolving contradictions in professional practices, enabling participants to develop new work methods through expansive learning cycles (Engeström, 1987/2015). The pilot was designed to test this methodology in an online TESOL context, engaging participants in four workshops over three months to identify challenges in their current use of AI tools and collaboratively model solutions.

Topic selection

The topic of integrating AI into TESOL was selected based on both the increasing reliance on AI-driven platforms for TESOL and the limited research on its practical application focusing on teachers' expansive learning.

The participants were working for online TESOL companies where AI was adopted as a part of the learning journey of students. Among the six teacher participants, four are native Chinese speakers residing in different cities in China, while two of them are native English speakers from Johannesburg, South Africa.

Workshop design

The workshops were outlined following guideline of Bligh (2023) and discussed with the supervisor of the researcher. Two 90-minute workshops were conducted twice each (meaning four workshops in total), to accommodate participants speaking different first languages and living in different time zones). The timescale was around 6 weeks.

Expansive learning actions

The projects aim to focus in turn on questioning and analysis. Other expansive learning actions cannot be addressed realistically, given this is a pilot study.

Technical instrumentalities

The workshops are facilitated using VooV for video conferencing and Miro for collaborative knowledge production (see Figure 2 and 3).

Project outcomes

Participants are able to undertake some expansive learning actions successfully and produce interesting differences which were caused by their own first language and cultural background. Many presented that their agency was enhanced in CL workshops.

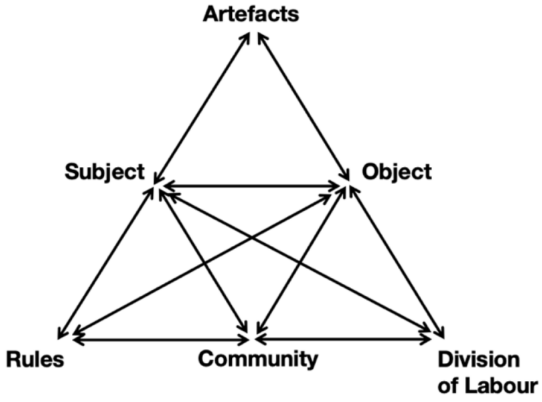

Figure 1: The Activity System Model (Engeström, 1987/2015)

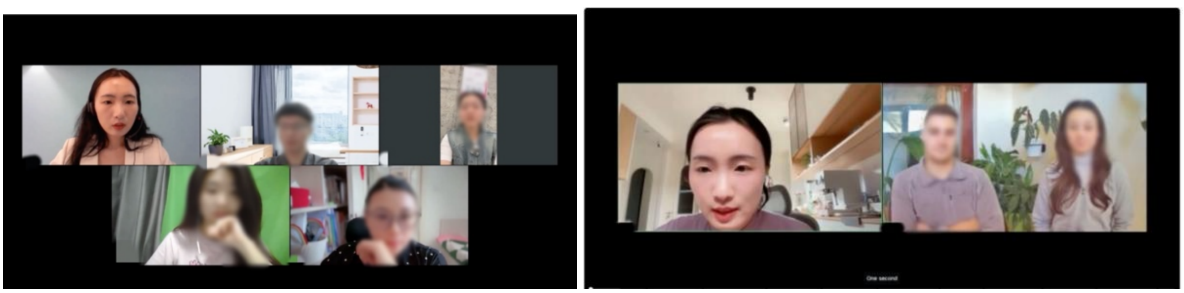

Figure 2 The use of VooV for the online Change Laboratory workshops.

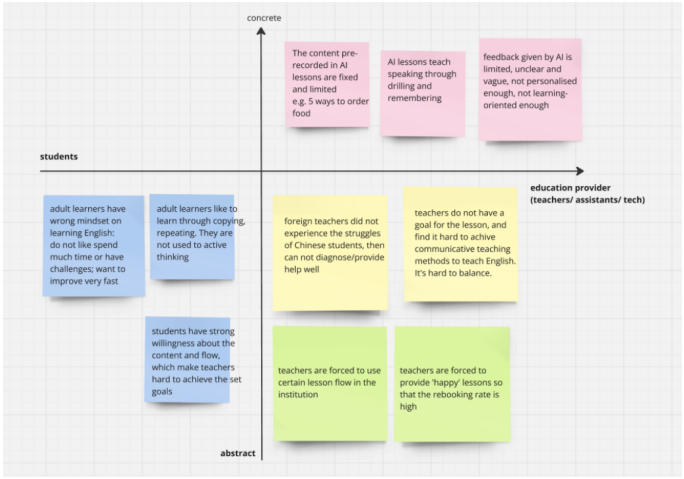

Figure 3 The use of Miro for the online Change Laboratory workshops.

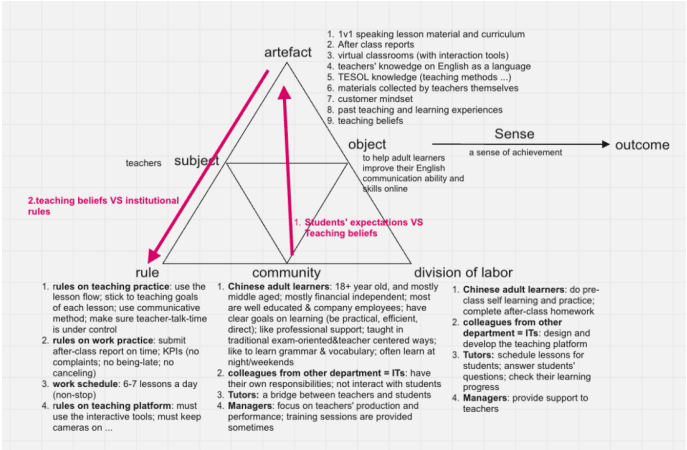

Figure 4: Teachers' activity system (summarised on Miro by the author)

Difficulties

Difficulties arise from:

- time constraints as the participants were too excited to talk;
- mediate with the same limited mirror data twice when participants of two groups react differently when encountering the data;
- unexpected confusion and tension caused by linguistic and cultural background.

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I would like to thank the participants joined in the sessions with passion, dedication and creativity. Their caring and loving about their career and development of online education drives me as a researcher of this field.

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Co-Creating Ethical AI Guidelines: A Change Laboratory with Pre-Service Early Childhood Educators in a UAE Tertiary Education Context

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Abstract: This paper reports on an in-progress Change Laboratory intervention exploring the co-construction of ethical AI guidelines with pre-service early childhood educators and faculty in a UAE tertiary institution. Grounded in Cultural-Historical Activity Theory (CHAT), the project addresses tensions between institutional policies and everyday practice. Three online sessions conducted via Microsoft Teams have revealed contradictions around unclear rules, inconsistent norms, and limited support for ethical AI use. Emerging solutions include transparency checklists, contextualized guidelines, and collaborative practices that reposition students and faculty as co-designers of policy. Early findings highlight both methodological innovation in adapting the Change Laboratory online and practical contributions to equity, sustainability, and participatory change in education.

Keywords: AI in Education; Change Laboratory; CHAT; Ethical Guidelines;

Introduction

As Artificial Intelligence (AI) becomes increasingly embedded in educational environments, there is a growing need for ethically grounded, context-sensitive guidelines for its use. However, institutional policies often lag behind practice and tend to be top-down, leaving limited space for dialogue with the educators and students most affected. This paper describes an in-progress Change Laboratory intervention that engages pre-service early childhood educators, faculty, and management in co-constructing ethical AI guidelines for both their current academic use and their future classroom practice.

This study responds to calls for equity, sustainability, and participatory practices in education, particularly in times of crisis and transformation. It contributes to the ISCAR 2025 conference theme by outlining a CHAT-informed, bottom-up model for organizational and pedagogical change. Three online sessions have been completed to date via Microsoft Teams, and early findings are presented here.

Theoretical framework

The project is grounded in third-generation Cultural-Historical Activity Theory (CHAT) (Engeström, 1987; Engeström, 1993), which emphasizes multi-voiced activity systems, contradictions, historicity, and expansive learning. Central to the design is the Change Laboratory methodology (Engeström, 2001; Virkkunen & Newnham, 2013), a formative intervention that uses mirror data and the principle of double stimulation to foster collective agency and conceptual development. Rather than implementing pre-defined solutions, a Change Laboratory facilitates the co-creation of new tools and practices within a specific work activity.

Context & participants

The intervention is taking place within the Education Department of a federal tertiary institution in the United Arab Emirates, and also draws on experience from a previous Change Laboratory intervention carried out in the same context (Miles, 2021, 2022). The participants include final-year pre-service early childhood education

students and faculty members involved in pre-service teacher education. For the initial sessions, a core group of four students and four faculty members has been identified. This group will be augmented in future sessions to include management and other members of the community in order to maximize multi-voicedness. The students are preparing to enter the workforce and are already engaging with AI tools for planning, assessment, and reflection. Faculty are also engaging with AI tools in their own classrooms. However, all report uncertainty about institutional expectations and ethical boundaries.

The first three meetings were conducted online on Microsoft Teams. This was to circumvent issues with availability due to teaching schedules and practicum placements, but also to facilitate recording and transcribing the meetings. Students in the UAE are uncomfortable with being recorded due to cultural expectations. However, they are used to using Teams and therefore are willing to be recorded in this context as they can use avatars or leave their camera off.

Methodology

A purposive sample of students and faculty were invited to participate in a Change Laboratory intervention during the Summer Semester 2025. The research is ongoing into the Fall semester and beyond.

The research design follows the six overlapping stages of expansive learning:

1. Questioning current practices
2. Analyzing historical and systemic contradictions
3. Modelling new solutions
4. Examining the model
5. Implementing the model
6. Reflecting and consolidating new practice

Three sessions have taken place so far. The first session employed mirror data from student and faculty surveys, excerpts from the existing institutional AI Guidelines for Faculty and Students and anecdotal notes from the participants. In session two, the participants examined root causes for contradictions identified in session one, prioritizing those in most need of resolution. In session three, participants began the process of modelling potential solutions to the existing contradictions. As noted, all meetings were mediated through Microsoft Teams as an adaptation to circumstances and to facilitate recording and transcribing meetings.

Findings

Emerging contradictions

Following session one, five main contradictions were identified.

1. AI tools are widely used, but students and faculty are unclear about the rules for ethical use.
2. Faculty are expected to guide AI use, but institutional support is limited.
3. The goal is deep learning and growth; the outcome is often surface-level use or confusion. For example, students simply copy and paste answers from ChatGPT without critical reflection.
4. Expectations around AI use vary by teacher; norms are inconsistent across the system.
5. Students lack structured training in meaningful AI use; faculty use varies widely.

Co-created potential solutions

Initial discussions have started to suggest potential new models of practice to solve the contradictions that are manifesting in the current activity system. While institutional guidelines exist, these are poorly integrated into curricula, if at all. Faculty and students feel clear, contextualized guidelines need to be embedded into all teaching and learning materials and assessments. An immediate proposal is the inclusion of transparency checklists and acknowledgements of AI use for submitted work.

Shifts in agency

The UAE and the institution are culturally hierarchical and inherently top-down, whilst a Change Laboratory is designed as a bottom-up intervention. Initially, participants were reticent in their participation, with students deferring to faculty in turn-taking and opinion building. However, as sessions have progressed there is evidence of a subtle change in agency as the participants become co-designers of the new model. This will be something to examine in more detail as the Change Laboratory progresses. An initial draft of the current activity system and contradictions can be seen in Figure 1.

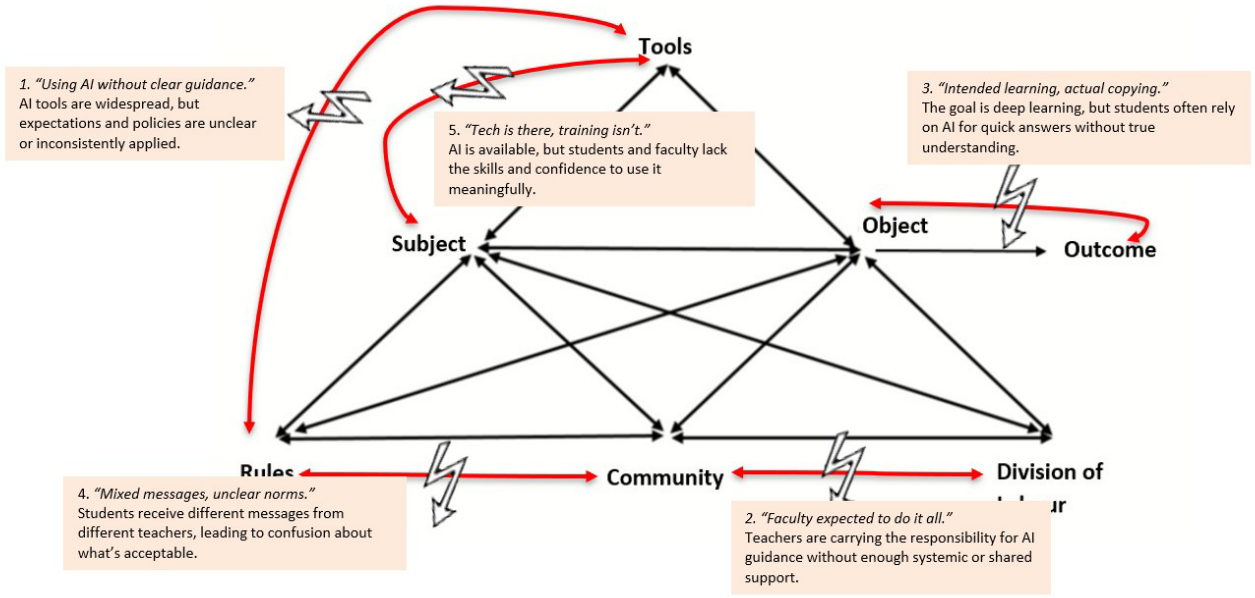

Figure 1 Initial draft of the current activity system

Potential solutions to these contradictions have been mapped to a future model. This will form the basis of upcoming Change Laboratory sessions. Note that in the proposed new model students intend to co-develop new practices and guidelines. See Figure 2.

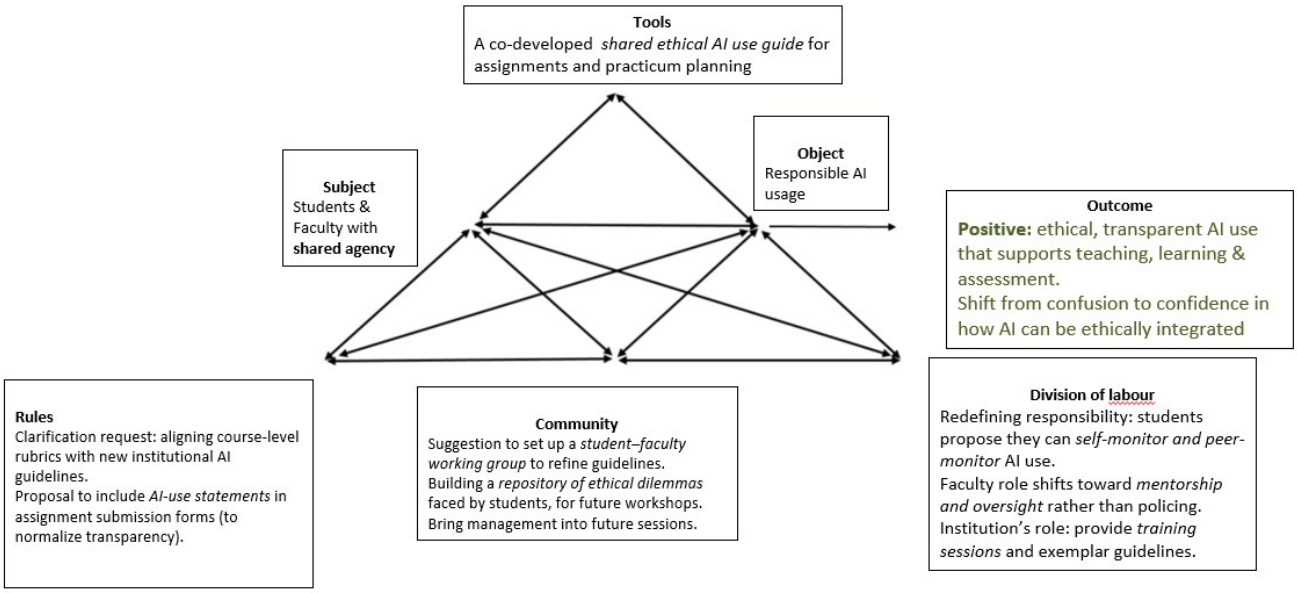

Figure 2 An emerging new model

Discussion

This study contributes to ISCAR 2025's themes in several ways:

- Equity and Peace: It engages pre-service educators as co-creators of policy and addresses power asymmetries in institutional decision-making.
- Sustainability: The guidelines developed will support responsible, long-term AI integration in higher education contexts.
- Theoretical and Methodological Advances: The project extends Change Laboratory methodology by adapting an online modality through Microsoft Teams.
- Changing Practices: It provides a structured model for cultivating collective transformative agency in response to emerging technologies.

There are limitations. This is a small-scale sample, but depth is I believe more important than breadth for the context of this project. Note that in future sessions both management and those at policy-making levels will be included to broaden the sample. Similarly, while the online delivery mode could be viewed as a limitation as there is the potential for less interaction, it is also a methodological contribution as it facilitates attendance when participants are in different locations, addresses cultural issues around being recorded, and makes transcription of meetings instantaneous.

Conclusion

Three sessions have taken place, leading to the initial identification of contradictions, and the process of modelling solutions has begun. Future sessions will continue the expansive learning cycle, focusing on modelling solutions and co-creating ethical AI usage guidelines. Other stakeholders, such as management and policymakers, will also be included as participants. This Change Laboratory intervention has the potential to create tangible improvements in practice within the UAE educational context while also offering a replicable framework for participatory AI guideline development across higher education.

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Teachers Fighting for Dignified Homes for their Students: A Case for a Politicized Sustainability Education

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Abstract: This paper examines the pedagogical and political dimensions of teachers' collective resistance to housing evictions in an impoverished municipality in Catalonia. Drawing on a two-years ethnography, it follows a group of teachers who, working in conditions of professional and territorial precarity, have mobilized to protect their students' right to housing. Their grassroots organizing has helped spark a broader movement of educators confronting evictions as structural barriers to education. Using insights from Cultural- Historical Activity Theory and affective scholarship, we argue that these teachers enact a form of sustainable schooling rooted in relational care, solidarity, and resistance. The study contributes to rethinking sustainability education beyond behavioural change frameworks, foregrounding environmental justice and the material conditions that sustain learning. The work positions the teachers' committed fight as a precondition for dignified, transformative learning in the context of ongoing socio-ecological crises.

Keywords: Sustainability Education; Social Justice; Ethnography; Teachers' Role.

Introduction

This paper explores how teachers' grassroots resistance to housing evictions in a marginalized municipality in Catalonia, opens up new conceptual and empirical possibilities for sustainability education. Drawing on two years of ethnographic fieldwork, we document how a group of public school teachers, working in precarious employment conditions themselves, have mobilized to confront housing insecurity affecting their students and their students' families. In doing so, these educators enact a pedagogy that not only protects the right to education but also affirms the right to a dignified life. This activism has inspired a broader social movement of teachers in Catalonia, bringing housing justice to the centre of educational concerns.

Sustainability education is often conceived through technical, cognitive, or behavioural lenses—emphasizing individual action, eco-efficiency, and ecological literacy. However, such framings frequently neglect the structural injustices and relational dynamics that condition the possibilities of education in the first place. Such structural injustices include inequal access to housing and gentrification, adding to the complexities that migrating populations face. Our work seeks to reframe sustainability education by foregrounding the material and affective conditions of schooling, the politics of care, and the spatial injustices that define everyday life in contexts of urban precarity. In line with calls to repoliticise environmental education (e.g., Kopnina, 2020; Svarstad et al., 2023), we show how the work of these teachers constitutes a form of sustainability pedagogy grounded in struggle, solidarity, and transformative care that can inform sustainability education at large.

Theorical framework: a critical cultural-historical perspective

Theoretically, we draw on Cultural-Historical Activity Theory (CHAT) to understand how teachers' practices develop in and against systemic contradictions. We conceptualize the teachers' movement as a historically and culturally situated response to tensions between the official role of the teacher and

the lived reality of working in spaces marked by inequality and housing instability, which makes the students' engagement with schooling difficult. Hence, a contradiction exists between current curricular means, norms and expectations about their role as educators, and their lived sense of their craft as one involving caring for and protecting their students' right to education. CHAT's emphasis on contradictions as sources of change (Engeström & Pyörälä, 2021) allows us to see how teachers reconfigure the objects and motives of their work—moving from curriculum delivery to collective action in defence of students' rights. As Butler (2015) puts it, "human action depends upon all sorts of supports – it is an always supported action (…) We cannot act without supports, and yet we must struggle for the supports that allow us to act" (p. 72).

We also engage with the concept of affective contextures (Guarrasi & Jornet, 2025) to examine how these teachers build networks of support that sustain not only their students but also each other in and through their everyday teaching and activist practice. These affective and material entanglements, we argue, are central to the relational infrastructure of sustainable schooling. As in nursing and other forms of feminized care labor (Fraser, 2022; Tronto, 1993), teachers' informal and affectively charged practices fill gaps left by institutional abandonment. However, these practices are not merely compensatory: they prefigure more just and sustainable futures by politicizing care and resisting the isolation and responsibilization typical of neoliberal governance.

Data and methods

We draw on materials gathered throughout over two years (from 2023 to the present) of participatory ethnography (Jornet, 2023) in an impoverished neighbourhood in Catalonia (Spain) with a high index of risk of severe child poverty and with a high rate of immigrant population. Data include videorecordings of three educators' assemblies; four demonstrations in the streets in which the teachers participate along students, neighbours and other associations; and 11 interviews (seven with teachers and 4 with students (14-25 years old). We conduct a narrative analysis of the case (Brandell & Varkas, 2011), seeking to identify emerging biographical accounts of the teacher's involvement in the movement and how these accounts include contradictions.

Findings: A narrative case study of the teachers' fight.

In the context of a growing housing crisis, in September 2024, schools in the focus neighbourhood begin a new school year experiencing over one eviction per week, as the teachers complain during one of their assemblies. Faced with the critical situation that affects a big number of the students, some of the teachers and other administrative staff from the schools, including principals, had recently organized with the common feeling that "something must be done" (Teacher, 2025). Inspired by other movements such as that organized by the local Housing Union, a first open assembly was organised in which all primary and secondary schools, as well as other organisations and institutions working in Salt, were invited, with most of them having attended. Although led by the teachers, their movement begins as already embedded in an ecology of local collaborations concerned with social justice issues related to housing inequalities.

Following that first assembly, a manifesto was drafted in which teachers and school staff constituted as a group of educators against evictions, including in the name a reference to the postal code of the district in which the educators work. In a very short time, replicas of this group began to appear in many other districts of Catalonia, each one marked by the postal code of a given area, making plain

that this was and is not a problem endemic to the neighbourhood where the movement begun but, on the contrary, is the effect of global neoliberal governance.

As the movement begins to organise actions, some of them involving public demonstrations and attempts to block actual evictions, the educators begin to face challenges that bring tensions between their felt responsibility and the institutional mandates as regulated by teaching schedules and teaching curricula. In addressing these tensions, their engagement with the housing crisis begins to be lived not as supplementary to their pedagogical role, but as something intrinsic to their sense of what it means to educate in a context of crisis. That is, the struggle against eviction is experienced not as activism adjacent to education, but as a basic defence of the conditions that make education possible in the first place. In this, our findings echo and extend previous work on "sustainable schooling" in contexts of extreme poverty and environmental degradation (Bussi, 2022b; Bussi & Grinberg, 2023a), where teachers do not just teach sustainability as content—they live it as a continuous and collective effort to hold together the fragile infrastructures of learning through schooling. By situating housing as a matter of environmental justice, and eviction as a process of systemic environmental violence, the teachers in our case enact a politics that confronts the uneven geography of environmental injustices—which include the inequal access to basic housing conditions and hence also to education. Their organizing draws attention to the ways in which the capacity to learn, care, and envision a future is unevenly distributed and materially conditioned as well—all of which are core elements to education for sustainability (Tasquier et al., 2022), because, as a teacher said in a big housing demostration in Barcelona: " the right to quality education cannot be separated from either the social situation or the vital situation of the students" (Teacher, 2025).

The school becomes, in this context, a place of convergence where urban precarity, teacher exhaustion, and student vulnerability meet. Yet, it is also a site of possibility, where the role of the teacher is reimagined in affective, collective, and insurgent terms (see also Guarrasi & Jornet, 2025). Such forms of "pedagogical sustenance" (Bussi et al., 2025; 2023b) contrast with depoliticised notions of resilience and instead reflect an everyday politics of emplacement, protection, and care. This approach resonates with feminist political ecology and recent critiques of the Sustainable Development Goals (SDGs), which often obscure the unequal burdens and responsibilities of environmental crisis (Sultana, 2022; Bylund et al., 2021).

We argue that these teachers model a different kind of sustainability education—one that is not about individual attitude change but about collective, activist confrontation with the forces that make life and learning more precarious. This aligns with broader efforts to reconceptualize sustainability as a situated and relational process rather than a fixed goal or set of competencies (Moriggi et al., 2020), and with agency notions in CHAT (Stetsenko, 2020). Through their actions, these educators expand the ethical and political horizons of what sustainability education can be—not a curriculum, but a collective practice of staying with the trouble (Haraway, 2016) of our times.

Conclusions

In conclusion, this paper offers three contributions. First, it documents an underexplored case of teacher-led housing activism and its pedagogical implications. Second, it expands the conceptual vocabulary of sustainability education by integrating insights from CHAT and affective-relational scholarship. Third, it affirms the importance of ethnographic approaches for grounding sustainability discourse in the lived struggles of those working at the frontlines of socio-ecological crisis. In places

like the ones documented in this study, sustainable schooling does not begin with green practices but with the defense of the material conditions that allow life—and learning—to continue.

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Teaching-learning of social-emotional skills to children and adolescents with visual impairments: from theory to practice

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Abstract: Socio-emotional skills (SESs) – the abilities to process social cues, regulate emotions, and engage in social interactions – are typically acquired implicitly through observation and imitation. Although SESs originate outside the framework of Cultural-Historical Activity Theory (CHAT), CHAT and the Vygotskian approach to special education provide valuable lenses for rethinking SESs development in children and adolescents with visual impairments (VI). As SESs acquisition relies heavily on visual and socio-cognitive systems, individuals with VI may face challenges that affect peer relationships, increase adult dependency, and limit social participation. Nevertheless, children and adolescents with VI can develop SESs through compensatory strategies and mediated learning experiences. This presentation therefore has three objectives: first, to explore the relationship between SESs and VI; second, to propose a general theory of teaching-learning of SESs incorporating CHAT concepts such as *perezhivanie*, mediation and the social situation of development; and third, to present assessment tools, teaching-learning strategies and the Visual Impairment – Social Emotional Learning (VI-SEL) curriculum.

Keywords: teaching-learning, social-emotional skills, visual impairments, social-emotional learning, special education

Extended Abstract

Social-emotional skills (SESs) are fundamental to effective social interactions, developing and maintaining friendships, and fostering a sense of belonging in social situations (Beauchamp & Anderson, 2010; Soto-Icaza et al., 2015). These skills include processing social information (e.g., recognizing others' emotions) and adapting behaviours to interact effectively in different social situations (e.g., with peers and teachers in class or with parents at home; Beauchamp & Anderson, 2010). SESs development is influenced by social situations and the maturation of key systems, including the sensory system (e.g., eye and face detection and gaze tracking), motor system (e.g., basic imitation and triadic interactions) and socio-cognitive system (e.g., emotion recognition, joint attention, inner speech, and theory of mind; Fernyhough, 2008; Soto-Icaza et al., 2015). Within these social situations, SESs are learned through observing and imitating peers and adults in emotionally meaningful interactions. These learning processes are mediated by sensory experience and cultural tools such as language, symbols, and signs (Bøttcher & Dammeyer, 2016; Vygotsky et al., 1929/1993).

Children and adolescents with visual impairments (VI) often face challenges in acquiring SESs, due to limited access to visual cues (e.g. facial expressions, gestures, and eye contact) and barriers within social situations (e.g., noisy classrooms that hinder auditory emotion recognition; Pérez Pereira & Conti-Ramsden, 2020; Roe &

Webster, 2002). Many develop compensatory strategies to navigate these challenges, reflecting both individual adaptation and cultural mediation (Pérez Pereira & Conti-Ramsden, 2020; Vygotsky et al., 1929/1993). Developmental difficulties observed in this population include impairments in joint attention (Tadić et al., 2009; Urqueta Alfaro et al., 2018), emotion recognition (Dyck et al., 2004; Minter et al., 1991), emotion regulation (Chennaz et al., 2022), and theory of mind (Brambring & Asbrock, 2010; Green et al., 2004). However, these impairments often diminish over time (Peterson et al., 2000). Stereotypical behaviours are common (Molloy & Rowe, 2011) and may serve functions such as emotion regulation and gathering environmental cues (Galiano et al., 2024; Molinaro et al., 2020). Other sensory modalities, including auditory and kinaesthetic cues (e.g., sound variations, air currents and echolocation), can support social understanding (Battich et al., 2020). Practitioners must reframe these behaviours and strategies, for example, recognising that that stillness in blind children may reflect attention rather than disengagement (van Eijden et al., 2023). In school-age, difficulties are often observed in peer interactions (Celeste, 2006), pragmatic communication (James & Stojanovik, 2007; Pijnacker et al., 2012), and social problem-solving (McAlpine & Moore, 1995). This can result in smaller social networks and greater loneliness during adolescence (Huurre & Aro, 2000; Kroksmark & Nordell, 2001). Consequently, research advocates for the explicit assessment and teaching of SESs, promoting positive social experiences, and the provision of developmentally appropriate scaffolding without over-support (Roe, 2019; Sacks, 2014; Sacks & Page, 2017).

Although SESs are not originally conceptualized within the framework of Cultural-Historical Activity Theory (CHAT), this theory and the Vygotskian approach to special education offer a valuable foundation on which to develop a general theory of teaching-learning of SESs for students with VI (Bøttcher & Dammeyer, 2016; Vygotsky et al., 1929/1993). Four core principles underpin this approach. Firstly, the primacy of the person over the impairment, meaning that practitioners should focus on the child's cognitive and behavioural responses rather than on the impairment itself (Vygotsky et al., 1929/1993). Secondly, the recognition of alternative developmental pathways, meaning that the development of a child with VI is not simply delayed, but follows a different trajectory (Vygotsky et al., 1929/1993). Thirdly, the dual role of impairment is recognized, meaning that, while it introduces limitations, it can also encourage development by presenting unique challenges (Vygotsky et al., 1929/1993). Fourthly, compensation through cultural mediation is key, not to correct the impairment itself, but to address the difficulties it generates. Practitioners therefore have the role of identifying and using "a different symbolic system which maintains the same content as any other instructional or educational process" (Vygotsky et al., 1929/1993, p. 85). The effectiveness of compensation depends on how well the compensatory strategies provided by social situations align with the severity of the child's VI, thereby overcoming any incongruence. From this perspective, development complicated by an impairment is always a creative process, in which practitioners participate by providing compensatory strategies and teaching-learning social situations tailored to each child (Vygotsky et al., 1929/1993). These principles are closely linked to the concept of *perezhivanie*, which refers to the child's lived emotional experience of a social situation. *Perezhivanie* offers an understanding of how children with VI interpret and internalize emotionally significant interactions, thereby influencing their developmental trajectories (Marchand et al., 2023).

From a practical standpoint, the following recommendations can be made. Firstly, a comprehensive assessment of SESs should integrate scientifically validated tools (e.g. the SSIS-SEL RFs; Elliott & Gresham, 2021) alongside instruments specifically designed for children and adolescents with VI (e.g., SCA and SSAT-VI: R; Loumiet & Levack, 1992; Sacks, 2014). Secondly, informal learning opportunities (e.g., daily routines, playtime, extracurricular activities) should be utilized, as well as explicit teaching of SESs through small-group or individual interventions using evidence-based strategies (e.g., role-playing, audiodescription, audiovisual methods, peer mediation, mentoring; Sacks & Page, 2017). One such applied resource is the Visual Impairment–Social Emotional Learning Curriculum (VI-SEL; Barras et al., 2025) – a ten-lesson Social Emotional Learning program for children with VI aged 6 to 12 – may offer a useful resource for practitioners. The VI-SEL curriculum offers a concrete application of the theoretical framework outlined here. By operationalizing CHAT and the Vygotskian

approach to special education, the VI-SEL curriculum supports the development of SESs through emotionally meaningful, culturally mediated, and individually adapted social situations that position children with VI as active participants in their own development.

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Exploring Nature-Based Solutions through the exploitation of educational robotics, Artificial Intelligence, Augumented Reality and 3Dimensional activities in the sustainable kindergarten

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Abstract: The present study focuses on the creative approach of the Sustainable Development Goals (SDGs) by preschool students in the context of their participation in the innovative educational project entitled "Nature Based Solutions EduWorld" which recognizes the importance of educating future generations about NBS and their potential to solve environmental and societal problems. Based on the Activity Theory, the specific concern of this project is the expansion of the learning environment outside the classroom. During the design and the implementation phase, action research and field research are applied, while the socio-cultural approach to the teaching of STEAM education is mobilized as methodological tool. In this context, parents, local authorities and community are implicated in the action planning and materialization of activities. The research framework is completed with the process of the overall evaluation and dissemination of the learning results to the educational and extended community.

Keywords: Sustainable development, STEAM Education, Artificial Intelligence, Early childhood education

Introduction

In recent years, there has been an increasing focus on the application of innovative methods in the early childhood learning process. The present research focuses on the approach of selective goals of education for sustainability by preschool students in the context of their participation in the Nature-Based Solutions (NBS) EduWORLD project which empowers students to become engaged citizens in shaping sustainability solutions.

This effort uses as theoretical framework the principal element of Cultural Historical Activity Theory (CHAT). Based on the Activity Theory and the belief that learning is the result of interaction, the natural, social and cultural environment is utilized as an important and primary source of knowledge. In this context, the organized learning process includes formal, non-formal and informal types of education.

The dominant concern and the main purpose of this study is to investigate the existence of a positive correlation between the utilization of STEAM education, robotics, artificial intelligence, augmented reality and three dimensional activities as mediating tools, with the effective approach of selective goals of education for sustainability, the encouragement of active citizenship of young students and the transformation of the school into NBS living Lab and an innovation hub for the green transition.

The progress of the study includes qualitative and quantitative collection data methods, such as semi-structured interviews and questionnaires, researchers' field notes, participatory and non-participatory observation. The research framework is completed with the evaluation and dissemination of the learning outcomes to the local and extended community.

Theoretical background

According to the notion of development as a dialectical movement and interdependency between the individual mind and the surrounding world (Vygotsky, 1978), the theoretical framework of this research is based on the principal element of Cultural Historical Activity Theory (CHAT) and the belief that learning is the result of interaction (Topoliati, 2023). In this context, the planned activities are structured according to the principal components of the triangle model of CHAT theory (As seen in Figure 1), including the Subject, the Object, the Mediating and Methodological tools the Rules, the Community, the Division of Labor and the Outcomes of the activity system adapted from Engeström (1987).

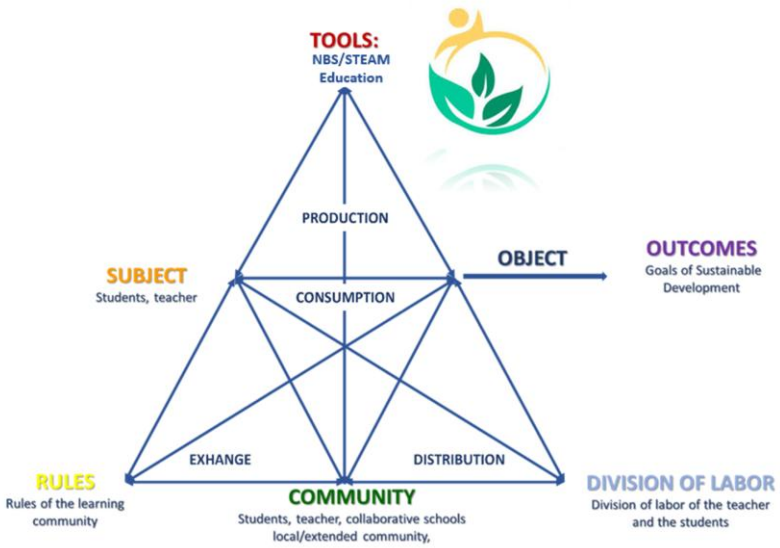

Figure 1. Triangle model analysis of CHAT theory (Engeström, 1987)

Methodology

During the planning and implementation phase is applied action research (Cohen L. – Manion L., 1994), while the socio-cultural approach of STEAM education and the conceptual framework of NBS EduWORLD project are mobilized as methodological tools.

In the developmental phase, proposed and collaborative activities are submitted by the pedagogical team through brainstorming and democratic procedures (Topoliati, 2015). It is worth to be mentioned that parents, local authorities and community are implicated in the action planning and materialization of activities.

In this context the school is seen as:

- a *living lab* for knowledge exchange that develops partnerships, co-designs and co-creates with society.
- a *sustainable learning environment*, a 'learning building' for experimentation, problem-solving and scope of initiatives.
- a *place to apply learning methods* that promote the development of green competences and shape the citizens of tomorrow
- an *innovation hub* for the study, application, and dissemination of NBS to enhance sustainability and address the challenges of the 21st century (NBS, 2023).

Results

In the empirical part, the "Little Creative Scientists" discover Earth planet through augmented reality and artificial intelligence activities (AR Solar System, MetAClass). Especially, the students are focused on the experiential study of the flora and fauna of their local area through the exploitation of artificial intelligence applications (such as Seek by i-Naturalist). In this context, are organized and implemented outdoor expeditions and field trips that immerse participants in natural environments to enable firsthand interactions with ecosystems and fostering a deep appreciation for nature (NBS) (Figure 2).

Figure 2. Experiential study of the flora and fauna of their local area

Additionally, students identify the absence of a composter from their school building. Exploiting the implementation of “flipped classroom” activities, the children design 3D models of composters in the Tinkercad platform with the support of their parents. Subsequently, their creations are shared in the classroom and promoted to the local authorities as a request with a proposed solution to the problem. Students’ effort is completed successfully with the installation of a composter in the school yard (Figure 3).

Figure 3. Installation of a composter in the School yard

Finally, children share their work, learn from one another, inspire others to adopt NBS approaches and participate in the STEM Discovery Campaign (SDC). The SDC is an annual campaign organised by Scientix cpmmunity with the support of partner organisations that recognizes and rewards outstanding projects, highlighting best practices, and promoting further integration of Science, Technology, Engineering and Mathematics (STEM) and NBS in formal education (NBS, 2023).

Conclusion

According to the results that are collected through qualitative and quantitative data methods, STEAM education and Nature Based Solutions are introduced as powerful and flexible mediating tools that involve students actively in the learning modules of sustainable education. It is essential to note that through the implementation of this innovative project, students are empowered to become engaged citizens and active change-makers in shaping sustainability solutions. Simultaneously, children learn to work in teams, to communicate and collaborate effectively.

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Generative Artificial Intelligence in Education: Navigating Contradictions to Support Creativity

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Abstract: *The availability of generative artificial intelligence (GenAI) in education brings to the surface historically accumulated and newly emerging contradictions within teachers' activity. These contradictions, which appear in the relations among mediating artefacts, rules, division of labour, and the collective object of teaching and learning, unsettle established forms of professional agency and pedagogical creativity. Drawing on Cultural-Historical Activity Theory (CHAT), this study investigates how GenAI functions as a transformative mediational means that reconfigures the dynamics of educational activity systems. Instead of treating emerging tensions as problems that require technical correction, we conceptualize them as generative contradictions that can initiate processes of expansive learning. Focusing on didactic creativity and co-creativity, we analyse how teachers can enrich and reconceptualize their professional practice when they collectively examine, negotiate, and re-mediate AI technologies in concrete learning situations. In line with the tradition of formative interventions, we argue that supporting educators in critically engaging with these contradictions can foster a shift from adaptation toward dialogical and transformative reorientation of their activity in the context of GenAI.*

Keywords*: Creative Agency, Teacher Education, Generative Artificial Intelligence, Formative Interventions*

Generative artificial intelligence (GenAI) is increasingly present in educational environments, and its integration participates in the reconfiguration of pedagogical practices, knowledge production, and professional agency. As GenAI becomes embedded in everyday teaching activities, it reorients the mediational structure through which teachers and learners pursue their object of activity. This integration often introduces contradictions within teaching and learning activity systems (Uden & Ching, 2024). In Cultural-Historical Activity Theory (CHAT), contradictions are understood as historically accumulated tensions that reveal limitations of the existing activity system. They are not merely obstacles but dynamic forces that drive qualitative transformation (Engeström et al., 2024). When GenAI is introduced into education, it can give rise to contradictions of the second order, especially those that arise between new instruments, such as AI tools, and pre-existing norms, including educational values, assessment protocols, and institutional expectations. Tensions may also emerge between pressures for technological innovation and ethical commitments to autonomy, reflexivity, and the cultivation of learner agency. These tensions create opportunities for formative interventions that can support expansive learning and enable the reconfiguration of the object of activity from knowledge transmission toward the development of critical, creative forms of agency within complex digital contexts.

At the centre of this reconfiguration lies the concept of creativity. From a sociocultural perspective, creativity is not conceived as an individual attribute. It is understood as a situated and relational process shaped by the cultural, historical, and material conditions of activity. From a didactic perspective, creativity refers to teachers' capacity to transform curricular constraints and available resources into innovative and context-sensitive pedagogical scenarios (Anderson et al., 2022; Terzidis, 2023). From a CHAT perspective, co-creativity is a

collective process that involves participants in negotiating the object of activity and generating new possibilities for action. It supports expansive learning by enabling participants to identify and work through contradictions, co-construct new meanings, and collaboratively transform the activity system itself (Isaac et al., 2022; Romero & Barma, 2024). Seen in this way, creativity is inseparable from the developmental contradictions that shape educational practices.

Teachers may experience a contradiction between the efficiency promised by GenAI and their aspiration to maintain reflective, agentive, and learner-centered practices (Frøsig & Romero, 2024; Lan & Chen, 2024). This contradiction reflects a deeper tension that has long been present in education. It involves the coexistence of pressures to automate and standardize educational tasks and the profession's humanistic (Ellis et al., 2010) and creative (Urmeneta & Romero, 2025) orientation. In this context, the repoliticization of creativity becomes essential. Creativity cannot be treated as supplementary or decorative. It must be understood as a lever for professional agency and pedagogical transformation. It enables teachers to question dominant technological narratives, reclaim authorship over their professional decisions, and cultivate learner agency. From a CHAT perspective, creativity is always emergent within a system of activity shaped by collective tensions, historical trajectories, and cultural expectations.

The #ppAI6 framework, which conceptualizes levels of creative engagement with generative AI in education (Romero, 2024; 2025). These levels range from passive consumption of AI outputs to forms of expansive learning supported through sustained engagement with AI. At the highest level of the #ppAI6 model, GenAI operates as a collaborative partner in the production of new conceptual, pedagogical, and material artifacts capable of addressing complex challenges within educational activity systems. At this level, practitioners work to identify systemic contradictions and initiate expansive learning processes. Within this perspective, AI does not replace teacher agency. Instead, it becomes a mediational means through which that agency can be expressed, expanded, and reorganized.

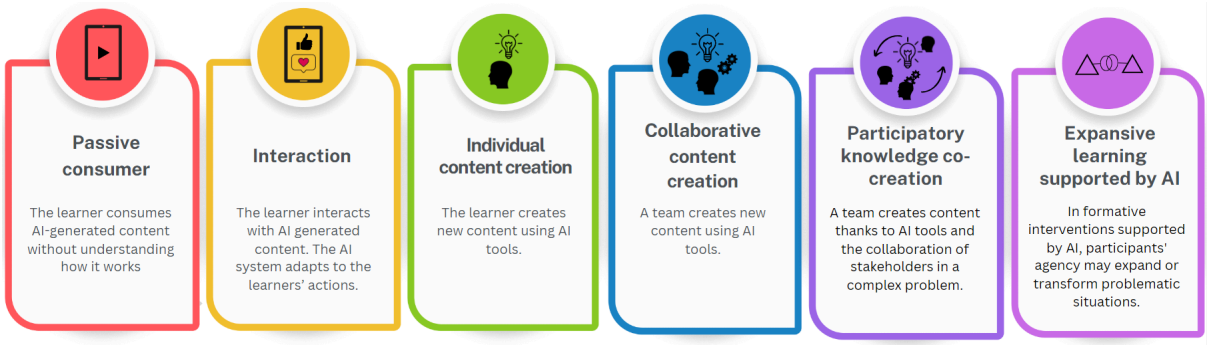

Figure 1 Six levels of creative engagement with generative AI (GenAI) in education

Formative interventions that are grounded in this approach do not aim to provide prescriptive or technical solutions. Instead, they aim to create dialogic spaces in which participants can surface, explore, and address systemic contradictions. Such interventions may include collaborative scenario-building, collective analysis of real or simulated classroom practices, and reflective engagement with AI-generated artifacts. The central purpose is to support a shift from training that focuses primarily on the operational use of tools toward forms of professional development that cultivate critical, reflective, and creative engagement with GenAI. In doing so, these interventions contribute to the development of teaching and learning activities that are more responsive to the complexity of contemporary educational contexts.

This study focuses on pre-service teacher education and investigates how formative interventions can support the development of co-creative practices involving GenAI. We analyze the experiences of three groups of

pre-service teachers (n=59) who participated in a series of formative interventions informed by Cultural-Historical Activity Theory. The analysis emphasizes the manifestation of contradictions observed throughout the intervention process as well as the characteristics of the artifacts that participants developed through the use of GenAI. Particular attention is given to how participants identified tensions, negotiated new meanings, and reconfigured the object of their collaborative activity.

The findings indicate that formative interventions guided by CHAT can reconceptualize the integration of GenAI as a dialogical and transformative process rather than a technical adjustment aimed at increasing efficiency. Through the identification and negotiation of contradictions within educational activity systems, creativity emerges as a collective resource through which teacher agency can be reclaimed and expanded. Ultimately, this process contributes to the reorientation of education toward more meaningful, ethical, and emancipatory goals that align with sociocultural and activity-theoretical perspectives on learning and development.

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Artificial Intelligence among us: From Theory to Action

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Abstract: This study examines the transition from theoretical understanding to practical AI use in education, highlighting advances in data processing, pedagogy, ethics, and inclusion, through Cultural-Historical Activity Theory (CHAT). Within the APLICA Project, two teacher training programs in Mallorca and Esplugues de Llobregat—guided by the UNESCO AI Competency and Policy Frameworks, and Universal Design for Learning (UDL)—were compared using a mixed-methods approach. Findings show significant post-training gains in large language model (LLM) use, perceived benefits for inclusion and personalization, and greater diversity of AI tools, demonstrating that integrated, theory-driven training can enhance technical skills and foster ethical, critical engagement, promoting pedagogical transformation.

Keywords: Artificial Intelligence, Science Education, Activity Theory, Aplica project

Introduction

In an era where artificial intelligence (AI) has become an integral part of our daily lives, educational institutions face the unprecedented challenge of preparing learners for an AI-augmented world. AI adoption in education raises ethical dilemmas such as algorithmic bias, digital equity, and evolving human–machine learning relationships. This paper proposes a values-centered AI integration approach prioritizing collaborative learning and humanistic culture.

The authors outline a progressive framework for AI integration across educational tiers, beginning with foundational AI literacy and advancing toward sophisticated meta-reflection (Gallon, 2024). They present evidence-based strategies for developing computational thinking through project-based AI applications, fostering technical competence, critical evaluation skills, and professional development on ethics and global citizenship. This approach emphasizes the importance of interdisciplinary teaching methodologies that situate AI within broader societal contexts rather than isolated technical domains.

They study the APLICA Project for training teachers in Catalonia, to bridge theory and practice. A series of actionable initiatives is outlined, designed to promote participatory citizenship in an AI-influenced society. These include community data deliberation forums where stakeholders collectively establish ethical guidelines for AI use in local educational contexts; cross-generational AI design workshops that engage diverse participants in developing inclusive technological solutions; and inclusive educational AI activities that enable learners to explore complex dilemmas through experiential learning.

Theoretical Frameworks

Cultural-Historical Activity Theory (CHAT) serves as an interdisciplinary philosophical framework for analyzing individual behavior and social responses (Engeström, 2015). In educational contexts, CHAT elucidates how AI adoption is mediated by cultural tools, institutional rules, and community roles through dynamic interactions that shape pedagogical practices. AI tools – including chatbots, image and video AI generative tools, adaptive learning

platforms, and data analytics – function as mediating artifacts influencing the relationship between subjects (teachers/students) and objects (learning outcomes/professional competencies). CHAT reveals how AI integration transforms traditional pedagogical practices, redistributes educational community roles, and generates tensions or contradictions that drive innovation and change (Kaptelinin & Nardi, 2009).

UNESCO has developed three complementary frameworks: the *AI Competency Framework for Students* (Miao et al., 2024), the *AI Competency Framework for Teachers* (Miao & Cukurova, 2024), and *AI and Education: Guidance for Policy-Makers* (Miao et al., 2021). They emphasize ethical, inclusive, human-centered AI principles, promoting transparency, fairness, and digital literacy development consistent with CHAT principles. The competency frameworks focus on pedagogical applications and educator empowerment as AI-enhanced learning facilitators, and the policy framework prioritizes systemic governance, data stewardship, and evidence-based regulation for scaled AI deployment. Collectively, they establish a multi-level theoretical foundation positioning AI as both pedagogical tool and socio-technical system requiring coordinated oversight.

The authors have developed an approach that combines the United Nations Sustainable Development Goals (SDG's) (United Nations, 2015) and UNESCO competency frameworks for AI, with the trans-disciplinary systematic perspective that drives CHAT. This approach is based on a simple idea: Just as it is impossible to separate learning about brush techniques or pigment mixing from aesthetics or chromatic composition when learning to paint, it is impossible to use AI-assisted learning without learning at the same time, in a totally integrated way, about AI technology, how it works, where it is best applied, and when it is most convenient, sustainable, and ethical to use other tools.

These ideas lead to the development of three intertwined, essential and inseparable aspects of AI in education (Gallon, 2024; Ouyang & Jiao, 2021):

- AI literacy – learning about AI and how it works (technology, algorithms, process).
- AI-assisted learning – using AI for learning, developing strategies and practices in different disciplines, evaluated against predefined quality criteria.
- Co-creation with AI – collaborating with AI to create new knowledge and build knowledge structures according to ethical principles and criteria for multi-sectorial application.

These three areas also align with the revised Technological Pedagogical Content Knowledge (TPACK) model (Mishra, 2019) and with the integrated incorporation of AI in education based on the personalization defended by Universal Design for Learning (UDL) (CAST, 2018).

These principles inform the attitudinal analysis toward AI in training experiences elaborated here, under the APLICA project, designed by the Catalan Society of Pedagogy (Lorenzo Galés, 2023). Trainings were given at the University of the Balearic Islands, Mallorca (for a group combining professional teacher educators and law professors) and at the Escola Isabel de Villena, in Esplugues de Llobregat, near Barcelona (for primary and secondary school teachers). This provided a comparison of perceptions and readiness across different educational publics and contexts.

Methodology

The study in this article is a comparative evaluation of the impact of an AI teacher training program, aiming to identify participants' increase in AI literacy, evolution of collaborative practices, and attitudes toward AI in education.

Research design

A pre–post quasi-experimental design was used to compare qualitative and quantitative data, inside each cohort and between training groups, addressing three analytical dimensions that correlates with the already mentioned Ouyang & Jiao (2021) paradigms, and echoes the UDL principles for personalization:

- Initial knowledge and practice: introductory theoretical modules and demonstrations of AI tools in the classroom (UNESCO's AI competencies, evaluated on a Likert scale).
- Engagement in collaborative activities. Planning and designing school-level AI integration plans, and negotiating digital policy through collaborative processes. Co-creation of six "Decalogues" for AI use, evaluated via mixed methods using coherence, clarity, relevance, and academic criteria, with a consensus index (0–1) for thematic overlap.
- Meta-reflection and attitudinal transformation, measured via the Content Validity Ratio (Lawshe, 1975) to determine essentiality of items related to learning progress, strategy reflection, and role transformation. Awareness and hands-on educational activities, using AI tools in teaching and learning for wellbeing, better learning and transforming roles, based on SDG's.

Guides and resources provided during the training sessions aimed to integrate the policy-level and competency-level objectives of UNESCO's frameworks with CHAT's systemic view of mediated activity.

CHAT components in the Aplica Project:

- **Subject** = Teachers and Learners
- **Object** = AI literacy & profesional development
- **Artifacts** = AI tools + UDL + UNESCO frameworks
- **Rules** = Ethical principles + dynamics of CHAT elements
- **Community** = Training institutions, schools, universities, policy actors
- **Division of labour** = Roles of teachers, trainers, AI agents and collaborative teams
- **Outcome** = Professional transformation, Educational innovation (attitude evolution, ethical AI integration, inclusive AI pedagogy)

A pre–post attitudinal questionnaire and voluntary collection of AI-based classroom production served as the main evaluation instruments. Ethical protocols were rigorously followed in accordance with the *Standards for Educational and Psychological Testing* (American Educational Research Association, 1999) including informed consent, voluntary participation, and anonymized, aggregated data.

Intervention Overview

The APLICA training involved 92 in-service teachers (30 in Mallorca, 62 in Esplugues). Training combined theoretical modules on AI ethics, governance, and pedagogical integration (aligned with UNESCO), practical workshops on AI tools (e.g., LLMs, adaptive platforms, GenAI for video and analytical research), and collaborative activities for negotiation, role-sharing, and problem-solving (consistent with CHAT).

Next year, the course will be replicated at the University of Andorra, with Univariate Analysis of Variance (ANOVA) planned to compare mean score changes across three territorial contexts and content dimensions (Field, 2024; Tabachnick et al., 2019).

Results

The project produced three key outcomes:

- **Consensus-Building** – participants collaboratively created a negotiated *Decalogue for using AI in education*, refining it using GenAI tools with collective oversight.
- **Shift in Attitudes** – hands-on practical exposure reduced initial resistance, with some teachers moving from fearing cognitive decline to valuing AI for workload reduction and personalized learning.
- **Integration into Practice** – AI tools were embedded into lesson plans and used to co-create materials such as videos, texts, and classroom resources.

Using a convergent mixed methods design (Field, 2024; Tomczak & Tomczak, 2014), quantitative data in pre and post-tests were analyzed with Mann–Whitney U tests, reporting *p* values and rank-biserial correlations (Effect size r_{rb}: 0.1= small, 0.3= moderate, 0.5+= large).

The Mallorca cohort demonstrated measurable increases in self-reported familiarity and use of specific AI tools. Notably, *ChatGPT/Gemini LLMs* showed a statistically significant rise of moderate-to-large effect and *inclusion/personalization benefits (Q9*) also increased significantly. A comparison of pre and post perceptions (Figure 1) reveals interesting movements in attitudes, perceptions and other qualitative data related to risks and benefits of using AI in education:

Pre and post training perceptions of risks and benefits of AI in education

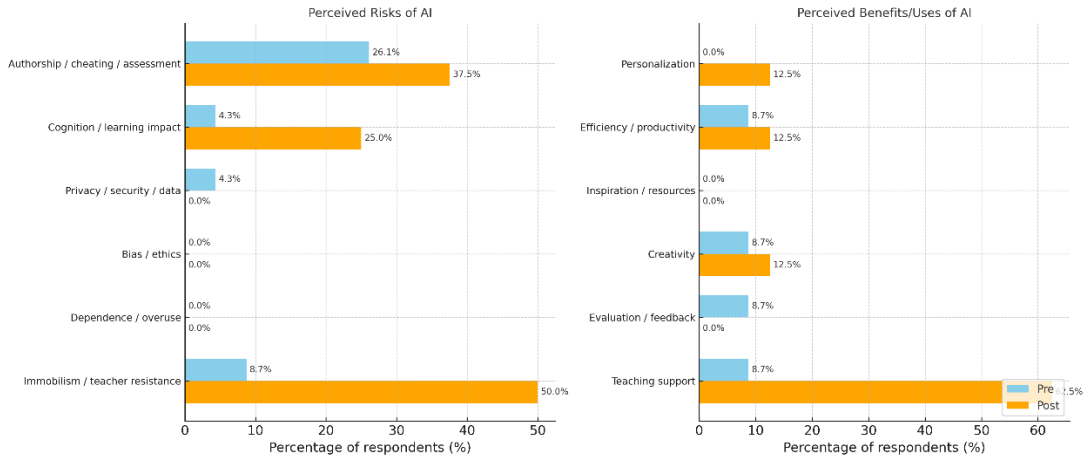

Fig 1. Qualitative analysis, Comparative data pre and post-test, Aplica project, 2025.

Note: the pre and post-test show a significant increase of perceptions of the risk of *teacher resistance*, and *cognition/learning impact*, and an increase of perception of benefits from *personalization* and *teaching support*.

Final Reflections and Conclusion

The APLICA Project employed an integrated theoretical framework combining UDL, CHAT, and UNESCO AI frameworks to examine AI competency development in educational contexts. The project was anchored in ethical principles, governance, and human-centered AI adoption, reflected in curriculum elements on AI ethics, data stewardship, and inclusive pedagogy. Results show Mallorca achieved significant gains in Large Language Model (LLM) use and perceived benefits for inclusion/personalization, plus broader AI tool diversity. Esplugues began with high pedagogical awareness but limited practice in AI, LLM's and digital diversity, suggesting untapped

potential. The findings underscore the need for contextual diagnosis before training and demonstrate that scaffolded, theory-driven approaches can build both technical competence and reflective practice.

These findings indicate that Mallorca's structured, collaborative approach yielded measurable gains in AI tool diversity and attitudinal shifts, while Esplugues' results indicate that awareness alone is insufficient – evolution toward diversified, pedagogically relevant applications is critical. Project results to date emphasize the critical importance of contextual diagnosis and theory-driven design, both at subject and community level, for optimizing training outcomes.

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Maker-STEAM projects and Science Thinking: perspective from the Cultural-Historical Activity Theory (CHAT)

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Abstract: This project shares a proposal for exploring scientific thinking in Mexican secondary school students. It considers a series of Maker-STEAM experiences, whose interactions are strongly related to Cultural-Historical Activity Theory (CHAT), a central axis of analysis for recognizing possibilities in the development of scientific competencies. Based on student contributions, aspects strongly related to tools and signs, division of labour, and ambiguity were identified, which demonstrate the use of scientific principles, experimentation, programming principles, and the development of aspects related to creativity.

Keywords: Maker Education; STEAM Education; Cultural-Historical Activity Theory (CHAT); Science Thinking

Introduction

Today, science education is considered one of the indispensable elements for the development of nations.In her academic and teaching work, she constantly focuses on creating strategies that are relevant to understanding children and adolescents. Mexico's educational reform (Nueva Escuela Mexicana, NEM) suggests incorporating active methodologies to develop curriculum understanding, considering STEAM for the scientific and mathematical fields (Secretaría de Educación Pública, SEP, 2022). A significant element is the use of Maker practices, which involve programming, electronics, and the design of unstructured solutions.

Method

To develop the proposal, the Maker approach (Blikstein, 2013), the Gradual Immersion Method (Sanabria, 2015), and the scientific method were integrated so that participants could move through problem identification, experimentation, verification, and presentation of results (Pech y Romero, 2024, Pech, Pérez, López, 2021; Pech, Sanabria, Romero, 2019). Significantly, an additional exhibition stage was proposed after the familiarization process (figure 1).

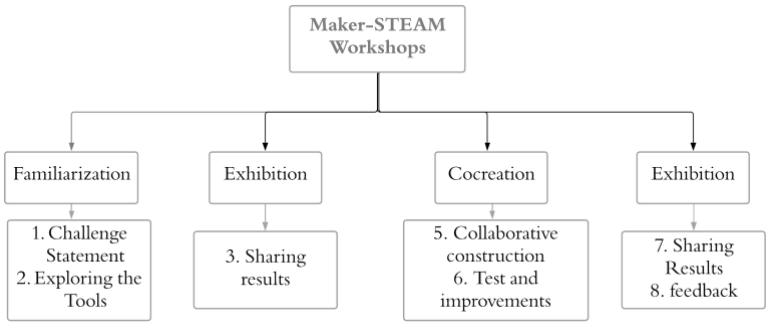

Figure 1. Stages of Maker-STEAM workshops.

With the participation of 24 secondary school students in Mexico, a total of 3 programming and electronics workshops with Arduino were held, wrapped in an interdisciplinary challenge that involved the collaborative construction of a device:

1. Let's Be Technocreative Biologists (Space Sciences and Electrical Circuits); in this workshop a species of biological interest for life on other planets was investigated and co-created usinf basic electrical circuits.

2. Smart Cities (Programming and Actuator Electronics); this workshop explored the programming of actuators in arduino for the automation of smart home elements.

3. S.O.S to the forest (Sensor programming and electronics); this workshop allowed for the programming of sensors such as ligth and temperature, wich were used to build a fire monitor for forests and other ecosystems.

For the analysis of the science and programming experience, it was necessary to build an instrument of open questions, based on CHAT, for which situations were described in which will reflect key aspects of the activities. After analyzing the experiences, considering a case of study, and codification process, the most significant elements associated with Tools and Signs, Ambiguity, the Artifact, and the Division of Labour were selected (Engeström, 1987, 2007b, 2015). These elements were explored with the help of an open-ended questionnaire at the end of each workshop.

Results

From this, aspects that students consider significant were identified, which also, related strongly to scientific competencies. In addition, as a result of analysis of interactions, the first activity system of what was called “Maker-STEAM Ecosystem” is shared (figure 2 and 3).

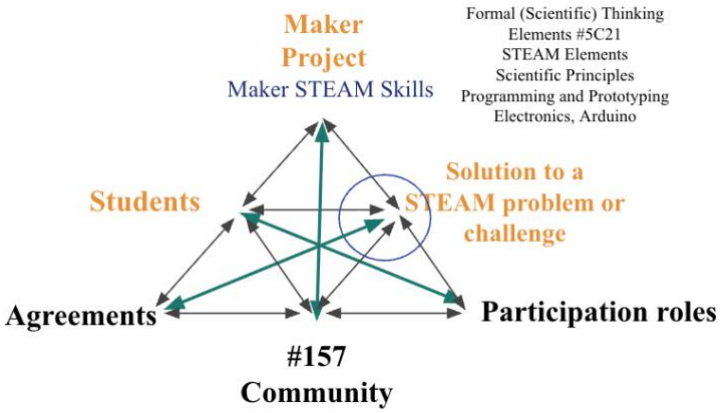

Figure 2. Activity System for the case

Figure 3. Aspects and codes of CHAT analyzed in the proposal

Aspect	Principle	Categories	Maker Experience 1	Maker Experience 2	Maker Experience 3
TA3. Tools and Signs	Scientific principles observed in experience	Skills of the Scientific Method	Scientific method: Experimentation, Research.	Scientific method: Experimentation (circuits, Arduino, actuators, programming), Creation (codes), Observation, organization.	Scientific Method: Experimentation, Trial and Error
		Scientific Concepts	Scientific concepts: electricity, electrical conductors, electrical circuits, animal species, space exploration, prototyping.	Scientific concepts, Electronics, Technology, Electrical circuits and Electricity.	Scientific concepts: global warming, electrical circuits, laws of electrodynamics, sensors.
		Technological Skills	Prototype	Arduino programming and automation	Programming, Electronics, Computing
		21st Century Skills	Creativity, design and use of materials	Creation of the artifact with recycled materials (Cr).	Creation (the maker essence): Creativity, Artifact
TA3. Instrument [Artifact]	The most outstanding features of the project	Functions, Operation	Operation, connections, lights	Functions, programmed in Arduino. Operation of the device (actuators).	Functions/operation of the device: Temperature sensor, Arduino, automation.
		OF, Scientific Hab	Research carried out		Scientific principles involved in the artifact: Species, Temperature.
		Materials	Materials used	Materials, electronics (actuators), recycling.	Materials used in the device: Cables, temperature sensor, Arduino.
		Creativity	Process creativity, design, imagination,	Design and Creativity: The chosen design and the result of the combination (Cr).	

Aspect	Principle	Categories	Maker Experience 1	Maker Experience 2	Maker Experience 3
TA3. Tools and Signs	Scientific skills lived in experience	Experimentation	Experimentation with circuit development and the use of non-conventional conductors (OF).	Experimentation: Programming, connecting circuits	Programming devices and sensors [Experimentation, OF 3]
		Hypothesis Testing	Hypothesis Testing in Electrical Circuits		
		Use of scientific principles	Electrical circuits, conductors and insulators (OF). Development of creativity (Cr)	Use of science-specific language: Programming. Technological skills, computer use, electrical connections Object design	STEAM Principles: Electricity, Species, Circuit Connections, Use of Technology
TA5. Division of labor	Distribution of work during the experience	Programmer, Designer, Connections	No Available	Arduino programming Connect electrical circuits Design or construction of the artifact	Programmer, the connections, and the design or construction of your device
TA7. Ambiguity	The freedom to create the artifact	Development of Artifacts	Development and creation of the artifact, Material Handling	Development and creation of the artifact: selection/use of components and materials, use of knowledge, programming. Using Creativity for Invention (Cr)	Freedom for development and creation (Cr), Freedom to use ideas Use of components and materials,
		Use of Scientific Principles	Species selection	Using programming	Use of ecosystems. Construction oriented towards scientific principles (ecosystems)
		Experimentation	Experimentation, Materials Handling, Research, Species Selection	Use of materials and components, Use of knowledge for programming.	Use of components and materials.
		21st Century Skills	Creativity	Using Creativity for Invention	Use of Creativity

Discussion

Based on student contributions, it is considered that the development of maker-STEAM activities involving the use of programming and electronics tools promotes elements of the scientific method, oriented toward experimentation, as well as trial and error, which in turn allow for the confirmation of assumptions or the presentation of an original solution. The activities also allowed for a deeper understanding of the elements of electricity and the use of sensors.

There is a strong presence of creativity, described by participants in the creation of their artifacts and in the search for solutions. The use of the Gradual Immersion Method allows for the development of Maker-STEAM projects in which familiarization and co-creation are evident. They have a strong connection with the development of scientific thinking.

Maker-STEAM activities foster the development of collaboration, which is evident from the distribution of tasks, with participants taking on programming, electrical circuits, design, or communication roles to solve the challenge. This approache actively diasmantles pre-established roles, promoting the equity, redardless of gender, or socieconomic background.

Project development in secondary education is a strong area of opportunity for further in-depth study of creative ecosystems from a CHAT perspective, such as the contradictions and dual stimulation posed by the challenge and learning of tools involving programming and design.

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Indicators of the self in the study of identity narratives of Latin American migrant women in Spain: a cultural-historical analysis

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Abstract: Latin American women constitute one of the largest groups within the migrant population in Spain. They are often recruited for domestic and care work, where they encounter various forms of discrimination. Grounded on a cultural psychology perspective, the paper analyzes identity reconstruction of four Latin American women living in Spain. The analysis was based on Bruner's indicators of selfhood: agency, resources, social references, and coherence. Migration itself, as a primary means of escaping poverty, was identified as a key indicator of agency. Perseverance and religion emerged as the main personal resources on which these women rely to pursue their goals. Among the social reference indicators, support was received from family members, friends, certain employers, and professionals, while ex-husbands and the broader Spanish population were identified as the main barriers to their integration. Finally, coherence indicators reveal an ongoing effort to maintain continuity during the migration process. The application of Bruner's (1997) indicators of selfhood enabled an examination of the processes of identity reconstruction in response to the rupture and transition triggered by migration. This rupture involves profound changes in the Activity Systems (ASs) in these women participate. These changes are associated with the appropriation of new semiotic tools.

Keywords: Migration, Identity, Indicators of selfhood, Mediated action

Introduction

The feminization of migration is a trend that began particularly in the 1990s, with women playing an increasingly prominent role in global migratory flows (Sassen, 2000). This trend has been also observed in Spain (Parreñas, 2001). The care crisis (Gálvez, 2016), associated with gender inequalities in the distribution of care work within Spanish families, has been addressed through the hiring of migrant women—many of them from Latin American countries—as domestic workers (Díaz-Gorfinkel & Martínez-Buján, 2018).

As a feminized activity, domestic work is marked by high levels of informality and precariousness, as well as by asymmetrical relationships between employers and employees. In the case of Latin American women, many have experienced racism and xenophobia (Rinken et al., 2021).

All these factors correspond to the macro-social level and shape the Activity Settings (ASs) in which Latin American migrant women participate: the workplace (private homes as domestic workers), schools (for their children), the healthcare system, religious groups, and institutional contexts (interactions with public administration, the police, etc.).

Theoretical framework

This study is theoretically grounded in Cultural Psychology, integrating Cultural-Historical Activity Theory (with particular attention to the contributions of theorists such as Zinchenko and Wertsch) and the work of other authors like Jerome Bruner (1997, 2003) and Zittoun (2008), who emphasize the role of narratives in the mediation of the human mind. This theoretical perspective is based on three main pillars: (1) the need to consider different planes of analysis; (2) the conceptualization of identity as action mediated by narratives; and (3) the understanding of migration as a process of identity reconstruction.

In line with this framework, we assume that the analysis of psychological processes requires attention to multiple planes of analysis:

- **The macrosocial plane**, which encompasses institutions and broader societal phenomena. The analysis at this level is informed by the concepts of *Activity System* (Leontiev, 1981; Engeström et al., 1999) and *Activity Setting* (Wertsch, 1985).
- **The microsocial plane**, which focuses on the dynamics of interpersonal interactions. These interactions are always situated within sociocultural activities (Activity Systems and Settings).
- **The individual plane**, which examines how individuals appropriate the semiotic and cultural tools historically developed and used in social interactions to mediate their own actions—thereby creating the intrapsychological plane (Wertsch, 1985).

From our perspective, identity (or self) is conceptualized as action mediated by narratives (semiotically mediated action, Wertsch, 1985, 1998; Zinchenko, 1985). Bruner's (2003) notion of *self-making narratives* aligns with this view. Such mediated actions allow individuals to maintain a sense of self-continuity over time (de la Mata et al., 2024).

Identity narratives are constructed within social, historical, and cultural contexts—namely, within Activity Systems that can be analyzed at different levels. Personal narratives, or life stories, are shaped through the appropriation of social and cultural narratives.

Identity narratives are multivoiced (Wertsch, 1991). They incorporate the voices of individuals, groups, institutions…(from both the micro and the macrosocial plane). As any other process of appropriation, the appropriation of master-alternative narratives by individuals and groups is not a mere process of transfer from "outside" to "inside", but a complex reconstruction in which new meanings and senses are created (Wertsch, 1985; Valsiner, 2014).

The third pillar of our analysis is the consideration of migration as a *rupture* (de la Mata et al., 2024) or a *transition* (Zittoun, 2008) in a person's life, involving profound changes in the Activity Systems in which they participate across all life domains. For our participants—and for most Latin American migrant women—this rupture is further exacerbated by the macrosocial factors discussed above. Migration, therefore, represents a profound challenge to the self.

This rupture prompts the reconstruction of migrant identity narratives. These narratives bring together diverse voices, often in conflict or contradiction, in a complex interplay where echoes of *master* (exclusionary) narratives and *alternative* (resistance) narratives can be heard.

Building on previous theories about the key elements of a "good story," Bruner (1997) proposed a set of nine "indicators of selfhood.", which reveal the extent and nature of self-construction within personal narratives, offering a framework for identifying the critical narrative nodes around which individuals—consciously or unconsciously—shape their autobiographical accounts. In our study, we focus on four of these indicators:

- **Agency** (both individual and collective).
- **Resources** employed by **participants** to navigate the challenges of migration.
- **Social reference**, **referring** to the groups, communities, or institutions that play significant roles in their migration experiences, including both supportive networks (e.g., family members, community organizations) and groups that represent the "Other" against whom participants position themselves (e.g., Spaniards). These references relate to different levels of analysis: individual, microsocial (interpersonal), and macrosocial (ethnic or national groups, institutions, etc.).
- **Coherence**, **referring** to how participants maintain or develop a sense of continuity of self—linking past, present, and future.

Aims

The aim of this study is to understand how participants confront the challenges of migration and reconstruct their identities. More specifically, we focus on:

- The **obstacles** they encounter—primarily social in nature—corresponding to both the microsocial and macrosocial planes.
- The **resources** they draw upon—both personal (often shaped by prior experiences) and social.
- The **social referents**, both positive (sources of support and identification) and negative (sources of tension and exclusion).
- Finally, we examine how participants **reflect on their migration experiences** to refashion a sense of self-continuity across time.

Method

The participants were four Latin American women who had migrated to Spain. They shared several common traits in their migratory trajectories. All had left their countries of origin more than 14 years ago, primarily citing economic reasons for migrating. At the time of migration, all participants were mothers with children under their care. They also shared physical characteristics identifying them as native Andean women. Upon arrival in Spain, they began working as cleaners or caregivers in private households and had experienced episodes of xenophobia.

The analysis was based on Bruner's indicators of selfhood: **agency**, **resources**, **social references**, and **coherence**.

Data was collected through a **semi-structured interview** focused on participants' migration experiences. The interview began with a brief section gathering sociodemographic information and addressed the following topics: the period before deciding to migrate; the moment the migration decision was made; the first year in Spain; current life in Spain; and future perspectives. Questions explored different life domains, including work, family and friends, education and healthcare systems, and the broader economic and political context.

Results

Agency. Migration itself—particularly as a means of escaping poverty—was identified as a fundamental expression of agency. Other indicators of agency were linked to how participants confronted obstacles and hardships, which included precarious economic conditions in their countries of origin, intimate partner violence (IPV), and administrative or bureaucratic barriers in Spain. All of these challenges were met with a variety of agentive actions reported by the participants.
Resources. The most salient personal resources were perseverance and religious faith, which the women relied upon to pursue their goals and cope with difficulties.
Social References. Participants identified sources of support that included family members, friends, certain employers and professionals, co-nationals living in Seville, and religious communities. Conversely, ex-husbands and the broader Spanish population were often perceived as barriers to integration. The participants' narratives included episodes of xenophobia and racism, where dominant (master) anti-immigration and racist narratives were voiced by some Spaniards. In response, the women articulated both master and alternative narratives in their own accounts, positioning themselves in relation to these discourses.
Coherence. Indicators of coherence revealed a continuous effort to maintain a sense of identity throughout the migration process. This was achieved through the ongoing positioning and repositioning of themselves and others, with caregiving emerging as a central theme in their lived experiences and personal narratives.

Discussion and Conclusion

From a cultural-historical perspective, the findings of this study can be interpreted through the lens of multiple levels of analysis and identity-related action. The application of Bruner's (1997) indicators of selfhood enabled a detailed examination of the processes by which Latin American migrant women reconstruct their identities in response to the rupture and transition triggered by migration.

This rupture involves profound changes in the Activity Systems (ASs) in which they participated in their countries of origin—such as family structures, employment, social networks, and institutional ASs like education and healthcare. After migration, the participants began engaging with new ASs in the host country, including domestic service, their children's schools, healthcare services, and administrative structures related to immigration. Within these new contexts, they were required to learn new roles and assume new—often subordinated—positions.

Throughout their migration narratives, the participants demonstrated how they confronted adversity through agentive action. They developed and enacted personal resources such as perseverance and religious faith and relied on social networks including family, friends, employers, and support organizations. These strategies enabled them to resist social exclusion and respond to racism and xenophobia.

From a cultural-historical standpoint, this process reflects the appropriation of new semiotic tools, leading to the transformation and reconstruction of identity actions. Notably, the analysis of the

coherence indicator showed that participants had developed the capacity to reflect on their experiences, gaining awareness of the changes brought about by migration. In this sense, these identity shifts can be interpreted as instances of expansive learning (Engeström & Sannino, 2010). Further analysis is needed to deepen this interpretation.

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Expanding the Present.

Collaborative creativity and Imagination in workplaces to design “the Near Future” of Family-School-Service Collaboration

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Abstract: Creating interprofessional spaces involves more than just exchanging information; it requires a mutual commitment to co-constructing knowledge and identifying shared goals and practices. In this process, imagination plays a fundamental role. When understood as an 'expansion' of experience and possibility, realistic imagination stimulates reflection on systematic practices and the representations, contradictions and desired changes of professionals. This paper presents a case study conducted with an interprofessional group working with children and families in Italy within the P.I.P.P.I. programme (Programme of Intervention for Preventing Institutionalisation), a national programme supporting vulnerable children and families. The presentation focuses on an exercise in which professionals are asked to write creatively and collaboratively about the near future of school-family-service collaboration. This narrative approach enables us to understand the proximal experience of professionals in their context, from analysing the future to addressing the challenges of the present.

Keywords: interprofessional work; service-family-school collaboration; imagination; narrative methods

Introduction

Service-family-school collaboration is often understood as a process of networking between persons who, on the basis of their own interpretation of a problem, get in touch by asking each other for the resources each believes to be appropriate. In a research on preventing children's vulnerability, Edwards (2011) proposes instead to base collaboration on the creation of interprofessional and community spaces in which to engage in co-constructing knowledge and understanding of the problem. The issue is not one of diluting specialist expertise or assuming one another’s professional roles, but rather of gaining sufficient insight into the purposes and practices of others to enable collaboration’ (Edwards, 2011, p. 34). Such collaboration extends beyond the mere exchange or transfer of information; it entails a genuine, reciprocal commitment to the identification of shared horizons and the practices through which these may be realised. At its core, it underscores the inherently relational character of effective agency (Edwards, 2011).
This horizontal working, which takes place at the boundaries of communities and professional practices, consists of negotiating interpretations of tasks and ways of accomplishing them: at the boundaries, the

categories, values and goals on which practices are based are revealed and, at the same time, the categories, values and goals of the work of others are recognised and paid attention to.
In the constitution of a symbolic domain for interprofessional and community work, imagination occupies a foundational role. Following Zittoun and Gillespie's (2016) cultural-historical approach, imagination is conceived not merely as a faculty of mental representation, but as an *expansion* of both experience and possibility, thereby foregrounding its generative and transformative potential.
According to Vygotskij (1987) "no accurate cognition of reality is possible without a certain element of imagination, a certain flight from the immediate, concrete, solitary impressions in which this reality is presented in the elementary acts of consciousness. The processes of invention or artistic creativity demand substantial participation by both realistic thinking and imagination. The two act as a unity" (p. 349). In outlining the relationship between imagination and experience, Vygotsky identifies the combinatory capacity of the human mind as the foundation of creative activity. He inquires into how this combinatory creative activity occurs, and stresses that its development depends on the accumulation of our experience (p. 55). Thus, the first and most fundamental connection between imagination and reality lies in the fact that every product of imagination is assembled from elements derived from reality and preserved through prior experience. As Vygotsky notes, it would be a miracle for imagination to generate something entirely ex nihilo, without drawing upon the reservoir of lived experience.
Within this theoretical framework, our research with an interprofessional group commenced by eliciting and sharing experiences of working within multidisciplinary teams, with particular attention to their constitutive elements, interprofessional dynamics, impacts, and discursive practices (first stimulus). Subsequently, the use of narrative tools was introduced as a means of stimulating professionals to envision and design prospective systems of collaboration among services, families, and schools. The writing process itself became a collective arena in which participants articulated motives and professional expectations regarding collaboration, while the narratives they produced functioned as second stimuli for analyzing the current activity system in both its historical-genetic and actual-empirical dimensions (Engeström & Sannino, 2010).
The aim was to examine the potential of the *letters from the future* narrative tool to decouple professional imagination from the immediacy of proximal experience, thereby opening a space for the exploration and identification of possible alternatives and transformations within the system of collaborative activity

Methods

This paper presents a case study conducted with social workers, educators, psychologists, teachers, neuropsychiatrists working with children and families in Italy within the P.I.P.P.I. program (Milani, 2022). P.I.P.P.I. is a national program for supporting children and families who live in a situation of vulnerability. The program is coordinated by the Italian Ministry of Welfare in association with the University of Padua, and the Universities of Torino, Verona, Trieste. P.I.P.P.I. is an intensive support program, and its name is an acronym for Program of Intervention for Preventing Institutionalization. It is based on interprofessional collaboration and collaboration between professionals and other formal and informal actors, families included. The local authorities that have participated in two or more implementation of the program can join the advanced module and constitute into a Territorial Laboratories (LabT): a collaborative space involving professionals and researchers to analyze the local system, promote learning and situated innovations involving different key actors who contribute to the wellbeing of children and families (Sità, Di Masi, Petrella, 2023).

The presentation focused on our experience of using the narrative tool *letter from the Future* (Zanzibar Protokol) in a LabT project. Professionals were asked to write about the near future of school-family-service collaboration (Kloetzer, 2025).
The letters have been written by an interprofessional group of 45 professionals (educators, social workers, psychologists, teachers, school principals) working in child and family welfare in the Tigullio gulf area (Nord-West of Italy). We used the following prompt as a trigger question to stimulate a near future imagination: "It is 2034, and you have the opportunity to write yourself a letter from the future that you receive today. What would you tell us about school - family - services collaboration in your region?"
The narrative tool allows us to represent the proximal experience lived by professionals in their context "what is" starting from a near future imagination "what it could become", i.e. from the analysis of the future to read the question of the present. It is a practice of realistic imagination and a stimulus to reflect on systematic and professionals' representations, contradictions and desired changes.
We present the key contents that emerged from a thematic analysis of these 45 letters, focusing on what it means to cross professional and institutional boundaries, trying to establish collaboration and to search for shared knowledge, while expanding the *bubble of now*.

Findings

The analysis of the *letters from the future* constructs an ambivalent imaginary of school–family–services collaboration, simultaneously infused with utopian projections and dystopian anxieties. The contradictions articulated by professionals reflect the broader socio-historical conditions in which they are embedded: precariousness in working life, the destabilizing effects of wars, the erosion of public commitment to welfare, and the transformative yet disruptive presence of AI technologies. These macro-structural pressures manifest at the micro-level in recurrent experiences of incommunicability, the absence of a shared lexicon across professions, and the persistent economic and social undervaluation of educational labour.

The recurrent evocation of “a common language” signals more than a technical demand for terminological alignment: it embodies the aspiration to transcend disciplinary boundaries and open up symbolic spaces as sites of unpredictable, and potentially transformative, understanding. At the same time, the topic of “borders” offers a glimpse into the blurring of the boundary between professionals and non-professionals. This is evident in their shared vulnerability in the face of injustices and precariousness experienced by individuals and families in the contemporary labour and economic system. It also suggests the potential for creating a caring community that transcends the disparities in power and opportunities associated with each person's social role.

a) Sharing “a common language”

“School-family collaborations have taken on a new value in respecting the figure of the teacher and the importance of parenthood. The times of long meetings and endless phone calls are over. We only speak one language! Inclusion, support, collaboration, listening are now internalized by everyone. I no longer feel like an alien” (school educator).

In these letters from the future, social and interprofessional work takes place in a space where communication takes on multiple, layered forms, such as voices, semantics, specialised languages and

'dialects' that constantly oscillate between the aspiration for a 'common language' and resistance to differences. Educational and social work is often reduced to collecting and managing information. The dialectical tension between *information* and *understanding* is crucial here: the risk is that technical simplification, rooted in organisational monolingualism and the lexicon of efficiency, obscures the richness of 'dialects', living and contextual languages. These are places of creativity and transformation.

b) Crossing and inhabiting borders

The problem of institutional and relational boundaries is rooted in a similar tension: these are not static barriers, but rather permeable thresholds that are continually crossed and renegotiated. For instance, the role of the educator is characterised by a constant tension between underestimation and redefinition within the team as an assessment actor. The fine line between professional function and identification with the users is also highlighted as being precarious, in a circuit of reciprocity. The space for the encounter between professionals and beneficiaries thus becomes a boundary device: a place where the continuity and circularity of relationships shape the conditions of collaboration itself.

"Everyone needs support in growing and developing. As an educator and then as a mother, I have benefited from this collaboration, too, because your own well-being and that of those around you is fundamental. Education today means physical, psychological and economic well-being: a network of services aimed at people for people. You work for others, but others work for you, not as a means but as an intertwining" (early childhood educator).

In this scenario, the question of knowledge emerges from collective trajectories involving the activation of opportunities and tools, which sometimes manifest as specific actors — such as schools, families and networks — that are not only contexts, but also competent subjects. The affective dimension is also relevant to this process: trust, passion and desire, as well as effort and resistance, act as generative or limiting forces in the configuration of interprofessional practices.
Nevertheless, the concept of institutional functioning is still largely influenced by neoliberal logics, which primarily define collaboration in terms of effectiveness, efficiency, and consistent achievement of objectives, thereby shaping professional discourse with performative and prescriptive semantics. This results in contradictions articulated as polarities: mechanical response *versus* organic response; information *versus* understanding; medicalisation *versus* the centrality of the educational act; and reparative function *versus* transformative function.
Ultimately, change can be interpreted as a dual process: firstly, as a subjective transformation resulting from individual learning and re-elaboration, and secondly, as change imposed by institutional mechanisms and socio-historical contexts that continuously restructure the margins of possibility for social work and interprofessional collaboration.

If we take these polarisations into account as dialectical forms, we can consider them as engines of development, levers for imagining innovation projects towards desirable future forms of interprofessional work.

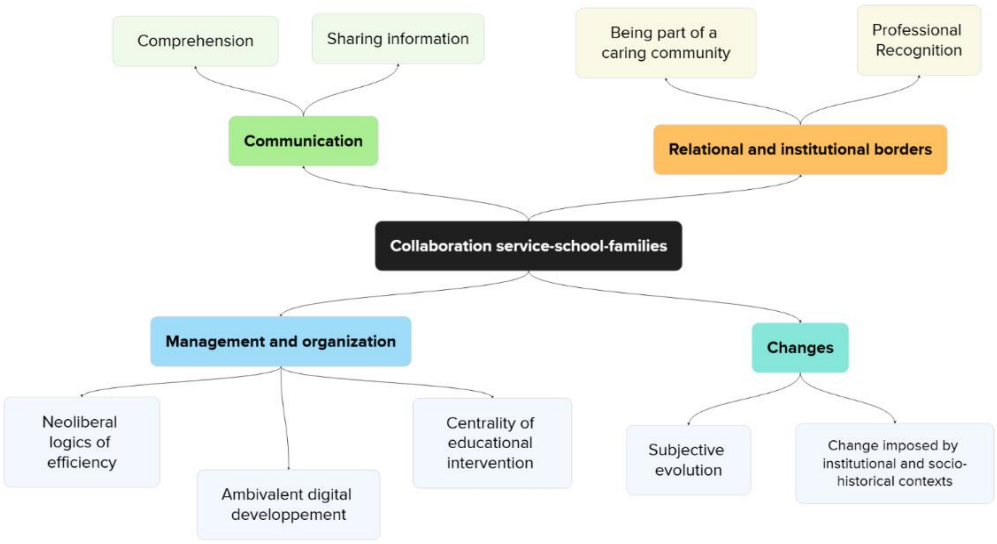

Figure 1 This diagram summarizes the initial analysis of the data emerging from *Letters from the Future*. The four main themes (communication; relational and institutional borders; management and organization; changes) are divided into categories that highlight the main contradictions or internal tensions that professionals are facing.

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Exploring Contradictions in Initial Teacher Education: A CHAT-Based Analysis of 21st-Century Skills Integration

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Abstract: Integrating 21st-century skills into teacher education is essential in today's evolving educational landscape. However, contradictions often emerge and serve as catalysts for change. While many studies acknowledge their role, few explore their complexity. This study uses Cultural-Historical Activity Theory (CHAT) to examine these contradictions and develop effective solutions. Fifteen participants from an Indonesian teaching practice programme—student teachers, teacher educators, and mentor teachers—were involved in the intervention aimed at developing a model for integrating the 21st-century skills in Initial Teacher Education. They participated in in-depth interviews for data collection. The analysis drew upon CHAT and concentrated on identifying contradictions between the activity system's components. The interviews revealed three key contradictions. The contradictions included a gap between theoretical knowledge and the practical use of 21st-century skills, community engagement barriers, and the absence of clear guidelines for assessing these skills effectively. to navigate complex classroom realities and contribute meaningfully to educational communities.

Keywords:Initial Teacher Education (ITE), 21st-Century Skills, Activity Theory, Contradiction, Educational Transformation

Introduction

It is Educational institutions worldwide have recognised the importance of developing 21st-century skills that can be applied across various fields of knowledge, enabling students to adapt, solve problems, and perform effectively in today's rapidly changing and complex 21st-century world [6] Teacher education programs, including Initial Teacher Education (ITE), are being challenged to integrate these skills into their curriculum to ensure that student teachers develop these skills in addition to pedagogical knowledge.

Despite the recognition of the importance of 21st-century skills, challenges of effectively integrating them into educational practices have persisted [2]. These challenges often manifest as contradictions, which can either prevent development or drive changes for transformative educational practices [7]. In many existing literatures, contradictions are commonly treated as incidental phenomena instead of treating them as change-inducing potentials [3]. Through the lenses of the Cultural-Historical Activity Theory (CHAT) framework, this research aims to unfold and analyse underlying contradictions that might hinder meaningful integration of 21st-century skills in Initial Teacher Education to further generate actionable solutions for educational practices transformation.

Research Methods

This study used a qualitative case approach that focused on an activity system. The analysis was grounded on Cultural-Historical Activity Theory (CHAT) by Engeström [4,5] to examine human interactions within the activity system. CHAT provides a robust framework for investigating

interactions between the components of an activity system, such as subject, object, tools, rules, community, and division of labour. These interactions give rise to systemic contradictions that can obstruct the effective integration of 21st-century skills within Initial Teacher Education (ITE).

Figure 1: A general model of the activity system

Context of the study and participants

This research focused on the practice of 21st-century skills integration in an Initial Teacher Education (ITE) program in Indonesia, where the activity system was the focus. There were fifteen participants, consisting of six student teachers, five teacher educators, and four mentor teachers from partner schools. These participants were deliberately chosen to gain a diverse representation of perspectives. This triangulation enabled a comprehensive understanding of systemic contradictions between components in an activity system [8].

Data Collection Method

This research employed semi-structured interviews to collect the data from participants. The questions in the interviews were designed in accordance with the principles of Cultural-Historical Activity Theory, ensuring that the data reflected the dynamic interactions between the components of the activity system [1]. Through the interviews, the participants could reflect on their experiences regarding the integration of 21st-century skills. These include their understanding of these skills, the implementation of these skills, and the challenges faced in implementing these skills. The interview took place in 60 minutes. All the interviews were video recorded with the participants' consent. The transcripts were then anonymised to ensure confidentiality. The ethical aspects of this study have been approved by the Human Research Ethics Committee (HREC) of The University of Sydney [ethics reference: 2024/HE000822].

Analytical Framework

In conducting the data analysis, a thematic coding approach informed by CHAT was employed. This included initial coding for identifying recurring themes and patterns inductively, mapping the emerging themes to the six components of CHAT, analysing the contradictions between the components, and the last process was interpreting and synthesising the findings [7]. Contradictions were seen as learning opportunities that may guide the reform of the initial teacher education rather than as a failure of the activity system.

Results

Based on the interviews, three main challenges were identified.

1. Student teachers faced challenges in implementing their knowledge of 21st-century skills into their academic classrooms and actual teaching practices, despite the implementation of 21st-century skills into the curriculum by ITE. This challenge suggests a contradiction between student teachers as the subject of activity and the object or goal of activity.

2. Student teachers were expected to implement the skills into their teaching practices but were hindered in their practice schools within the community. This challenge suggests a contradiction between the subject and the community.

3. There was a lack of clear guidelines for assessing 21st-century skills. This lack led to inconsistent practices and uncertainty about how to evaluate the skills and what was expected from the assessment. This challenge suggests a contradiction between the rules (what was expected) and the object.

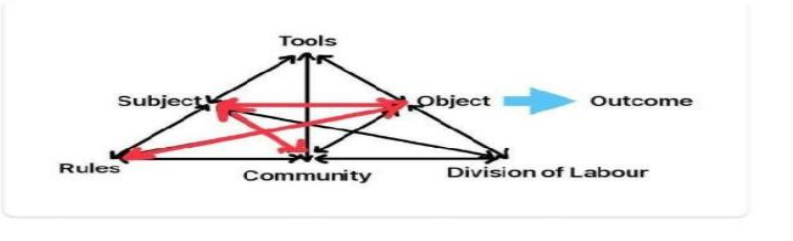

Figure 2: Key Contradictions of the 21st-century Skills Integration in ITE

Table 1: Summary of Key Contradictions and Implications

Contradictions	Activity System Components	Description
Theory–Practice Gap	Subject ↔ Object	Difficulty translating theory into the classroom practice
Community Engagement Barriers	Subject ↔ Community	Limited collaboration due to institutional constraints
Assessment Challenges	Rules ↔ Object	Lack of clear guidelines for evaluating 21st-century skills

Conclusion

The contradictions between subject and object, subject and community, and between rules and object expose a deeper structural and pedagogical misalignment. Through the lens of the Cultural-Historical Activity Theory, these contradictions can lead to solutions that inform reform efforts in the Initial Teacher Education, particularly in the integration of 21st-century skills.

Implications

The results of this research offer valuable insights for broader context, both theoretically and practically:

1. The contradictions that emerged within the activity system of Initial Teacher Education call for rethinking how teacher education conceptualises the development of 21st-century skills, ensuring that theory is not only taught but also meaningfully enacted within authentic teaching contexts.

2. The findings suggest that Initial Teacher Education programs should incorporate more practice-based learning and reflective teaching strategies to help student teachers bridge the gap between theory and classroom realities.

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Adaptive Learning and the Zone of Proximal Development: A Vygotskyan Perspective on AI-Based Educational Technologies

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Abstract: *This invited talk explores how AI-driven scaffolding, dynamic assessment, and social adaptation reinterpret and extend Vygotsky's socio-cultural principles of learning. Through the cases of ALEKS, Squirrel AI, and EDUTEAMS, this talk explores how adaptive systems model learners' evolving knowledge states and orchestrate instructional interactions in real-time, operationalising the concept of the Zone of Proximal Development.*

Keywords*: Adaptive Learning, Zone of Proximal Development, Artificial Intelligence, Intelligent Tutoring Systems*

Vygotsky's notion of the Zone of Proximal Development (ZPD), the distance between what a learner can achieve independently and what they can accomplish with guidance (1962, 1978), can serve to interpret adaptive learning as a socio-technical realisation of human scaffolding. Within sociocultural approaches, learning is understood as a mediated, socially situated activity in which tools, artefacts, and "more knowledgeable others" (MKO) support learning. The ZPD represents the dynamic space where learning occurs through cooperation between a learner and an MKO. This interaction is scaffolded as the learner internalises new competencies.

While Vygotsky conceived scaffolding as a fundamentally social and dialogical process, adaptive learning systems translate these principles into algorithmic form, redefining how mediation and guidance are enacted in learning contexts. Adaptive learning systems employ various techniques to infer the learner's current knowledge state and predict the next optimal learning task. In doing so, they emulate the scaffolding process characteristic of the ZPD. Systems like ALEKS apply Knowledge Space Theory (Falmagne & Doignon, 2010), modelling what a learner knows and what they are ready to learn next. Similarly, Squirrel AI employs fine-grained learner profiling and dynamic content recommendation to maintain each learner within their zone of optimal challenge. From a sociocultural perspective, these systems act as mediational tools that transform the learner–teacher–content triad. The traditional social mediation is partly replaced by algorithmic mediation. This shift introduces both opportunities for individualisation and contradictions regarding agency, context, and cultural meaning in learning activities (Engeström & Sannino, 2011).

From a Vygotskian computational perspective, adaptive learning represents both a continuation and a transformation of human pedagogical mediation. AI systems emulate aspects of the ZPD by personalising instruction and providing contingent support. However, they also introduce ontological shifts: learning becomes data-driven, interactional scaffolding is codified, and the social other becomes algorithmic. To reconcile these tensions, hybrid models of adaptive learning that integrate AI mediation with collaborative and dialogical contexts are needed. AI can function as a supportive artefact for a dynamic diagnostic and recommendation system, within a broader socio-cultural ecology where teachers and peers remain the primary agents of meaning-making within a collaborative learning activity. For instance, the EDUTEAMS tool (2025) provides support for creating competent and congenial teams of learners that mediate one-to-one tutoring.

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Integration of CHAT in Classroom Management Planning in the Digital Age: Educating for Online Sociability

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Abstract: In a school context marked by the omnipresence of digital technology, this paper explores classroom management planning in the era of online interactions between pupils. Rather than limiting itself to reactive responses, it proposes a proactive approach based on Cultural-Historical Activity Theory (CHAT). The Clim@t project, in its first research and development phase, draws on the narratives of four novice primary school teachers confronted with critical incidents involving the misuse of digital platforms (Snapchat, TikTok, Google Classroom, Canva). The analysis reveals conflicts of motives (e.g., prohibit vs. educate) that catalyze transformative agency. The participants proposed solutions such as a lesson plan focused on modeling digital behaviors, school-family collaboration, and the creation of educational video capsules. These findings highlight the importance of reflective and contextualized planning that integrates the relational challenges of digital technology. They call for structured institutional support and coordinated training to assist teachers in educating for online sociability. This work contributes to enhancing inclusive practices and promoting a positive classroom climate by anticipating digital challenges through teacher thinking that is both enlightened by a critical understanding of systemic tensions and shaped, that is, mediated by the tools, rules, roles, and cultural artifacts that structure educational activity.

Keywords: classroom management planning; online interactions; Cultural-Historical Activity Theory (CHAT); teachers

Introduction

In the Quebec school environment, as elsewhere, tablets and computers have become common tools for learning and communication. Their use, both in the classroom and at home, raises concerns related to the hyperconnectivity of some young people (Ruedas et al., 2021). Rather than advocating for screen bans, public messages promote balanced and responsible use, highlighting issues such as cyberbullying, online safety, digital literacy, and the development of critical thinking (Villeneuve et al., 2024). In this context, the school plays a central role, in collaboration with families and the community, in supporting pupils in their relationship with digital technology and fostering a positive classroom climate. Cultural-Historical Activity Theory (CHAT) helps to better understand teachers' actions in response to relational challenges arising from pupils' online interactions. This paper aligns with the conference themes: equity and peace in digital learning environments; inclusive practices; learning through interaction. The Clim@t research project, part of which is presented here from phase 1, fits within this perspective. The following sections outline the context, define key concepts, present the analytical framework and methods, and then discuss the results by highlighting both scientific and managerial implications.

Background of the Subject: Classroom Management Planning in the Digital Age

The planning of teaching, although crucial, is often perceived as difficult to implement in practice by novice teachers (Viola & Tremblay-Wragg, 2024). However, the levers that could guide this planning remain underexplored, despite their importance for pupils' development, learning, and socialization (Deprit & Van Nieuwenhoven, 2021). These authors highlight the impact of preactive reflection *for* action on the action itself, particularly in the context of classroom management in the

digital age. This phase allows teachers to anticipate interactions and analyze the diversity of pupils' needs, thereby influencing pedagogical decisions. Bergeron (2018) notes that planning-oriented thinking, focused on problem-solving, leads to informed decisions. Support for planning is all the more necessary given the challenges involved in choosing intervention strategies: experienced teachers tend to favor proactive approaches (Alasmari & Althaqafi, 2024; Al Khanbashi, 2024), while beginners, in search of guidance, often default to reactive responses. In a context where pupils' interactions extend online, planning cannot be limited to face-to-face interactions. It must anticipate digital relational challenges: misunderstandings, impulsivity, conflicts, that can disrupt the classroom climate (Elsaesser et al., 2021; Pellerin & Jacquet, 2021). This complexity adds to the well-documented challenges of classroom management among novices (Bernier et al., 2024; Caron, 2019; Julien, 2025), making it essential to develop pedagogical reasoning capable of guiding planning. Since pedagogical decisions can emerge from problems and solutions (Bergeron, 2018), it is important to empirically document authentic problems experienced by novice teaching staff. Understanding the nature of issues related to online interactions would lead to proactive intervention planning. CHAT provides a relevant framework for analyzing these planning practices, considering digital tools, institutional rules, and social dynamics. Two research questions are posed and addressed in this study:

1. What classroom management problems do novice primary school teachers encounter in face-to-face teaching when dealing with their pupils' online interactions?
2. What potential solutions can be identified from the analysis of experiential knowledge (lived problems) to support classroom management planning in the digital age, within a logic of mediated and contextualized activity?

Conceptual Framework: Teacher Planning and Online Interactions

Teacher planning involves three phases: preactive (before the activity), interactive (during the activity) and postactive (after the activity) (Tochon, 1989, as cited in Deprit & Van Nieuwenhoven, 2021). Each phase is essential: the preactive phase allows for organizing content and anticipating interactions; the interactive phase facilitates real-time adjustments; and the postactive phase supports the regulation of future practices. Preactive planning is defined as a situated reflective activity, preceding interaction with pupils and oriented toward programming content and preparing didactic guidance (Deprit & Van Nieuwenhoven, 2021). In Quebec, classroom management aims to maximize pupils' development, learning and socialization (Ministère de l'Éducation du Québec [MEQ], 2020). It relies notably on proactive planning, which involves a conscious organization of school realities and interventions in both individual and collective interactions (Dumouchel & Dufour, 2023). This process is structured into five steps: introspection, observation of pupils, development of a classroom management plan, implementation and regulation of this plan (Bernier et al., 2024, inspired by Bosch, 2006). This cycle allows teachers to reflect on their intentions, analyze a diversity of needs, design appropriate interventions, and adjust them over time. In today's digital context, this planning includes managing technological tools used both in class and at home, requiring specific preparation to ensure appropriate use (Dufour & Dumouchel, 2023). It also involves helping pupils develop skills to interact responsibly and constructively in digital environments (Sénéchal et al., 2023). Educating for online sociability requires a clear pedagogical intention aimed at preparing pupils for thoughtful and respectful exchanges. These interactions, according to Quintin & Masperi (2010), are part of a dialogic dynamic, where each message responds to another, partially or explicitly referencing previous statements. This structure, inherent to online interactions, underscores the importance of citizen education aimed at fostering online sociability (Villeneuve et al., 2024).

Methods: an R&D integrating CHAT analysis

The Clim@t project is part of a research and development (R&D) approach (Bergeron & Rousseau, 2021). The first phase, qualitative in nature, aims to clarify the development concept through an analysis of needs and solutions with novice teachers facing classroom management and relational challenges in the digital age. This step precedes the development of a prototype intended to support teaching staff. In winter 2025, four novice primary school teachers participated voluntarily in this phase. Each participant wrote a critical incident they experienced in classroom management (face-to-face teaching), using a tool inspired by Harvey (2023), and then took part in an individual interview (a RÉVERBÈRE tool) to explore the described situation in greater depth. These two instruments helped achieve the following objectives: Describe and understand classroom management problems related to pupils' online interactions; Identify potential solutions based on experiential knowledge. The data corpus consists of written critical incidents and audio transcripts of the interviews. The analysis is based on CHAT, which helps understand interactions that influence the classroom climate. The double stimulation method (Issac et al., 2021) was used: participants were confronted with a lived problem (stimulus-end), then invited to identify possible solutions (stimulus-means).

The interviews revealed conflicts of motives (e.g., to prohibit or to educate), which acted as catalysts for pedagogical reasoning and transformative agency (volitional actions). The data were structured into practice narratives, illustrated by a teacher-artist, fostering dialogue between the results and the lived and felt experiences (Beaupré & Caron, 2024). Feedback from participants helped validate the accuracy of the interpretations. Internal validity was strengthened through continuous adjustments and two rounds of peer review, ensuring rigorous reflexive validation.

Results: Four Illustrated Practice Narratives

To structure the initial phases of the Clim@t project, leading to prototyping, we rely on the enriched model by Zahedi and Tessier (2023), which extends Engeström's classic CHAT components by adapting them to collaborative dynamics. This model integrates traditional elements such as the subject (main actor), object (targeted goal or issue), tools (material or symbolic artifacts), rules (norms governing the activity), community (involved individuals), and division of labor (role distribution), while adding dimensions relevant to the next phase of our project (prototype), such as the collective subject (team sharing a mental model), object in context (situated understanding), signs (cognitive interpretations), design criteria (constraints guiding decisions), projected community (intended users), and shared approach (common project vision).

In this perspective, the four participants - Juliette, Silvana, Laura, and Dominique (pseudonyms) - implemented their classroom management plan, consolidating and adapting their practices with pupils in alignment with the planning cycle proposed by Bernier et al. (2024).

Table 1 illustrates how, starting from an encountered problem (stimulus-end), they deployed strategies to restore and maintain a positive classroom climate in the digital age, transitioning from reactive responses to a reflective and proactive stance (solutions to come).

Table 1. Double stimulation and conflicts of motives experienced by the participants.

Name	Grade Level	Problems: Stimulus-End	Conflicts of Motives and Feelings	Solutions: Stimulus-Means
Juliette	5th grade (part-time)	Digital conflict erupting in class, exclusion (Snapchat)	• Emotionally supporting one student vs managing the rest of the group • Waiting due to lack of human resources vs acting urgently • Ignoring conflicts arising outside school on a platform prohibited at this age vs taking partial responsibility **= Overwhelming**	• Reactive means: activity reorganization, individual listening, mediation, small group discussions • Volitional actions/agency: fostering digital empathy
Silvana	4th grade	Misuse of Google Classroom chat	• Allowing pedagogical use vs allowing social use • Disabling chat vs educating for online interactions **= Frustration**	• Reactive means: individual explanation, chat deactivation • Volitional actions/agency: modeling appropriate chat use
Laura	6th grade	Humiliating posts on TikTok	• Reporting behavior close to cyberbullying vs letting families supervise online interactions • Ignoring conflicts arising outside school on a platform prohibited at this age vs taking partial responsibility **= Indignation**	• Reactive means: reporting, coordinated intervention, suspension • Volitional actions/agency: joint training in digital use, strengthening school-family-community collaboration
Dominique	5th–6th grade (multi-level)	Loss of digital control during substitute teaching (Canva)	• Ignoring what happens during substitution vs taking responsibility as the main teacher • Allowing free Chromebook use vs controlling digital use **= Powerlessness**	• Reactive means: Chromebook removal, exclusion from activities, student discussions • Volitional actions/agency: considering supervision tools, using educational and reflective video capsules

The **subject** remains constant: novice teachers in a reflective posture, confronted with critical situations. Their vulnerability becomes a lever for understanding, revealing experiential knowledge and inclusive practices that consider a diversity of pupils' needs. Juliette, for example, adapts her activity by redirecting pupils to autonomous tasks in order to support an excluded pupil in distress, as illustrated in Figure 1. The **object** of the activity is shared: to maintain or restore a positive classroom climate despite disruptions caused by pupils' online interactions. Each narrative reflects this object within specific contexts: Juliette manages the consequences of a conflict on Snapchat, Laura responds to humiliating posts on TikTok, Silvana addresses the misuse of chat on Google Classroom, and Dominique reacts to inappropriate behavior on Canva following a substitute teaching period. These situations show that digital technology functions as a complex relational space, generating tensions and conflicts of motives. The digital **tools** and platforms used are often diverted from their educational purpose, becoming vectors of socialization or transgression. This contradiction highlights the need for modeling and collaborative training. The **rules** governing the activity are often unclear or absent, forcing teachers to improvise, which leads to cognitive and emotional overload. The educational **community** plays a variable role: some teachers are isolated, while others receive partial or coordinated support, revealing an uneven division of labor in which novice teachers bear a disproportionate burden, one they wish to share with parents and the school team. Incident management falls primarily on the teachers themselves, despite the collective nature of the issues. This diffuse responsibility underscores the need for structured institutional support and stronger collaboration with families. Interventions are often reactive (deactivation, withdrawal, punishment), but the narratives reflect a desire for transformation: Juliette proposes an activity on digital empathy; Laura envisions joint school-family training; Silvana hopes for turnkey lesson plans that include modeling; and Dominique imagines educational video capsules. The four participants agree on the relevance of developing a product that opens up to pupils' experiences of online interactions and classroom

discussions, while also taking into account these other suggestions. Finally, the narratives express a range of emotions (**signs**) that reveal the relational challenges of digital life: overwhelming for Juliette, frustration for Silvana, indignation for Laura and powerlessness for Dominique. These emotions reflect the complexity of classroom management in the digital age and confirm the need for an adapted product to support teachers' agency as they educate online sociability through inclusive practices.

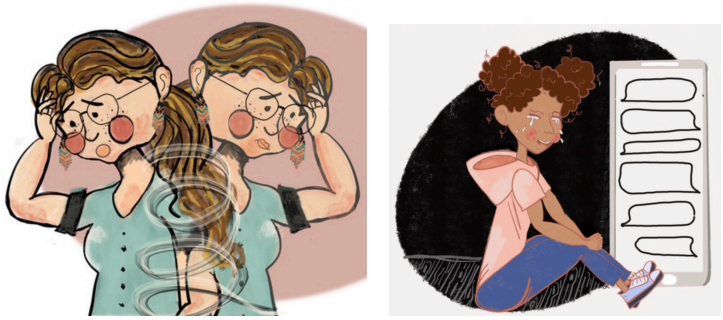

Figure 1 Juliette, overwhelmed, in the classroom and without support from the special education technician. Student A from Juliette's class, in tears after interacting online with classmates. Illustrations by Stéphanie Robitaille, teacher-artist. (Caron et Côté, 2025)

Concluding Discussion: Transformative Agency for a Future Preactive Phase

This communication sheds light on classroom management planning in primary education in the digital age, through the lens of CHAT. The conceptual framework (Bergeron, 2018; Bernier et al., 2024; Deprit & Van Nieuwenhoven, 2021; Villeneuve et al., 2024) enables an analysis of planning as a reflective and iterative process. The participants' narratives reveal an evolving stance and transformative agency, marked by conflicts of motives that pull them in different directions, echoing Isaac et al.'s (2021) work on volition actions in dilemma contexts. The findings also highlight the need for institutional support, coordinated training, and school-family-community collaboration. The participants' proposals offer concrete solutions to educate online sociability and support planning. Illustrations created by a teacher-artist enrich the narratives by making visible the emotions experienced (signs), providing useful visual mediation in training contexts (Beaupré & Caron, 2024). The results show that online interactions disrupt the classroom climate and require both urgent responses and proactive inclusive strategies. Planning decisions emerge from a situated reflective process, where stimuli prompt adjustments based on reactive strategies. Teacher thinking, illuminated by CHAT, helps visualize the interactions between knowledge, pupils, teachers, and institutions (Xue, 2013), which is relevant for classroom management training. Limitations include the small number of participants and the absence of an explicit presentation of the analytical framework to them, which limits the scope of the findings. The participants could have been explicitly informed that double stimulation has the potential to serve as a springboard for learning how to plan classroom management in the digital age. The Quebec context also calls for caution in transferring the results. The next phase of the Clim@t project will aim at coconstructing a prototype with novice teachers, based on their narratives. The collective subject will emerge, the object in context will be redefined, and the signs from interpretations will guide the design (Zahedi & Tessier, 2023). The final product will aim to transform experiential knowledge into shared resources, to support teachers' agency and anticipate digital relational challenges.

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Reframing Critical Thinking in AI-Mediated Undergraduate Thesis Writing: Towards Equitable Assessment and Cognition in Higher Education

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Abstract: In the current educational landscape, where generative artificial intelligence (GenAI) tools like ChatGPT are reshaping academic writing, critical questions arise regarding student cognition, authorship, and equitable assessment. This study explores how GenAI impacts the development and evaluation of critical thinking in undergraduate thesis writing from both student and teacher perspectives. Drawing on sociocultural theories of learning and Cultural-Historical Activity Theory (CHAT), thesis writing is examined not merely as a cognitive process but as a culturally mediated activity system where GenAI tools, academic norms, and roles intersect. The research follows a three-phase mixed-methods design: Phase 1, a systematic literature review using the PRISMA protocol; Phase 2, a qualitative inquiry with students and supervisors; and Phase 3, a Delphi method with international experts. This paper focuses on Phase 2, which investigates real-world practices and dilemmas around GenAI. Interviews with supervisors and focus groups with students reveal tensions around assessment fairness, originality, and ethical boundaries. Findings highlight systemic contradictions in current evaluation frameworks, particularly the misalignment between assessment criteria that reward fluency and learning objectives that demand critical depth. The discussion emphasises the need for new policies, rubrics, and pedagogical approaches to support authentic critical engagement in the age of AI.

Keywords: Critical Thinking; Academic Writing; Artificial Intelligence; Higher Education; Cultural-Historical Activity Theory.

Introduction

Academic writing has traditionally served as a means for students to externalise thought, demonstrate research competencies, and engage in higher-order reasoning. The rapid integration of generative AI into academic writing practices has precipitated what Engeström (2001) calls a 'double bind' in higher education. On one hand, tools like ChatGPT demonstrate remarkable capacity to support text production (Al-Zubaidi et al., 2024); on the other, they destabilise conventional understandings of authorship and critical engagement. This research addresses two research questions (RQ):

RQ1. How has the introduction of GenAI reconfigured the traditional division of labor between students and supervisors in the undergraduate thesis writing process?

RQ2. What systemic contradictions emerge between established institutional assessment practices and the new, AI-mediated writing processes?

In this study, the central activity system under analysis is the undergraduate thesis writing process, understood as a culturally and institutionally mediated practice. Drawing on the third-generation Cultural-Historical Activity Theory (CHAT) framework (Engeström, 2001), this study analyzes the undergraduate thesis writing process as a complex, culturally, and institutionally mediated activity system. Within this system, the student acts as the subject, pursuing the *object* of developing and demonstrating critical thinking. This process is mediated by a variety of *tools*, including digital resources like generative AI, as well as institutional artifacts such as rubrics, academic language, and citation norms. The activity is governed by *rules* like institutional evaluation policies and ethical guidelines, and it is embedded within a *community* comprised of the supervisor, evaluation committee, and peers. This *community* collectively determines the division of labor, where the student is the primary writer, the supervisor provides guidance, and the committee performs the final evaluation. By framing thesis writing in this way, the study aims to uncover how the introduction of GenAI disrupts or transforms the relationships among these components, particularly in terms of how critical thinking is demonstrated, supported, and evaluated.

Methodology

This study adopts a three-phase mixed-methods design. Phase 1 consisted of a systematic literature review using the PRISMA protocol (Page et al., 2021) to map existing research at the intersection of AI, academic writing, and critical thinking assessment. Phase 2 centres on a qualitative investigation of how students and supervisors perceive, use, and evaluate GenAI in thesis work. Phase 3, still forthcoming, will employ a Delphi method with international experts.

This study focuses on Phase 2, which explores real-world practices, ethical dilemmas, and the perceived fairness of assessment (Al-Zubaidi et al., 2024). Phase 2 comprises two strands: interviews with 15 supervisors and 3 focus groups with undergraduates. Supervisors assessed anonymized thesis excerpts, some AI-generated, others not, using rubrics. After they developed semi-structured interviews. Students discussed their use or avoidance of GenAI, critical thinking, ethical boundaries, and fairness. This dual approach revealed systemic contradictions in academic evaluation (Engeström, 2001) and informed the design of Phase 3.

Preliminary Results

Analysis of Phase 2 revealed three key patterns. First, supervisors reported difficulties in evaluating AI-mediated theses: many noted that AI-assisted texts appeared 'generic but well-written' according to the supervisors, and rubrics tended to prioritize surface features over critical engagement. Second, students described using GenAI for drafting and editing, while expressing uncertainty about ethical boundaries and disclosure. Third, both groups highlighted systemic tensions between institutional policies, traditional expectations, and emerging AI practices.

Discussion

Findings illuminate fundamental tensions in AI-mediated thesis writing. The paradox of 'fluency without depth' describes how GenAI enhances textual fluency while obscuring critical engagement (Al-Zubaidi et al., 2024). This creates a contradiction between *tools* (GenAI) and *object* (critical thinking). The 'assessment challenge' highlights misalignments between evaluation frameworks and AI-mediated practices: rubrics fail to capture the origin of ideas or the quality of human–AI collaboration, raising concerns about validity. The rubric can include a new criterion assessing the student's ability to critically edit and build upon AI-generated drafts, as evidenced

by clear revisions and the integration of original analysis. The 'transparency dilemma' reveals unresolved tensions around AI disclosure, as students fear bias and supervisors lack consistent standards. Finally, the 'agency reconfiguration' shows how students strategically delegate drafting to AI while retaining control in editing, raising questions about how agency is conceptualized. Together, these tensions point to the need for revised rubrics, clearer disclosure policies, and pedagogical approaches that support reflective engagement with AI.

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Opening Address

Together Toward Equity, Peace, and Sustainability in Times of Crisis. Opening of the ISCAR Southern Europe and West Asia Conference

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Distinguished colleagues, esteemed members of the ISCAR community, keynote speakers, dear guests, it is our great honour to welcome you to Sant Cugat del Vallès, to the Faculty of Education of the Universitat Internacional de Catalunya (UIC Barcelona), and to the ISCAR 2025 Southern Europe and West Asia (SEWA) Conference, "Towards Equity, Peace and Sustainability in Times of Crisis." We are delighted to host you here and to open this conference together with the ISCAR President, Professor Annalisa Sannino, whom we warmly thank for her presence and support. This conference brings together scholars and practitioners from Southern Europe, the Middle East, and beyond, who are engaged in sociocultural and activity research at a time marked by multiple crises. These social, environmental, political and educational crises call for renewed ethical, intellectual, and practical commitments. Our theme invites us to consider how our research can contribute to more equitable, peaceful, and sustainable futures.

From an axiological standpoint, we see this conference and our research community as grounded in strong values and ethical commitments. Human development is not neutral; it is historically situated and value-laden. Communities working for equity and sustainability are, in this sense, our natural allies in education and research. They remind us that engagement should go beyond individual self-interest and contribute to collective forms of responsibility and care.

Ontologically, ISCAR SEWA is rooted in a sociocultural understanding of human activity. We study learning, development, and practice as profoundly social and historical processes. Epistemologically, our community embraces diversity. We value the coexistence of multiple ways of knowing, and we see epistemological pluralism as a strength: it enables richer, more integrated forms of interdisciplinary inquiry. Rather than falling into "methodological tribalism," we aim for a pluralistic coexistence in which openness, dialogue, and constructive criticism foster innovative cross-fertilisation of methods and perspectives. Our conference is therefore not only an academic event, but also a space for the cultivation of a community with shared values and a diversity of voices. It is a space where each researcher, at whatever point in their journey, can develop within a plural and supportive environment. In the spirit of Lev Vygotsky, we might say that to truly understand one another at this conference, we must go beyond each other's words to engage with each other's thoughts.

We are also honoured to highlight our keynote speakers, whose trajectories embody the kind of engaged scholarship we wish to promote. The first keynote is delivered by professor Sylvie Barma, from Université Laval in Québec, recipient of the Raymond Gervais Prize for excellence and academic trajectory in science and technology education, and currently counselor to the Ministry of Education in Québec. The second keynote is delivered by professor Katerina Plakitsi, from the University of Ioannina in Greece, former ISCAR President (2017–2024), elected board member of the University of Ioannina, and Director of an international master's programme on One Health Education for Global Sustainability developed in collaboration with George Mason University and the University of Florida. We thank both Professors Barma and Plakitsi for accepting to join us as keynote speakers and for inspiring our reflections on equity, peace, and sustainability.

This conference is a collective achievement, and we would like to express our heartfelt gratitude to all those who have contributed to making it possible. From the Faculty of Education at UIC, we wish to thank: Enric Vidal, Dean of the Faculty of Education, Sergio Cruz, manager of the Faculty of Education, Marta Teruel,

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We are also deeply grateful to the research and support team whose work has facilitated the organisation of this event: Thomas Frøsig, Saint-Clair Lefevre, Guillermo Pech, Joseba Cejudo, Sara Cebollada, Amaia Uzcategui, Oksana Strutynska, Chengcheng Li, Guillaume Isaac, and Patricia Díaz. Their efforts in coordination, communication, and participant support have been essential to this conference.

Let us now share some organisational and logistical information to help you navigate the next days:

- Wi-Fi access: The Wi-Fi network is “UIC”, and the password is “Connectat.”. Beyond its practical purpose, “Connectat” (to be connected) resonates with the spirit of this event. It symbolises the human, intellectual, and social connections that we hope will flourish here: between disciplines, institutions, regions, and people. We invite you to keep this idea of connection in mind throughout the conference.
- Programme and sessions: All essential information about sessions, rooms, and times is available in the programme via the EasyChair Smart Program for ISCAR2025BCN : https://easychair.org/smart-program/ISCAR2025BCN/ . Please consult it regularly for any updates and to orient yourself within the scientific programme.
- WhatsApp group: A conference WhatsApp group has been created to facilitate communication among participants and to provide quick updates. The link is provided in the conference materials.
- Photo album and image policy: A shared online album has been set up so that participants can upload and view photographs from the conference. The link is included in your materials. If you prefer not to appear in photographs, please indicate this at registration. You will be given an orange dot on your badge. We kindly ask all participants taking photos to be attentive and avoid photographing individuals wearing an orange dot.
- Sustainability and campus facilities: In line with our commitment to sustainability, we encourage you to use refillable water bottles. There are watering stations at different locations around the campus where you can refill your bottle during the day.
- Gala Dinner: For those who have registered, the Gala Dinner will take place on Thursday at 19:30. The walk from UIC to the venue is approximately seven minutes, and we will depart collectively from UIC at 19:10. Dietary constraints have been taken into account (two participants have indicated specific dietary needs), and the venue has been informed accordingly.

Throughout the conference, we invite you to engage in the spirit of #ISCAR2025BCN: to connect, to collaborate, and to co-construct knowledge oriented towards equity, peace, and sustainability. May these days be an opportunity not only to present and discuss research, but also to nurture a scholarly community that is critical, caring, and committed.

We thank you warmly for being here and for contributing your time, your work, and your perspectives to the ISCAR SEWA community. We wish you a stimulating, collegial, and memorable conference.

Margarida Romero (#ISCAR2025BCN Chair) and Enric Vidal, Dean, Faculty of Education, Universitat Internacional de Catalunya

Opening Address to the SEME Region Conference by ISCAR President

CHAT Scholarship in Times of Malignant Normality

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It is a precious opportunity for the International Society for Cultural-historical Activity Research (ISCAR) to have the Conference of its Southern Europe and Middle East (SEME) Region taking place in Spain. It is of great historical significance that this SEME conference is taking place specifically in Spain. This is because of the role scholars from Spain have played in the establishment of ISCAR in the first place. As it is known to many acquainted with ISCAR pre-history, the predecessor of this organization was called ISCRAT (International Society for Cultural Research on Activity Theory) established in 1986. As the ISCAR webpage reads:

> *"By the end of 1990s, it became clear that ISCRAT shared similar concerns and drew from some of the same theoretical sources as the Society for Sociocultural Studies (SSCS). Many scholars were actively participating in both the ISCAR and SSCS congresses and recognized that their efforts were both overlapping and complementary. During an ISCRAT Executive Committee meeting in Amsterdam in 1999, Pablo del Río gave a presentation of the history of the Society of Sociocultural Studies (SSCS) and proposed the ISCRAT and SSCS congresses to be unified." (https://iscar.org/pages/prehistory-and-history).*

In connection with this historical note, it is also of significance that this SEME conference is taking place in 2025. This year marks the 30th anniversary of a publication that in many ways conveys key aspects of the pre-history and history of ISCAR as well as its deep interdisciplinary, internationalist and multilateral ethos. In 1995 James V. Wertsch, Pablo del Río and Amelia Alvarez published the edited volume Sociocultural Studies of Mind with Cambridge University Press. This milestone publication includes chapters from Jean-Paul Bronckart, Université de Genève, David R. Olson, from Ontario Institute for Studies in Education, Tadanobu Tsunoda from Tokyo Medical and Dental University; Barbara Rogoff, University of California; Ana Luiza B. Smolka, Universidade Estadual de Campinas in Brazil, Vladimir P. Zinchenko, from Moscow Institute of Engineering, Electronics, and Automation. When this publication appeared, Pablo Del Río was working at Universidad de Salamanca and Amelia Alvarez was representing the Fundacion Infancia y Aprendizaje.

The book posits the foundational argument in cultural-historical activity research that mental functioning is tightly intertwined with the cultural, historical and institutional contexts in which human beings are born, grow up and develop. Bridging socio-cultural psychology, cognitive science, philosophy and cultural anthropology, this volume wove together three threads that remain to date cornerstones of the fields of scholarship represented in ISCAR:

1. The contexts in which human beings operate shape their minds by means of the cultural tools they put into use.
2. Processes of mediation enable the tracing of how the shaping of the mind takes place.
3. The influence of cultural tools in the shaping of the mind and the world can be understood by looking at human action as a unit of analysis.

The editors of the book open the introductory chapter with a sentence that probably resonates with what the participants in this conference have thought when reading about the theme of this event: “Perhaps it is the fate of every generation to believe it experiences a period of crisis, or at least rapid social change.” (p.1) Wertsch, del Río and Alvarez refer in this chapter to the impact on the mind of major crises such as World War I and the Great Depression, reminding us that the cultural and psychological dimensions of great social crises are as central to understanding such events as are economic and political dimensions. The chapter also characterizes the circumstances at the time the book was written in terms which are still valid today:

> *“Instead of bringing the prosperity and tranquility expected by many, the end of the Cold War has unleashed a host of major social and political forces that are changing our lives in ways few had anticipated: The forces of globalization have accelerated in a variety of arenas such as finance, economic production, and communication, while simultaneously and somewhat paradoxically, new forces of localism, especially in the form of nationalism, have emerged with their attendant and often brutal consequences” (p.1).*

Since the publication of this book much has changed in the world and much remains the same. Despite having the technology, knowledge and resources to ensure the flourishing of each human being and living being on our planet, we still see too much violence and too many wars raging in many parts of the world.

> *“It has become blatant that business as usual reflects systemic dysfunctions that threaten the very existence of life on our planet, along with the rule of international law and the protection of basic human rights” (Nordic Baltic ISCAR, 2025, p.4).*

It is hopeful and at the same time moving to see many human rights activists, including Ada Colau i Ballano, former Mayor of Barcelona, who stand up with determination to do their part in the face of atrocious violence we are seeing in many parts of the world and in particular in Gaza. Many times in history people felt that they had to take risks to confront injustice and oppression, and lost their lives so that current and future generations may one day be allowed to flourish in supportive civil societies regardless of their skin color, religion, gender or socio-economic status.

The theme of this conference tells clearly what this event sets out to accomplish: taking steps “Towards Equity, Peace and Sustainability in time of Crisis.” Today humanity is at a crossroads due to the climate crisis, persistent extractivism and colonial continuity, as well as radical increase in polarization and militarization which exacerbate racism, inequity and risks of a nuclear winter. Following Wertsch, del Río and Alvarez and the authors of their edited book, we could ask ourselves what the global crises from the past, having led to today’s global crises, mean for the mind, and how this historical heritage informs human actions in everyday activities as well as prospects for the future.

In the following, I wish to address these questions by mobilizing a conceptual framework which is at the core of my own research, that is, the framework of cultural-historical activity theory (CHAT). I will do so by engaging in a dialogue with a major intellectual of our time, Robert Jay Lifton. He was a psychiatrist and proponent of the transdisciplinary perspective of psychohistory (Lifton & Strozier, 1984). He is primarily known for his studies of the psychological dynamics of exposure to mass violence and the roles professionals in medicine and psychology have played in enabling some of the darkest atrocities in history (Lifton, 1986).

The relevance of Lifton's scholarship in dialogue with CHAT in the context of the opening of this conference pertains to the centrality of human activities in moving toward equity, peace and sustainability. In the following, I will first offer a brief overview of some of Lifton’s key ideas. After that, I discuss parallels between Lifton’s work and CHAT. Finally, I return to the questions raised above, sketching some tentative answers. The main argument is that a focus on the history and development of human activities is inherently generative of a future

of equity, peace and sustainability. This is because activities hold the power of maintaining business as usual or nourishing alternatives to destructive capitalism. As actors in systems of activity, practitioners and professionals along with researchers have key roles to play to transform educational and work activities in ways that foster, or at least allow, movement toward equity, peace and sustainability.

Lifton's legacy

In the past decade, Lifton was very vocal on the absurdity of human (in)action in the face of the realistic prospect of the demise of human civilization as we know it by the end of this century. Lifton's work on the threat posed by both nuclear weapons and climate change led to the conclusion that to avert annihilation, humanity must become able to alter the normality it lives in. He referred to this as a particular kind of formed awareness, that is, an understanding of the root causes of nuclearism (Lifton, 1980) and climate denial (2017b) and of the role everyone can play to break away from them. He coined the notion of "malignant normality" (Lifton, 2017a) to indicate the carrying on of business as usual, for instance by continuing extracting coal, oil, and natural gas, despite knowing very well that curbing global warming necessitates discontinuing the extraction and use of fossil fuels (Lifton, 2017b).

Some of Lifton's famous studies examine the perspective of professionals descending into darkness by enabling and contributing to the horrors of the holocaust, Hiroshima, and the Vietnam War. He studied Nazi doctors assigned to Auschwitz to carry out selections for the gas chamber (Lifton, 1986), showing that the doctors generally adapted to carrying out these tasks which required them to kill rather than heal. In other words, Lifton'ss works show how naturally it can happen that institutions succeed in making professionals act in ways that are the opposite of what they are meant to do. These, according to Lifton, are actions that contribute to the normalization of malignant endeavors. He established parallels with the conduct of Nazi doctors and psychologists operating under the auspices of the American Psychological Association to design torture in prisons and detention centers (Peltz, 2008).

His studies are a call to practitioners and professionals to give themselves the necessary instruments to grasp what their work is used for and to draw the line when it turns out that it is serving unethical, inequitable and destructive ends. He saw himself as "a witnessing professional" giving formal testimony of these historical events and their psychological meaning in his studies with doctors and survivors (Lifton, 2011). To define his scholarly journey, he often used the verse from Theodore Huebner Roethke's poem (1966): "In a dark time, the eye begins to see."

Lifton's interviews with veterans of the Vietnam war revealed that military psychiatrists routinely supported solders, who were experiencing anxiety and felt morally challenged by the events they were part of, to return to their duties, thus further enabling and enhancing the ongoing horrors (Lifton, 1975). He claims that professionals might be molded into the structure of military medical activities to the point of becoming part of "atrocity-producing situations" (2004). Malignant normalizing of inequity, violence and destruction is the result of human ability and at the same time vulnerability to adapt to immediate circumstances:

"When Nazi Doctors did what they did, and when nuclear physicists involved in weapon making and others involved in weapon strategy do what they do, they are adapting to an immediate environment and to an immediate national ethos. But that adaptation is maladaptive to the larger future; immediate adaptation to genocidal potential threatens the overall human adaptation" (p. 28).

Something evil can slowly but surely become the norm to the point that entire societies adapt to it. This comes out quite vividly in my own work on homelessness - a phenomenon many countries seem to have adjusted to as a form of malignant normality "impossible to overcome." Phenomena as unjust and unequal as homelessness

may become the normality of everyday life because we humans are a highly adaptive species. But if evolutionary adaptation is a strength, it also makes us vulnerable. Adapting to immediate circumstances may lead us to get habituated to normalized injustice, violence, and destruction, as well as undermine broader necessities, pertaining to the survival of our own and other species. General policies and ethical rules of conduct usually do not identify specific social and political circumstances; thus, individual professionals and practitioners can easily become instruments of malignant normalization.

Lifton's work through CHAT lenses

The brief overview of some of Lifton's key ideas enables discussing parallels between his work and CHAT, and how the conclusions he reached in his work may transfer to our domain of scholarship within ISCAR. First and foremost, Lifton's work reminds us how central human activities are in moving toward equity, peace and sustainability, as well as in taking opposite directions through the work that practitioners and professionals do within these activities.

Lifton's view on the absurdity of human (in)action in the face of the realistic prospect of the demise of human civilization is a manifestation of possibly the most acute contradiction of human existence today, that is the clash between sticking to our normalized ways of living and the awareness of the necessity of acting otherwise (Sannino, in press). When Lifton discusses the threats posed by nuclear weapons and climate change, his conclusion that humanity must become able to alter the normality it lives in aptly resonates with CHAT understanding that change requires breaking out from consolidated patterns of activity (Engeström, 1996).

Lifton's reference to the need to nourish a formed awareness of root causes that takes a long-term and broad systemic perspective, different from the common fragmented one, about the role everyone can play to break through malignant normality, can be also interpreted through CHAT lenses. It can be seen as an invitation to invest in a dialectical understanding of human actions as part of systems of relations in constant flux, stemming from and contributing to history - for the good and for the bad. CHAT might also interpret Lifton's explanation of adaptation to malignant normality as the common tendency to remain merely at the level of actions, neglecting the systemic activity-level links that influence these actions and that these actions can in turn influence.

In CHAT the alienating process of disconnect between actions of production and the overall system of production and its object of activity is almost a truism. Charlie Chaplin's 1936 film Modern Times vividly depicts the dehumanizing effects of a sole focus on actions and operations. Ever since Leont'ev's (1978) classic example of the primeval hunt, CHAT scholarship has emphasized that when detached from the historical and systemic dynamics of activity, the actions of individuals are likely to be subject to instrumentalization. Through CHAT lenses, it is therefore not surprising that institutions may more or less consciously create circumstances in which the actions of professionals may turn out to be the opposite of what they are meant to be in the first place. In other words, while Lifton's work is a call to practitioners and professionals to give themselves the necessary instruments to grasp what their work is used for and to draw the line when it turns out that it is serving unethical, inequitable and destructive ends, CHAT offers some of these critical conceptual instruments to practitioners and professionals.

By focusing on the historical development of activities and on their systemic nature, the activity system as CHAT's foundational unit of analysis can be a potent resource for practitioners and professionals, as well as for researchers, to transcend the limitations of action-bound normalization of local circumstances. If grasped as part of historically evolving systems of activity, human actions may become less vulnerable to the normalization of malignant pursuits. Human activities disclose their true potential as inherently generative entities for equity, peace and sustainability when professionals realize the role these activities play in maintaining destructive capitalism, or creating meaningful alternatives to it.

Toward tentative answers

Earlier in this essay, following Wertsch, del Río and Alvarez (1995), I raised the following questions:
-What do the global crises from the past, having led to today's global crises, mean for the mind?
-How does the historical heritage of these cumulating crises inform human actions in everyday activities, as well as prospects for the future?

In the light of Lifton's studies of humanity's descent into darkness and the parallels drawn between his work and CHAT, two tentative answers may be sketched in response to these questions. First of all, the history of inequity, violence and destruction shows that the mind can be adaptive and resilient, but also in ways that are harmful to others, to our own species and to the world ecosystems. Secondly, the sustainable development of human activities by initiatives of individuals and collectives requires a strong sense of history and of the difference individual and collective actions can make in the broad and long-term perspective of systems of activity.

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Inaugural Keynote

Going beyond the wall: moving from a comfort zone to an expansive and unexpected journey in education

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My journey with Cultural Historical Activity Theory (CHAT) goes back to my doctoral studies, when I started reflecting on the limits of traditional science teaching as most of us have experienced it. One theme that is present in my work is that of trajectory, whether personal or professional. Trained in pure science and having worked in science laboratories, or in the field, with civil servants as an undergraduate student, I became a biology, chemistry, and physics teacher engaged in the reproduction of empirico-realistic experiments with high school students.

I was rapidly unsatisfied and understood the importance of going beyond disciplinary teaching. This led me to question my own professional and epistemological trajectory, and I became interested in interdisciplinarity and the relevance of gathering a much wider number of actors to give meaning to the classes under my responsibility. I abandoned textbooks and lab protocols, got involved with sociosensitive issues in my community (especially concerning the use of pesticides in the environment), and dove into the unknown. My teaching approaches clashed with some colleagues, and I was recruited by the Ministry of Education in the early 2000s to help implement a new science curriculum in Quebec.

In parallel, I decided to engage in graduate studies, and my attempts to de-encapsulate science teaching materialized in my doctoral thesis, where I used CHAT and Expansive Learning to document how a science teacher innovated and collaborated with others and experts to go beyond her school.

As an academic, I was able to gather a great number of participants — students, principals, teachers, special education teachers, parents, and others — over a long period of time as my team and I investigated teachers' resistance to implementing a new curriculum, how climate change was taught in classrooms, the impact of the legalization of cannabis in Canada on high school students, and more.

In my keynote, I present the theoretical and methodological challenges I faced as I progressed through my research activities. Starting with descriptive research, where I did not ask so much "why" but rather "what" and "how," I rapidly faced conflicting motives — such as focusing on individual participants as they experienced new teaching instruments to modify mediators (rules, division of labour, community) versus aiming at more participation and collaboration. Then, engaging in developmental work research and the need for de-encapsulation, I faced issues like feeling out of control with data analysis while doing CHAT in the field and learning to accept that time and money are important elements to sustain transformative practices.

Doing CHAT "in the wild" and adopting the Change Laboratory methodology, I engaged in formative intervention methods for developing work activities with practitioners in contexts such as the legalization of cannabis in Canada and hand hygiene in emergency rooms during COVID-19. Finally, for the last five years, I

acted as a political advisor to the Minister of Education. Those years were as challenging as interesting as I gained the power to influence political actors.

In a nutshell, I will discuss with the audience how to address the analysis of years of data collected and how to reconstruct a multilevel and experiential expansive trajectory in the field. I am especially thinking about young researchers as they start their own journey and already feel lost in translation. My work has led me to focus on the importance of emotions in the form of conflicting motives as key in the double stimulation process. I have documented how focusing on individual and collective conflicts of motives and joint agency helps to understand why and how participants engage in the expansive resolution of conflicts of motives to collectively progress and expand the borders of their joint activity.

When it comes to documenting expansion, my conclusions point to the importance of having enough time and money to de-capsulate educational settings when historical and cultural aspects are taken into account and reconceptualized. Even if conflicts of motives start with the individual, they rapidly reach a collective layer to be resolved, leading to the definition of a boundary zone where a new form of practice emerges. The expansive resolution of conflicts of motives goes beyond the individual and scales up to collective transformation. The question of sustainability, on the other hand, is another kettle of fish and hopefully, will be addressed by younger generations to make sure that we indeed go beyond that wall of comfort that makes all of us so secure most of the time.

Keynote

Expanding Science Education: A Living Lab Cycle Integrating One Health, Equity, and Sustainability

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This keynote charts the developmental journey of the living lab at the University of Ioannina, Greece, examining how key milestones and crises have shaped its trajectory. It begins with a fundamental inquiry into transforming early-years science education—an inquiry that evolved into a shared goal among communities of practice. In response to successive crises, both the tools employed and the frameworks of activity were reconfigured.

To meet these challenges, we have developed a model named SCOPES, which extends traditional science education through an integrated approach drawing on psychology, sociology, and the One Health paradigm. SCOPES aims to promote sustainability, peace, and inclusion by linking human, environmental, and social well-being, and scaling from local initiatives to European and global collaboration. As the model is being implemented, emerging tools continue to refine its practice, giving rise to new questions and research directions.

In this presentation, we share not only outcomes but also methodology, reflections, and practical lessons. We will try to address systems for adapting education in crisis, strategies for interdisciplinary collaboration, and how One Health education can contribute to global sustainability. The talk is grounded in real practice and open to dialogue across scientific disciplines.

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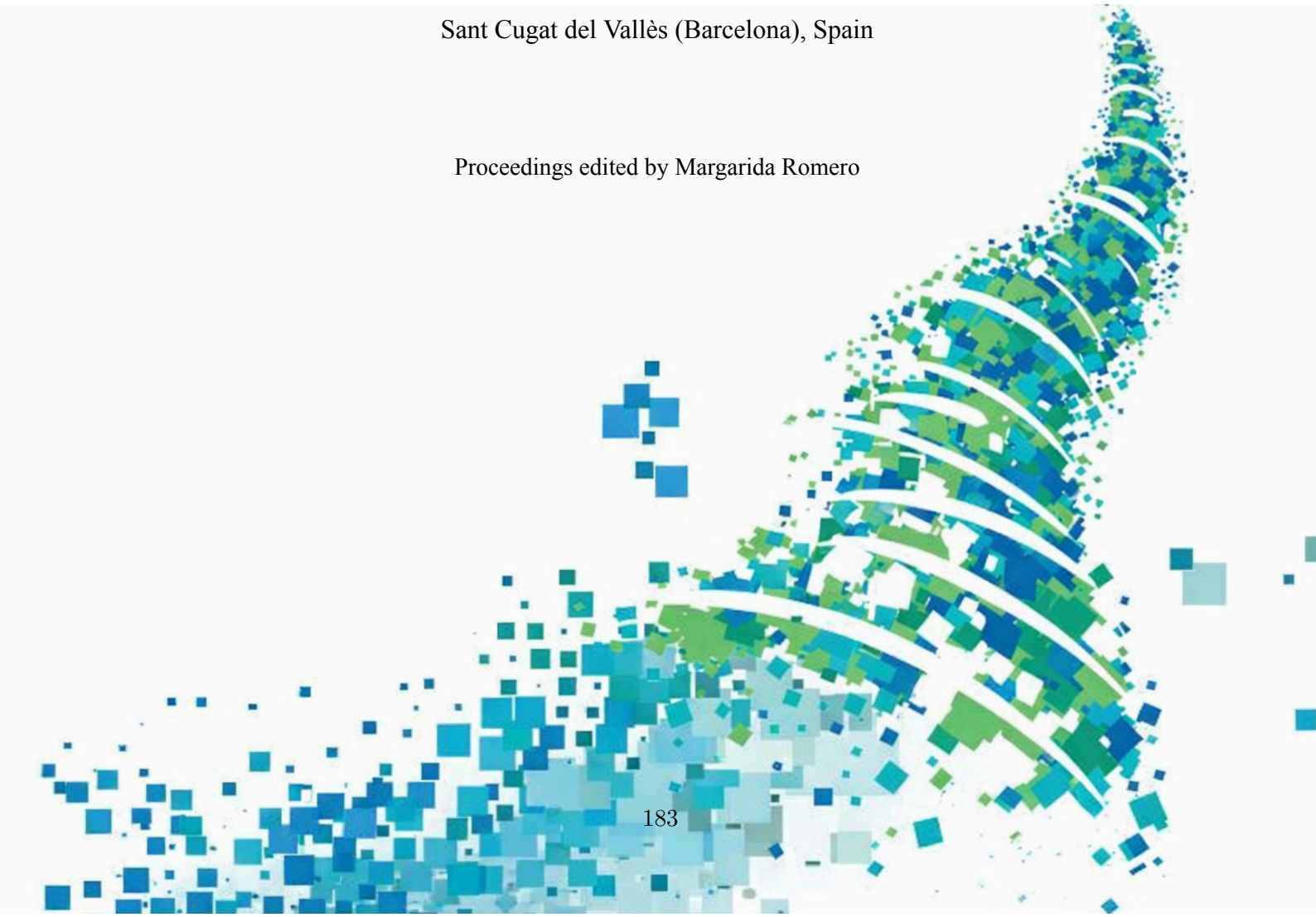

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