# OPEN DIGITAL SPACES AS EMOTIONALLY AWARE LEARNING ENVIRONMENTS: A COLLABORATIVE EXPERIENCE IN TFA PROGRAMS

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**ABSTRACT**
This paper explores the role of open digital spaces in the development of emotionally aware learning environments within initial teacher education programs. The study was conducted within Inclusive Learning Technologies workshops delivered in Italian special education teacher training programs (TFA) and involved 1,500 teacher candidates from different regions of Italy.The research adopted a qualitative action-research approach supported by descriptive quantitative data. Evidence was collected through participant observation, educational digital ethnography, analysis of more than 4,000 digital artifacts, and a final questionnaire consisting of 19 items.The findings highlight a progressive reduction in participants' initial resistance to public sharing, increased active engagement, and the emergence of spontaneous forms of professional collaboration. Psychological safety emerged as a key condition for fostering trust, participation, and collaborative learning.The evidence suggests that digital environments can evolve from simple technological spaces into professional communities of practice when they are intentionally designed as relational contexts grounded in pedagogical care, digital affectivity, and mutual recognition.

**KEYWORDS**
Digital affectivity; psychological safety; communities of practice; teacher education; Universal Design for Learning.

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## 1. Introduction

### 1.1 Education and digital transformation: beyond the technological dimension

In recent years, the spread of digital technologies, collaborative platforms, and generative artificial intelligence systems has profoundly changed the ways in which people learn, communicate, and construct knowledge. In education, these transformations have favored the move beyond models focused exclusively on the transmission of content, promoting approaches geared toward participation, collaboration, and the shared construction of knowledge. However, the literature highlights that technological innovation cannot be interpreted solely as the introduction of new tools. Technologies influence relational dynamics, participation methods, and the processes of constructing professional identity, helping to redefine the very meaning of the learning experience (Selwyn, 2016; Floridi, 2014). From this perspective, the quality of learning depends on the ability to design contexts that foster interaction, belonging, and engagement. Consequently, digital platforms acquire educational value only when embedded within robust pedagogical frameworks.

The spread of artificial intelligence in education opens up new opportunities for personalizing learning and supporting instructional design, but at the same time raises important questions about the role of educational relationships and the human dimension in educational processes (Holmes, Bialik, & Fadel, 2022). In light of these transformations, it seems necessary to move beyond a technocentric vision of educational innovation and focus attention on the social and emotional dimensions of learning. Digital platforms are not simply teaching tools, but environments in which relationships, collaborative practices, and forms of professional belonging develop.

### 1.2 Digital affectivity and emotionally aware learning environments

Digital affectivity draws attention to the role of emotions in online learning, participation, and relationship building (Zembylas, 2015). Social presence and psychological safety offer two related perspectives for interpreting these processes.

### 1.3 Teacher training, professional collaboration and communities of practice

Initial teacher education represents a privileged context for observing the processes through which professional identities, collaborative skills, and knowledge-sharing practices develop.

From this perspective, the theory of communities of practice proposed by Wenger (1998) highlights how professional growth develops through participation in communities that foster comparison, reflection, and mutual learning.

The evolution of digital environments has expanded these possibilities, enabling the construction of distributed professional networks that transcend geographical and institutional boundaries. In this scenario, Siemens's (2005) connectivism interprets knowledge as a phenomenon distributed within networks of people, resources, and digital tools, emphasizing the importance of connections and participation in the collective construction of knowledge.

This study fits within this theoretical framework and explores how an open digital space can transform into an emotionally aware learning environment and a professional community of practice. It analyzes the role of digital affectivity, psychological safety, and professional collaboration in a training experience involving 1,500 TFA course participants distributed throughout Italy.

### 1.4 Research objectives

This study stems from the observation of a phenomenon that emerged during Inclusive Learning Technologies workshops conducted as part of the specialization courses for support activities (TFA): the progressive transformation of an open digital space into a professional community characterized by active participation, spontaneous collaboration, and emotional engagement. In light of the theoretical framework outlined, the research investigates the relationship between digital technologies, affectivity, and professional participation in initial teacher training.

The specific objectives of the study are:

1. Analyze the role of collaborative digital environments in building professional learning communities.
2. Analyze the contribution of psychological safety to the processes of participation, sharing, and collaboration among trainee teachers.
3. Understand how the affective dimension influences the educational experience within open digital environments.
4. Examine the perceived impact of the course on the development of participants' digital, inclusive, and methodological skills.

5. Identify the pedagogical and organizational conditions that favor the transformation of a digital platform into an emotionally aware learning environment.

In line with these objectives, the research was guided by the following questions:

**RQ1.** How can an open digital space foster meaningful professional relationships among teachers who have no prior collaborative experience?

**RQ2.** What role does psychological safety play in participation and sharing within collaborative digital environments?

**RQ3.** To what extent does digital affectivity contribute to the development of a sense of belonging, mutual trust, and professional learning?

**RQ4.** What effects do participants perceive in terms of increasing digital, inclusive, and design skills?

Through the integrated analysis of quantitative and qualitative data, this study aims to contribute to the scientific debate on the relationships between affective education, technological innovation, and teacher training, offering empirical evidence useful for designing learning environments capable of combining participation, inclusion, and professional development.

## 2. THEORETICAL FRAMEWORK

### 2.1 Communities of practice and collaborative professional learning

Community of practice theory (Lave & Wenger, 1991; Wenger, 1998) interprets learning as a social process that develops through participation in shared practices. In digital environments, such communities can overcome geographical and organizational constraints, fostering collaboration, professional exchange, and the collective construction of knowledge. However, the availability of a digital space does not automatically guarantee the emergence of a community of practice, which requires meaningful participation, shared goals, and a sense of belonging.

### 2.2 Connectivism and learning in digital networks

According to connectivism (Siemens, 2005), learning is distributed within networks made up of people, resources, and technologies. Knowledge emerges from the connections between individuals and digital environments and from the ability to access, select, and share meaningful information.

### 2.3 Digital affectivity, social presence and psychological safety

In recent years, there has been a growing focus on the role of emotions and relationships in digital contexts. This perspective finds expression in the concept of digital affectivity, which recognizes emotions as central elements of technology-mediated learning processes (Zembylas, 2015).
In this context, the Community of Inquiry Framework proposed by Garrison, Anderson, and Archer (2000) is particularly relevant. It identifies social presence as one of the fundamental conditions for online learning. The authors define it as the ability of participants to perceive each other as authentic people within a technology-mediated environment, fostering belonging, engagement, and collaboration.
A further theoretical contribution is provided by the concept of psychological safety, developed by Edmondson (1999), which refers to the shared belief that the group provides a safe environment for expressing ideas, doubts, and difficulties without fear of judgment or devaluation.
In the educational setting, this dimension is particularly relevant because active participation often requires sharing one's work and accepting the possibility of making mistakes. When the context is perceived as safe, individuals are more willing to participate, collaborate, and take cognitive risks that are functional to learning.

### 2.4 Teacher digital competence, Universal Design for Learning and inclusive design

The DigCompEdu framework (Redecker, 2017) defines digital competence for teachers as a pedagogical skill that integrates the use of technology, instructional design, inclusion, and professional collaboration. Similarly, Universal Design for Learning (Rose & Meyer, 2002; Meyer et al., 2014; CAST, 2018) promotes educational design capable of responding to student variability through multiple modes of representation, expression, and engagement.

## 3. METHODOLOGY

### 3.1 Research design

This research is based on the qualitative-interpretive paradigm of educational research and adopts an action research approach supported by descriptive quantitative data. This methodological choice stems from the need to understand not only the outcomes of the training process, but above all the relational, collaborative, and emotional processes that develop within open digital environments designed for initial teacher training.

Specifically, the action-research design was structured into four continuous, iterative phases implemented throughout the academic year: (1) Planning, involving the design of the collaborative digital environment (Padlet) and the integration of multimodal tools aligned with UDL principles; (2) Acting, encompassing the implementation of inclusive learning technology workshops where trainees engaged in shared planning and artifact creation; (3) Observing, through digital educational ethnography and participant observation to monitor online interactions and participation patterns; and (4) Reflecting, evaluating emerging relational dynamics, addressing initial digital and emotional fragilities, and progressively refining community support strategies.

Action research and digital educational ethnography have proven to be particularly suitable for observing emerging phenomena within an authentic training context, allowing for the integrated analysis of collaborative practices, online interactions, and knowledge construction processes (Denzin & Lincoln, 2018; Pink et al., 2016).

The integration of qualitative and quantitative approaches allowed us to build a comprehensive understanding of the phenomenon under investigation, enhancing both the interpretative richness of the narrative evidence and the descriptive capacity of the quantitative data collected through the final questionnaire.

### 3.2 Research context

The research was conducted within the Inclusive Learning Technologies laboratories activated in the university specialization courses for support activities (TFA). The training program was designed to promote the development of digital, inclusive, and design skills using collaborative environments and tools for the production of multimodal content. The program took place throughout the academic year and included synchronous and asynchronous activities aimed at shared planning, documenting experiences, and building a professional learning community. A central element of the

process was the use of Padlet as an open and collaborative digital environment. The platform was conceived not as a simple repository of materials, but as a space for meeting, discussion, and collective knowledge construction. Within the environment, participants were able to publish works, share projects, comment on colleagues' contributions, and participate in mutual learning processes.
Padlet has been integrated with several digital tools aimed at inclusive design and multimodal production, including StoryJumper, Book Creator, Canva, Google Workspace, Wordwall, Gamma, Copilot, and generative AI applications.

### 3.3 Participants

The study involved a total of 1,500 students enrolled in specialization courses for support activities.
The participants came from different Italian regions and had diverse professional backgrounds. Their ages ranged from 26 to 55, while their work experience in the education sector ranged from 2 to 15 years.
One of the most notable aspects of the sample was the lack of previous professional relationships among most of the students. Participants came from different educational backgrounds and generally had no prior experience of collaborating with one another.
The information collected during the initial phase of the program also revealed limited familiarity with digital collaborative environments. A significant portion of participants stated they were unfamiliar with Padlet before the training experience and had never publicly shared learning materials in online professional contexts.

**Table 1. Sample characteristics**

| Variable | Description |
|---|---|
| Participants | 1500 students |
| Age range | 26–55 years |
| Professional experience | 2–15 years of service |
| Geographical origin | Northern, Central and Southern Italy |
| Training path | Specialization for support activities (TFA) |
| Previous experience with Padlet | Generally limited or absent |
| Online collaborative experience | Variable, mostly occasional |

### 3.4 Data collection tools

The collection of empirical evidence was achieved through a methodological triangulation strategy that integrated qualitative and quantitative sources to obtain a comprehensive understanding of the participation, collaboration, and learning processes that developed within the digital environment.

Information sources included participant observation of laboratory activities, digital educational ethnography of online interactions, analysis of artifacts produced by students, and the administration of a structured final questionnaire. Participant observation allowed us to document the relational dynamics, participation methods, and forms of collaboration that emerged during the course, while digital educational ethnography allowed us to analyze the communication practices developed within Padlet and the other digital tools used.

Over the course of the experience, over 4,000 digital artifacts were produced, including interactive books, learning units, inclusive activities, multimedia products, storyboards, and lesson plans. The artifacts documented the range of activities carried out in the digital environment and provided examples for the qualitative interpretation of multimodal production, inclusive design, and peer exchange. Their total number indicates the volume of production and should not be interpreted as a direct measure of increased competence.

At the end of the course, an anonymous questionnaire was administered. The instrument comprised 19 items divided into six thematic areas: (1) initial profile and digital skills, (2) experience in the Padlet environment, (3) sharing and collaboration, (4) professional growth, (5) emotional and relational dimensions, and (6) open-ended narrative questions. It included multiple-choice questions, Likert scales, and open-ended items designed to gather perceptions, evaluations, and reflections on the training experience. The questionnaire was administered digitally as the final activity of the workshop and was completed anonymously by all participants involved in the course (N = 1,500). Quantitative results were interpreted using descriptive statistics (frequencies and percentage distributions). The four open-ended questions asked participants to identify the most significant moment of the course, describe how sharing with other teachers influenced their learning, indicate what they would bring into future professional practice, and summarize the experience in three words. The closed questions addressed prior use of Padlet, public sharing of teaching materials, perceived collaboration, professional growth, and emotional and relational aspects of the experience.

### 3.5 Data analysis

The data analysis was developed through an integrated approach.
The information collected through the questionnaire was subjected to descriptive statistics aimed at identifying frequencies, percentage distributions, and general trends relating to participants' perceptions.
The open-ended responses, observations collected during the course, and interactions developed in digital environments were analysed through a *thematic analysis* (Braun & Clarke, 2006). This qualitative procedure was structured across five distinct phases: (1) familiarization with the data; (2) initial content coding; (3) grouping of codes into interpretative categories; (4) identification of emerging themes; and (5) construction of the final interpretative framework. The resulting themes are used to interpret participants' accounts and observed interactions; the number of artifacts produced is reported separately as a description of activity in the environment.

Four main thematic nuclei emerged from the analysis:

- overcoming initial digital fragilities;
- building psychological safety;
- development of professional collaboration;
- development of a sense of belonging.

### 3.6 Ethical considerations

Participation in the study was voluntary. Participants were informed of its educational research purpose. The final questionnaire did not collect names or email addresses, and the quotations included in this article are presented without participants' names.

## 4. RESULTS

### 4.1 Initial profile of participants and starting conditions

The first section of the questionnaire was aimed at exploring the level of familiarity of the trainees with collaborative digital environments and professional sharing practices before starting the training course.
The results highlight an initial situation characterized by limited experience in using collaborative platforms and a reduced habit of publicly sharing teaching materials.

**Table 2:** Initial profile of participants

| Indicator | Percentage |
|---|---|
| Participants unfamiliar with Padlet | 88% |
| Participants who did not use Padlet in their teaching practice | 89% |
| Initial level of basic digital competence | 76% |
| He had never shared any teaching materials publicly. | 84% |

The data highlights limited initial familiarity with digital collaborative environments and a limited propensity to publicly share teaching materials. The testimonies collected confirm that the main resistance was attributable not only to technological factors, but also to fear of judgment and professional exposure. These conditions make the subsequent development of collaborative and participatory practices particularly significant.

### 4.2 Padlet as a learning and participation environment

The second section of the questionnaire analysed the perception of the Padlet environment as a learning and collaborative space.
The evaluations collected show very high levels of appreciation regarding the organization of the environment and its ability to support learning and participation processes.

**Table 3:** Perception of the digital environment

| Perceived size | Positive rating |
|---|---|
| Learning space | 96% |
| Collaboration space | 94% |
| Space for professional discussion | 93% |
| Emotionally positive space | 95% |
| Professional community | 92% |

The collected feedback shows a largely positive perception of the digital environment. Padlet was recognized not only as a learning space, but also as a context for collaboration, professional discussion, and emotionally meaningful participation. Evidence suggests that the quality of the experience was primarily influenced by the relational dynamics that developed throughout the program.

### 4.3 Sharing, Collaboration and Mutual Learning

The third section of the questionnaire was dedicated to the analysis of the sharing and collaboration practices developed by the participants.
The results show how consulting the materials produced by other students represented one of the main learning factors.

**Table 4:** Effects of consulting shared materials

| **Size** | **Percentage** |
|---|---|
| New teaching ideas | 95% |
| Personal reflection | 94% |
| Professional comparison | 93% |
| Motivation | 92% |
| Sense of belonging | 91% |
| Improving your papers | 89% |

Participants reported that consulting shared materials offered opportunities for peer learning, professional reflection, and revising their teaching plans. They also described spontaneous collaborations with teachers from different regions, suggesting that making projects visible to peers may have supported professional exchange.

### 4.4 Professional growth and skills development

The fourth section of the questionnaire explored the perceived impact of the program on participants' professional development. The evaluations highlighted very high levels of growth across all dimensions considered.

**Table 5:** Areas of professional growth

| **Scope** | **Percentage** |
|---|---|
| Inclusive design | 96% |
| Methodological awareness | 95% |
| Digital skills | 94% |
| Using UDL | 93% |
| Professional collaboration | 92% |

| Scope | Percentage |
|---|---|
| Use of AI in teaching | 88% |

Participants perceived improvement in their digital, design, and inclusive skills. They also reported learning that they considered transferable to classroom practice, alongside greater professional self-efficacy and methodological awareness; these outcomes were not measured through direct performance assessments.

### 4.5 Emotional dimension, psychological safety and sense of belonging

The fifth section of the questionnaire explored the emotional dimension of the experience. The findings show very high levels of engagement, trust, and personal development.

**Table 6:** Emotional and relational dimensions

| Size | Percentage |
|---|---|
| Emotional and professional growth | 96% |
| Involvement | 95% |
| Motivation | 94% |
| Mutual support | 93% |
| Trust | 92% |
| Personal development | 91% |

The results highlight the central role of the emotional dimension in the learning experience. Engagement, trust, mutual support, and personal development emerge as elements closely linked to active participation. The testimonials describe an environment perceived as welcoming and supportive of sharing and collaboration.

### 4.6 Emerging themes from the qualitative analysis

The analysis of open-ended responses, observations, and digital interactions allowed us to identify four main thematic clusters.

#### Theme 1. Overcoming initial digital fragilities

Participants describe a journey of progressively gaining confidence in using digital tools and sharing their work publicly. Initial difficulties, related both to technological aspects and to the exposure of their work to the judgment of others, gradually diminish over the course of the training experience.

**Theme 2. Building Psychological safety**

The testimonies highlight the perception of a welcoming and non-judgmental environment, capable of fostering participation, experimentation, and sharing. As one participant states: *"I felt welcomed and protected from the first time I accessed Padlet. There was no sense of being judged, but rather of being supported along the way"*. The perception of a positive relational climate fostered a growing willingness to actively participate and share one's professional experiences.

**Theme 3. Spontaneous professional collaboration**

Numerous episodes demonstrate the emergence of unexpected collaborations, developed through ongoing peer-to-peer collaboration. The public sharing of projects has fostered mutual learning and the construction of distributed professional networks.

**Theme 4. Development of a sense of belonging**

Participants described the transition from an initial state of professional individualism to the sense of belonging to a learning and practice community. One student summed up the experience effectively: *"I felt part of something important, a node in a beautiful human network, and not just a passive recipient"* (Open Response, Section 6). The testimonials highlight how ongoing discussion and mutual support contributed to building meaningful professional relationships.

**4.7 Summary of results**

The integration of quantitative and qualitative data highlights three main findings. First, the process helped overcome initial resistance related to both digital competence and professional sharing. Second, participants described a welcoming climate alongside opportunities for participation, collaboration, and mutual learning. Finally, the digital environment gradually took on the characteristics of a professional community of practice, in which technology

served as a mediating force and relationships were the primary driver of engagement and professional growth.

## 5. DISCUSSION

### 5.1 Beyond technocentrism: the role of relationships in digital environments

One of the most relevant findings concerns the relationship between technology and participation. The participants' accounts suggest that the availability of digital tools alone did not explain their experience of collaborative learning and professional exchange. In this setting, meaningful participation was described alongside a pedagogical design oriented toward relationships.

This finding appears consistent with Selwyn's (2016) argument, according to which educational technologies do not automatically produce innovation, but rather acquire value based on the practices that guide their use. Similarly, Rivoltella (2017) highlights how technologies can become authentic community technologies when designed as devices for connecting people and not as simple containers of content.

The results of this study confirm this perspective. Padlet was not perceived by participants as a platform for submitting papers, but rather as a shared space for building relationships, engaging in discussion, and learning from one another. The transformation of the digital environment into a professional community therefore appears to depend not on the technical characteristics of the tool, but on the quality of the interactions it enables.

### 5.2 Psychological safety and professional participation

A second particularly relevant result concerns the role of psychological safety in participation and collaboration processes.

The initial situation described by the participants was characterized by concerns related to the visibility of their work, fear of judgment, and a perceived inadequacy with respect to their digital skills. These findings are consistent with the literature describing the teaching profession as a context in which the public sharing of practices can be experienced as a potentially risky form of professional exposure (Hargreaves, 1994).

Over the course of the experience, these resistances gradually diminished. Participants began publishing materials, commenting on their colleagues' work, and increasingly spontaneously seeking feedback. This change appears closely linked to the creation of a climate perceived as welcoming and non-judgmental.

Edmondson's (1999) reflections allow us to effectively interpret this phenomenon. According to the author, psychological safety encourages participation because it reduces the fear of negative consequences associated with the expression of ideas, doubts, and errors. When people perceive the group as a safe environment, they are more willing to share their contributions and collaborate with others.

Participants' accounts can be interpreted in the light of Edmondson's concept of psychological safety. They describe trust and freedom from judgment alongside sharing and participation. The present study does not isolate psychological safety as a causal factor, but suggests that it is a relevant dimension to consider when designing collaborative digital learning environments.

Subsequent literature has confirmed the relevance of psychological safety in organizational and educational contexts, highlighting its contribution to learning, collaboration, and innovation processes (Edmondson & Lei, 2014).

### 5.3 Digital affectivity and social presence

The evidence collected attributes a central role to the affective dimension of the educational experience.

Participants' testimonies show how the program was experienced not only as an opportunity for technical and methodological learning, but also as an experience characterized by engagement, mutual recognition, and a sense of belonging. This finding is particularly significant given that it took place within a predominantly digital environment.

Zembylas (2015) reflections allow us to interpret these findings through the concept of digital affectivity. From this perspective, emotions are not a marginal component of online interactions but actively contribute to the construction of the educational experience. Motivation, trust, belonging, and mutual recognition influence participation and the quality of learning.

The Community of Inquiry Framework (Garrison et al., 2000) also offers a useful interpretative key. The authors identify social presence as one of the essential conditions for online learning, emphasizing how people participate more actively when they perceive other community members as authentic and accessible.

The results of this study seem to confirm this perspective. Participants frequently describe Padlet as a community, not just a platform. The relationships built throughout the process fostered sharing, mutual support, and active participation, contributing to the creation of an environment perceived as meaningful on both a personal and professional level.

This evidence suggests that the quality of relationships is an essential component of online learning and that digital affectivity should be considered a central dimension in contemporary educational planning.
The findings can also be interpreted considering the caring pedagogy proposed by Noddings (1984, 2012), according to which the quality of educational relationships is an essential condition for learning and personal development. From this perspective, the educational act is not based solely on the transmission of content, but on the construction of relationships characterized by listening, mutual attention, and recognition of others. Participants' testimonies highlight how the climate of acceptance, mutual support, and appreciation of differences fostered active participation and a willingness to share. This evidence suggests that pedagogical care can also be a central dimension in digital environments, contributing to the construction of professional communities based on trust, collaboration, and a sense of belonging.

### 5.4 From learning communities to communities of practice

The research results also allow us to interpret the observed experience through Wenger's (1998) theory of communities of practice.
The digital environment analysed gradually took on the characteristics of a professional community in which participants did not simply carry out assigned tasks, but developed autonomous forms of collaboration, sharing, and knowledge construction.
The production of over 4,000 digital artifacts, the high frequency of consultation of shared materials, and the spontaneous emergence of collaborations between students from different regions are significant indicators of this process. The observed learning appears closely linked to active participation in the community and the opportunity to engage with different practices.
These dynamics can also be interpreted through the connectivist perspective proposed by Siemens (2005). The digital environment offered a distributed network in which participants could exchange resources and ideas. Their accounts describe connections with peers and opportunities for collective professional reflection; the study did not measure the independent effect of those connections on learning.
From this perspective, the training program can be interpreted as an example of a distributed community of practice, in which professional learning develops through participation in a collaborative network supported by digital technologies.

### 5.5 Implications for initial teacher training

The findings from the research offer some relevant insights for designing teacher training programs.
First, the findings suggest the need to move beyond training models that focus exclusively on the acquisition of technical skills. Digital teacher competence, as highlighted by the DigCompEdu framework (Redecker, 2017), encompasses pedagogical, collaborative, inclusive, and relational dimensions that require training experiences geared toward active participation and community building.
Second, the importance of designing environments that foster psychological safety and mutual recognition emerges. The willingness to share one's work and collaborate with others appears closely linked to the perception of being in a welcoming and non-judgmental environment.
Finally, the research highlights the potential of open digital environments for building distributed professional networks. The opportunity to engage with teachers from diverse backgrounds fosters the expansion of professional perspectives, the dissemination of innovative practices, and the development of collaborative skills, which are increasingly relevant in contemporary schools.
Taken together, these findings suggest that initial teacher training can particularly benefit from designing digital environments that integrate technological innovation, inclusion, affectivity, and professional community building.

## 6. LIMITATIONS OF THE STUDY AND FUTURE PROSPECTS

### 6.1 Limitations of the study

Like any research developed within authentic educational contexts, this study also has some limitations that must be considered when interpreting the results and their transferability to other contexts.
A first limitation concerns the nature of the sample. Although the number of participants involved is particularly large and includes teachers from different geographical areas of Italy, the sample was not selected using probabilistic procedures. The results must therefore be interpreted with reference to the specific context of the specialization courses for support activities and cannot be automatically generalized to the entire teaching population.
A second issue concerns the prevalent use of data based on participant perception. The information collected through the questionnaire describes how participants interpreted and experienced the training experience, but it does not allow for direct measurement of actual, objective changes in

professional skills. Therefore, the dimensions relating to digital, methodological, and collaborative growth must be strictly interpreted as indicators of perceived change and self-reported efficacy rather than objective performance measurements.
The lack of a control group should also be considered. The study focuses on an in-depth analysis of a real-world educational experience and does not compare different training models or groups subjected to different experimental conditions. Therefore, it is not possible to exclusively attribute the observed results to the use of Padlet or to the individual digital tools employed during the program.
Finally, this study focuses primarily on the participants' perspectives and does not include longitudinal measurements that could verify the persistence of the observed effects over time. Therefore, it is not possible to establish with certainty whether the collaborative practices and professional relationships developed during the program continued to produce significant effects after the training experience concluded.

### 6.2 Future research perspectives

Despite the limitations highlighted, the results that emerged open up interesting prospects for further study in educational research.
A first direction involves a longitudinal study of the professional communities generated within collaborative digital environments. It would be particularly relevant to examine whether the professional relationships and collaborative practices developed during training programs continue to strengthen over time and to what extent they influence teachers' teaching practices after their university experience concludes.
A second perspective concerns the relationship between digital affectivity and generative artificial intelligence. The growing diffusion of AI-based tools in educational settings necessitates understanding how these technologies can support processes of collaboration, professional reflection, and inclusive planning without compromising the quality of educational relationships.
Taken together, these perspectives suggest the need to continue exploring the relationships between digital technologies, educational relationships, and the affective dimension of learning, contributing to the construction of educational models capable of combining technological innovation and the centrality of the person.

## 7. CONCLUSIONS

The growing diffusion of digital technologies and artificial intelligence in educational settings requires reflection not only on the potential of these tools, but also on the relational and emotional conditions that enable meaningful learning.

This study explored the role of open digital spaces in building emotionally responsive learning environments within initial teacher education. The evidence collected shows that the mere availability of collaborative technologies is not enough to foster participation and shared learning. These processes emerge when digital environments are designed as relational contexts capable of fostering trust, mutual recognition, and collaboration.

Participants described trust, mutual support, and a sense of belonging within the digital environment. These perceptions suggest the relevance of psychological safety and digital affectivity to the training experience, without demonstrating that either dimension caused changes in participation or professional competence.

From a pedagogical perspective, the findings suggest the need to move beyond a purely technical conception of digital competence in teachers. The ability to design inclusive, collaborative, and emotionally aware environments is now an essential component of teaching professionalism. From this perspective, technology takes on educational value when it contributes to supporting meaningful relationships and shared knowledge-building processes. Finally, while recognizing that these insights are grounded in participants' self-reported perceptions rather than direct causal proofs, they offer valuable empirical foundations for future research and inclusive teacher education design.

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