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Biographical repair in science teacher education: the role of guided reflective writing

Abstract

Research on teacher education has documented that biographical experiences shape teachers' conceptions and pedagogical practices, yet there remains a limited understanding of the mechanisms by which adverse experiences are transformed into inclusive pedagogies. This study analyzes the trajectory of a pre-service chemistry teacher in Argentina through a guided reflective writing device, with the aim of understanding how experiences of academic failure, frustration, and exclusion during her previous university studies were transformed into deliberately reparative pedagogical strategies in her teaching practice. A qualitative instrumental case study design was adopted, with a 6,500-word reflective text produced by the resident serving as the empirical data for her practicum final assignment. The analysis was grounded in Bernard Charlot's theory of the relation to knowledge (epistemic, identity, and social dimensions) and in literature on biographical repair. The findings reveal a process of conscious transformation in which experiences lived as failure and as a weakening of academic self-efficacy are reconfigured into an explicit commitment to generating learning experiences that are more supported, safe, and meaningful. Three psychological constructs mediated this process: determination, reconstructive self-efficacy, and pedagogical empathy. The structured reflective writing device, combined with dialogic guidance, facilitated connections among biography, theoretical frameworks, and practice, going beyond mere descriptive reflections. The study provides empirical documentation of the mechanism of biographical repair in science teacher education in a Latin American context, suggesting that accompanied reflective devices can catalyze productive identity transformations in contexts marked by unequal educational trajectories.

Keywords: biographical repair, initial teacher education, reflective writing, science education, relation to knowledge

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Introduction

Research on teacher education has established that prospective teachers' school biographies significantly shape their conceptions and pedagogical practices (Zeichner & Gore, 1990).[1] Experiences lived as students—both positive and adverse—operate as "lenses" through which pre-service teachers interpret what it means to teach and what kind of teachers they aspire to become.[2] Although these studies document which biographical experiences influence teachers' conceptions, they predominantly focus on describing these influences rather than on the specific mechanisms of transformation. For example, recent narrative studies describe teachers' formative experiences[3,4] but do not examine in depth how those experiences are translated, in operational terms, into concrete pedagogical decisions or which psychological and reflective processes mediate that conversion. However, there remains a limited understanding of the specific mechanisms through which these biographical experiences are transformed into conscious pedagogical decisions,[5,6] particularly when they involve adverse experiences of failure, feelings of devaluation, or forms of academic exclusion documented in the literature.

Recent studies have begun to conceptualize this phenomenon as "biographical repair": the process through which pre-service teachers turn traumatic experiences into pedagogies deliberately oriented toward not reproducing that pain.[7,8,5] However, this body of work primarily comes from Anglophone contexts and focuses on disciplines such as mathematics and physical education. The field of science education in Latin America remains underexplored, even though unequal educational trajectories and academic cultures that may normalize frustration are particularly prevalent in university classrooms in the region's "hard" sciences.[9]

This study analyzes the trajectory of a pre-service chemistry teacher in Argentina through a guided reflective writing device. Its objective is to understand how adverse experiences in her previous university education were transformed into inclusive pedagogical strategies during her teaching practice. The analysis is grounded in Bernard Charlot's theory of the relation to knowledge (2000, 2008),[10,11] which enables exploration of the epistemic, identity, and social dimensions of this transformative process.

Theoretical framework

The relation to knowledge: An approach based on Bernard Charlot

Bernard Charlot's perspective on the relation to knowledge offers a valuable framework for understanding how pre-service teachers build professional identities from complex educational paths. For Charlot[10,11] learning is not just about accumulating content. It involves forming a relationship with knowledge (epistemic), with one's own sense of self (identity), and with others (social).

The epistemic dimension refers to the ways in which the subject appropriates knowledge: it may involve mastering an activity (knowing how to do something), appropriating a cultural object (knowing about something), or constructing meaning about the world. What is crucial here is that knowledge exists only insofar as it is mobilized by the subject in a situated activity. Recent studies in science education show that the epistemic relation to disciplinary knowledge varies markedly across teaching contexts and the positions occupied by the subject.[12,13] For pre-service science teachers, this dimension becomes particularly complex because they must move from a relation to science as students to one as an object of teaching.

The identity dimension implies that learning also involves constructing an image of oneself. Each piece of knowledge appropriated—or not appropriated—says something about who the subject is. Lutovac and Flores[14] show that experiences of academic failure strongly shape teachers' identities, especially when such failures are experienced as questioning their own capability. Avraamidou[15] documents how science teachers' "identity trajectories" are constructed over time, weaving together school, university, and professional experiences into narratives that confer biographical coherence.

The social dimension means that learning always involves others. Teachers might enable or block learning, classmates support or compete, and families value or devalue achievement. Abacioglu et al.[16] show that teachers' multicultural knowledge is rooted in relationships with diverse people. Yerrick et al.[17] find that students from marginalized backgrounds build scientific knowledge through shared social ties that enrich learning. Charlot's view is powerful for teacher education studies because these three dimensions cannot be separated. Kayi-Aydar[4] argues that teacher identity forms from life, work, and relationship paths simultaneously. Each pedagogical choice—what content to teach, how to handle error, what classroom climate to build—reflects the teacher's epistemic relation, self-image, and the people who shaped them as students and continue to shape them as teachers.

School biography, biographical repair, and reflective devices in teacher education

The identity and social dimensions of the relation to knowledge, as proposed by Charlot, are constructed along educational trajectories in which significant others—teachers, peers, institutions—shape how the subject sees them self and what kind of learner/teacher they aspire to become. Research on teacher education has systematically documented this biographical influence: here, 'school biography' refers to the cumulative set of experiences lived as a student (positive or negative) that impacts future pedagogical conceptions and practices (Zeichner & Gore, 1990).[1] Lortie coined the term "apprenticeship of observation" to describe the process through which pre-service teachers, often implicitly, internalize models of what it means to teach, across thousands of hours as students.

Recent studies in science education confirm this pattern. Kitchen et al.[12] show that secondary school experiences, especially exposure to "inspiring teachers"—who motivate and support students—or to "antimodels"—teachers whose negative behaviours serve as examples to avoid—strongly influence career choice and teacher identity. Song[2] demonstrates that school memories can serve as "antimodels" when critically reflected upon: teachers with negative experiences may deliberately create opposite practices. This possibility of transformation—rather than repetition—depends on critical biographical reflection.[3,4]

A specific mechanism of biographical transformation that recent literature has begun to conceptualize is biographical repair: the process through which pre-service teachers turn personal experiences of failure, feelings of injustice, or forms of devaluation and academic exclusion—as described by Esping,[7] Dobbins,[8] and other studies—into pedagogical strategies deliberately oriented toward preventing their students from living similar experiences. Esping[7] introduces the archetype of the "wounded healer" to describe teachers who transform their experience of trauma or exclusion into motivation for empathetic and reparative teaching. Dobbins[8] documents that teachers who have overcome academic difficulties develop three distinctive attributes:

determination (persistence in the face of challenges), reconstructive self-efficacy (a belief in their ability to teach differently from how they were taught), and a tendency to set high expectations and to build affective relationships with students. These characteristics do not emerge spontaneously, but through reflective processes in which adversity is re-signified as a source of pedagogical knowledge.

Wilson and Kittleson[6] draw a crucial distinction between "educative struggle," which fosters growth because the subject maintains agency, and "debilitating struggle," which erodes self-concept and leads to withdrawal. This distinction helps explain why not all teachers who have experienced difficulties develop reparative pedagogies: it depends on how those experiences were subjectively lived and subsequently reflected upon. Wrench and Garrett[5] identify that transforming failure into a pedagogical resource requires specific conditions: safe spaces for constructive reflection, support from mentors who legitimize the emotional experience while also offering interpretive challenge, and conceptual frameworks that allow adversity to be reinterpreted as learning. Without these supports, failure tends to sediment as shame (Desbiens et al., 2019). Latin American literature adds critical dimensions: López and Linares,[9] for example, show how biographical experiences of discrimination inform justice-oriented pedagogies in Chile.

In this context, structured reflective writing emerges as a central device for facilitating biographical repair in teacher education. Fraser et al.[18] designed an experience–theory–expectations framework to scaffold reflective writing, showing that students initially produce "mere descriptions of experience," but that structured frameworks promote "discursive depth" by connecting theory with practice. Hagan and Magennis-Clarke[19] report similar developmental processes: students progress from superficial to critical reflections when they receive structured scaffolding and iterative feedback. Kosmidou and Sfyroera (2023) identify dialogic feedback with tutors or peers as a "cornerstone" for deepening reflection, transforming visceral experiences into conscious pedagogical knowledge.

Methodology

This study adopted a qualitative instrumental case study design,[20] focusing on the trajectory of a pre-service chemistry teacher during her practicum. The case was purposefully selected because it presented theoretically relevant characteristics: a student with a complex academic trajectory that included changing degree programs and experiencing significant academic difficulties, elements that the literature identifies as potentially productive for exploring processes of biographical repair.[6,7]

The study was conducted within a chemistry teacher education program at a national university in Argentina during the second semester of 2024. The participant, referred to as Florencia (pseudonym), was in the final year of the chemistry teacher program and was completing her practicum in a public secondary school. Florencia was 24 years old and had a prior academic trajectory that included incomplete studies in two other university programs related to chemistry before entering the teacher education program. This history of moving between programs was one of the key criteria for her selection.

For this study, an academic trajectory was operationally defined as complex when it presented at least three of the following markers: (1) interruption or change of degree program due to non-vocational factors;[21,8] (2) structural academic disadvantage, evidenced by gaps between prior preparation and institutional expectations attributed to contextual factors;[6] (3) episodes of frustration and questioning of

one's own academic capability in which the person was invalidated in their right to belong in the academic space;[22] (4) disciplinary tension, manifested as an affective deterioration of the relation to the discipline;[23] and (5) an extended time frame for completing the program or the need for additional compensatory resources.[22] Linear trajectories may involve isolated challenges, but they lack the accumulation of structural and affective factors that characterize complexity.[5] Florencia met all five markers, positioning her as a paradigmatic case for analyzing processes of biographical repair.[7]

The central empirical data consisted of a reflective text written by Florencia as her practicum final assignment. To guide this writing, a structured protocol organized into four reflective axes was designed, drawing on validated frameworks for promoting critical reflection in teacher education.[24,5]

The guide structured reflection into four thematic axes with specific prompting questions. Axis 1: Reconstruction of one's own history as a knowing subject. Explored significant experiences during secondary school and university education, with questions such as: How would you describe your personal relationship with chemistry during your education? Were there moments when this relationship became strained or changed? What generated pleasure or desire for you when studying chemistry? Did you feel part of the "world of science" or did you see it as something distant? Axis 2, The transition to and present of the teaching role, invited reflection on transformation through teaching: How has your relationship with chemistry changed since you started teaching? Which experiences have marked your first steps as a teacher? What tensions do you feel between the "academic chemistry" you know and the "school chemistry" you have to construct? Axis 3, Projection and transformation of future practice, connected biography with pedagogical decisions: In light of your own history, what kind of relation to chemical knowledge would you like your students to construct? If you had to design a learning experience on a topic you found difficult, what would you do differently? Axis 4, Metareflection, promoted awareness of the reflective process itself: Which questions generated the most discomfort for you? What emotions emerged during this writing? Do you notice any pattern or assumption in your responses about what it means to "teach well"?

This device sought to overcome the documented tendency of students to produce merely descriptive reflections[19] by providing conceptual scaffolding to connect lived experience, theoretical frameworks, and projected future action. The guide was distributed three weeks in advance, and two dialogic support meetings were offered before the final submission, following the model of iterative feedback identified as essential in the literature (Kosmidou & Sfyroera, 2023).

The final text produced by Florencia was approximately 6,500 words long and was organized into four sections corresponding to the proposed axes. The text combined a chronological narrative of her trajectory with a reflective analysis of concrete pedagogical decisions made during the practicum, including descriptions of specific classroom situations and excerpts from dialogues with students. The two dialogic meetings (45 minutes each) were held in weeks 2 and 3 after the guide was distributed. During these meetings, expectations were clarified, examples of deep versus descriptive reflection were shared, and Florencia's anticipated difficult experiences were emotionally validated. For example, a superficial reflection ("the lab class went well") was contrasted with a deeper one ("students' initial frustration at not obtaining the expected result in the titration made me recall my own difficulty with experiments in one of my previous degree programs; this led me to adapt my explanation, emphasizing

that experimental errors are part of the process and linking this to the epistemic dimension of learning by doing"). Conceptual scaffolding was provided through questions such as: How can Charlot's dimensions (epistemic, identity, social) help you reinterpret that university experience? In what ways does a difficulty you faced as a student inform a specific pedagogical decision you made in the classroom?

The analysis adopted Bernard Charlot's theory of the relation to knowledge (2000, 2008)—with its three dimensions, epistemic, identity, and social—as the main conceptual framework. This framework was not applied as a set of rigid a priori categories, but as sensitizing concepts[25] that oriented interpretive reading. The coding process generated specific categories for each of Charlot's dimensions. For the epistemic dimension, codes such as fascination mediated by the desire to know (experiences of autonomous library research), loss of disciplinary meaning (theory–practice disconnection at university), and re-signification through teaching (chemistry making sense when contextualized) emerged. For the identity dimension, codes included shame due to not knowing ("fear of asking in case I got scolded"), self-efficacy crisis ("I did not have the abilities for the degree"), identity reconstruction (transition to teacher education), and reparative project ("being the kind of teacher I would have liked to have"). For the social dimension, codes such as invalidating others (teachers who assumed prior knowledge), enabling mentors (teacher educators who legitimized emotions), and reparative reciprocity (an autistic student expressing comfort) were identified. The three readings operated as follows: the first, holistic reading identified 23 emotionally dense passages; the second applied these categories systematically; the third established causal connections between codes, generating the interpretation of the biographical repair mechanism.

Rigour was strengthened through four strategies:[26,27] member checking with the participant on preliminary interpretations; thick description with direct textual evidence; and researcher reflexivity. Reflexivity was exercised through an analytical journal in which the researcher documented: (1) personal emotional reactions to passages in Florencia's text that resonated with the researcher's own formative experiences, making explicit how these could bias interpretation; (2) the teacher educator's pedagogical assumptions that might be projected onto the data (e.g., a prior positive valuation of "reparative" pedagogies); and (3) the tension inherent in the dual role, given that the reflective text was simultaneously an evaluative practicum assignment and a research instrument. To mitigate social desirability bias, it was emphasized in the dialogic meetings that the goal was reflective depth—not telling the "right story"—and negative experiences were emotionally validated without pressuring for predefined interpretations. Member checking with the participant on preliminary interpretations enabled the researcher to identify two instances in which the researcher had overinterpreted causal connections that Florencia did not recognize as such, prompting adjustments to the analysis.

Analytical memos documented key interpretive decisions, including justifications for the inclusion or exclusion of passages (e.g., why an episode of changing degree programs was coded as "identity dimension" and not only as "biographical-descriptive"), the evolution of categories (the initial code "academic shame" was refined to "shame as an identity emotion" after identifying its function in constructing the self), and unresolved interpretive tensions (e.g., to what extent "repair" was conscious versus an emergent, partly unconscious process). A colleague with experience in narrative analysis reviewed a sample of five memos and their associated textual excerpts, pointing out two instances in which the categories required

stronger empirical justification, prompting a revisit of Florencia's text and refining the coding.

The study was conducted within the framework of routine formative relationships in the teacher education program, where reflective writing is part of the evaluation process. Specific informed consent was obtained to use the text for research and academic dissemination purposes. Florencia was informed about the purpose of the study, the use of a pseudonym to preserve anonymity, and her right to withdraw consent at any time.

Analysis and findings

The text produced by Florencia is characterized by remarkable openness in narrating painful episodes from her academic trajectory. It is uncommon for pre-service teachers to disclose, with such explicitness, moments of identity rupture, feelings of incapacity, or decisions experienced as failures. This narrative honesty constitutes an important interpretive condition: Florencia writes from a place of relative safety, allowing her to revisit adverse experiences without excessive defensiveness, thereby facilitating the deep reflective analysis that characterizes her text.

The analysis is organized according to the three dimensions proposed by Charlot—epistemic, identity, and social—although it should be noted that, as Charlot himself insists, these dimensions are deeply intertwined. Separating them is an analytical exercise that should not obscure the fact that, in Florencia's lived experience, they operate as an inseparable whole.

Epistemic dimension: When chemistry makes sense, loses it, and finds it again

Florencia's relation to chemical knowledge goes through at least three clearly distinguishable moments, although these are not closed stages but rather configurations that gradually sediment and transform.

The first moment, situated in her early years of secondary school, is marked by what could be called fascination mediated by the desire to know. Florencia vividly recalls a Natural Sciences teacher whose "way of talking and explaining phenomena and/or concepts was very engaging." What is interesting here is not only the enthusiasm that the subject generated in her—something that could be attributed to a personal disposition—but the type of activities the teacher proposed and that Florencia interprets as "different." It is worth dwelling on one of these activities because it condenses something central about her relation to knowledge at that time. She recounts that she did not have a computer at home, so she had to go to the library every morning to look for information in books. She describes:

> "Most of the time, I found a lot of information on a given topic, but in different books, so the action of searching for the content that 'worked for me' in each book and bringing it together to write it in my notebook became an everyday practice for me. This generated my enthusiasm to want to know more and to keep searching in all the remaining books, because it could happen that another book had more information, and therefore I could learn something else."

This excerpt condenses a relation to knowledge that Charlot would characterize as active appropriation: Florencia is not simply copying information, but engaging in an intellectual task of selecting, comparing, and synthesizing. What is crucial is that this activity gives her pleasure—"it made me feel very good"—and a sense of autonomy: "on my own I was able to meet my academic goals, and this allowed me to gain confidence and security." Here, learning appears as the mastery of an activity (searching, comparing, synthesizing) rather than the mere assimilation of knowledge-objects. And this activity is invested with desire because it returns to her an image of herself as someone capable.

The second moment, in the final years of secondary school, introduces an interesting nuance. Teaching becomes "quite propedeutic," centred on explanation at the board and on solving exercises and equations. Florencia notes that "this was not a problem for me because I was really fascinated by the subject and I did not mind spending hours doing exercises." Something different is operating here: pleasure no longer comes from the activity of searching and constructing, but from the knowledge-object itself. Chemistry, as a discipline, has become something that fascinates her in its own right, almost independently of how it is taught. However, Florencia introduces an important critical reflection: "after everything I have experienced up to now, I do not agree at all with that way of doing chemistry." This critical distance is significant: she can tolerate—and even enjoy, to some extent—mechanical teaching because she has already built her own sense of the discipline, but she recognizes that this way of teaching "left behind those students who did not participate or did not show interest."

The third moment is undoubtedly the most critical and marks a deep rupture in her relation to chemical knowledge. During her years in a first-degree program and later in a second-degree program, Florencia experiences what could be described as a loss of meaning. The content is perceived as "totally new and complex," the pace as "too fast," and something devastating appears: "I was not managing to internalize the content, and I also could not easily connect it with the lab practicals." This disconnection between theory and practice, between abstraction and concreteness, is particularly relevant in chemistry, a discipline that constantly operates at the submicroscopic level and requires considerable cognitive effort to construct mental models. Yet what truly strains her relation to knowledge is not only the epistemic difficulty but also the associated social experience: feeling at a disadvantage compared to classmates who had already seen that content in secondary school and to teachers who took for granted prior knowledge she lacked. Chemistry, which had been a source of pleasure and confidence, becomes a source of anxiety and a sense of incapacity.

A fourth moment then emerges—or, more precisely, a moment of re-signification—which coincides with her entry into the teacher education program. Florencia expresses this with striking clarity: "I fell in love with chemistry again when I discovered the wonderful world of teaching it." What kind of shift takes place here? It is not that academic chemistry suddenly becomes easier or more accessible. Rather, her epistemic relation to knowledge changes radically when it is placed within a new horizon of meaning: teaching it. Florencia discovers that "beyond having always been part of my trajectory, [the teacher education courses] helped me regain confidence in myself as a student and as a future teacher." She adds something crucial: "chemistry made sense again when I was able to understand it through everyday phenomena and see its applications, situations that I had not experienced in previous courses and that I now consider essential."

This reveals something fundamental about her conception of school chemical knowledge: meaning does not reside in theoretical abstraction per se, but in the possibility of anchoring concepts in everyday life, in what students can "see," touch, and link to their own experience. This conception directly informs her pedagogical decisions. Florencia recounts, for example, how she began a lesson on charges and electric forces with the phenomenon of lightning: "I

asked them to watch a very short video about a lightning strike in a nearby town so we could analyze its consequences and relate these to what they thought or already knew." Only after establishing this connection with the real did she proceed to explain the theoretical concepts. Her declared goal is that students should always be able to answer the question "What is this for?"

This transformation in her relation to chemical knowledge seems to exemplify what Charlot argues: the multiplicity of meanings that the same knowledge can acquire depending on the subject's position and the activities in which that knowledge is embedded. For Florencia, as a student in her earlier degree programs, chemistry was a set of abstract, decontextualized contents that she had to master under the pressure of accelerated pacing and comparison with better-prepared peers. For Florencia, as a future teacher, chemistry is knowledge that must be translated, contextualized, and made meaningful for others. And paradoxically, it is in this work of translation that she herself recovers its meaning.

Identity dimension: from shame to repair

If the epistemic dimension speaks about Florencia's relation to chemical knowledge, the identity dimension speaks about how that relation shapes—and is shaped by—the image she constructs of herself. Her narrative is traversed by experiences of rupture and pain that are fundamental for understanding the kind of teacher Florencia is becoming.

The most intense point of identity crisis occurs during one of her previous degree programs. Florencia describes starkly the impact of realizing that she had an "academic disadvantage" compared to classmates who had attended higher-performing schools: "The truth is that realizing the academic disadvantage I had compared to others had a very strong and negative impact on me." What is most relevant here is not only the recognition of a knowledge gap but the identity effect it produces. Florencia begins to doubt her abilities: "I started to feel a lot of frustration and that I did not have the abilities to complete the degree."

There is one episode that condenses the emotional dimension of this crisis. Florencia recounts that in a seminar, she asked about an exercise she could not solve, and the professor replied, "That I should already know that because it was covered in secondary school." Florencia's reaction is telling: "I felt very uncomfortable and bad in that situation, because I really had not seen it at school." And this is repeated: "Similar situations happened several times, so I reached the point of being afraid or ashamed to ask anything in case I got 'told off'."

Shame is an identity emotion par excellence: it involves a perception of inadequacy relative to a social norm or expectation. Florencia internalizes the idea that she "should know" things she does not know and, instead of reading this as a problem of the educational system that trained her, she reads it as a personal problem. The result is withdrawal: she stops asking questions and isolates herself in her difficulty. She ultimately decides to leave the degree program. What is interesting is how she makes sense of that decision in retrospect:

> "This decision was very difficult for me because throughout my school years I had always done very well, and since I was not getting such good results in the degree, I began to feel a lot of frustration and that I did not have the abilities to complete it. In addition, the decision also affected me because of my parents, since although I never received any pressure from them, I felt that I had let them down."

Here we see at work what Charlot calls the identity dimension of learning: it is not only about acquiring knowledge, but about constructing a certain image of oneself. For Florencia, being a "good student" was part of her identity, and not achieving this at university confronts her with a painful question: Who am I if I am not capable of this?

However, Florencia's trajectory does not end there. There is a turning point that she herself clearly identifies: when she decides to switch to the teacher education program. Here, the voice of her mother appears, telling her: "That's great! I always knew you had a teacher's soul, but I never said anything because it was your decision." This external recognition—"teacher's soul"—allows Florencia to reconnect with practices she had always carried out but had not understood as part of a possible professional identity: "Since I was very young, I always explained or helped friends, my brother, cousins, etc., to solve tasks or prepare subjects."

It is interesting to note how Florencia reflects on this: "How did I never realize that this was what I really liked?" Her answer is meaningful: "When I finished secondary school, I was too young to really think clearly and decide among so many degree options; I also think that at that time I did not have the tools or the ability to search for appropriate information about them." There is an understanding here that constructing a professional identity is a process, not a sudden revelation.

What follows is a progressive rebuilding of confidence. Florencia states this explicitly: the teacher educators "helped me regain confidence in myself as a student and as a future teacher." More importantly, that history of pain and reconstruction is translated into a pedagogical project centred on repair. She articulates it with striking transparency:

> "It is interesting how with one question I can continue reflecting and, even more, find the origin of the feeling expressed in my own biography. The truth is that the pleasure of seeing others' progress arises as a way of 'repairing' or re-signifying my own experiences of frustration and loneliness as a student. On the other hand, I feel that being the teacher I would have liked to have is the central source of my professional satisfaction."

This phrase -"being the teacher I would have liked to have"- is perhaps the keystone of her emerging teacher identity. It is not a rhetorical formula: Florencia sustains it through very concrete pedagogical decisions that run throughout her narrative. When she describes how she reacts to a student's mistake, she explains: "When a student makes a mistake, I do not highlight the error from a negative perspective; instead, I use it and build on it to strengthen the content." When she talks about students who obtain "poor results," her approach differs radically from what she herself experienced: "I go up to them and explain the mistakes they made, encouraging them to see these as an opportunity for learning. I also tell them that a single result does not determine their abilities."

There is one anecdote that almost perfectly condenses this operation of reparative reciprocity. Florencia recounts that an autistic student, after managing to participate aloud in class over many lessons, one day called her over and said: "Teacher, I am autistic, it is very hard for me to participate and do some things on my own, but with you I was able to, I feel comfortable." Florencia's reaction is emotional: "I did not expect him to call me over to say something so valuable to me; it surprised me [...] When I got home, I felt so happy about what had happened; having a student express his well-being in my classes was very rewarding for me as a teacher and, above all, as a person."

The student is giving back to Florencia exactly what she did not receive: the recognition that she can, that she is capable, that she belongs. That reciprocal recognition—she enables him, he recognizes her—closes, in a certain way, an identity circle. Florencia can now see herself as the teacher she wants to be.

Social dimension: those who sustain and those who undermine

The third dimension proposed by Charlot—the social dimension—appears transversally throughout Florencia's narrative, but it is worth examining it explicitly because it shows that the relation to knowledge is never an individual matter; it is always mediated by others. In Florencia's case, there are others who obstructed her relation to chemical knowledge and others who enabled it.

Among those who obstructed it, university teachers stand out, operating from a meritocratic logic and assuming prior knowledge without considering students' unequal educational trajectories. The case of the professor who told her, "You should already know that because it's covered in secondary school," has already been mentioned. But there is more: Florencia speaks of teachers who "took for granted that I understood other previous topics" that she did not master, and of a course pace that did not give her time to internalize the content. More seriously, she describes a climate in which she feels "afraid or ashamed to ask anything in case I got 'told off'."

This climate is the opposite of what Charlot would call a relation that mobilizes the desire to know. Instead of enabling desire, it inhibits it. Instead of generating safety to ask questions, it generates fear. The result is predictable: Florencia withdraws, isolates herself, and eventually drops out.

By contrast, other figures operate in completely different ways. The Natural Sciences teacher from secondary school is the first model of teaching that mobilizes desire: her lessons were "engaging," the activities "different," she encouraged individual library research and group work to create creative products. Florencia summarizes it well: "The 'different' activities proposed by the teacher connected me deeply with pleasure and the desire to know."

The most significant enabling "others," however, appear in the teacher education program. Florencia describes two episodes that are particularly revealing. The first occurs while she is observing a lesson taught by her cooperating teacher. A student asks something about an element in the periodic table, and the teacher responds naturally that she does not remember it well at that moment and that she will look it up and they will discuss it in the next class. Florencia confesses that this had a profound impact on her because one of her "initial fears" was precisely "not knowing something that students might ask me and ending up as a 'bad teacher'." The cooperating teacher's explanation was clarifying: if at some point she did not know an answer, she should say what the teacher had said, "because we are human, we can forget things, and, moreover, being a teacher does not mean that we are going to know absolutely everything at all times." This message—"not knowing is okay, we are human"—is deeply enabling because it dismantles the fantasy of omniscience that pre-service teachers sometimes feel they must embody. It gives Florencia permission to be fallible, to not know, to be able to say, "I don't know, I will look it up."

The second episode is equally powerful. At the end of a course, another teacher told her that "she was going to be a very good teacher, that she had a very good way of explaining because she felt that she could easily translate content for others." Florencia acknowledges the impact: "I did not expect praise of that magnitude from someone I admired so much. This comment helped me a great deal because, in a way, it encouraged me to trust myself more and, therefore, to trust my decisions."

Here we see what Charlot calls recognition by the other as a condition for learning. Florencia is not only acquiring pedagogical knowledge; she is being recognized by significant others as capable, as someone with a talent for teaching. This external recognition enables the construction of a positive self-image that had been severely damaged during her previous degree programs.

Florencia also mentions others who support her in less visible but equally important ways: her "inner circle"—parents, partner, friends—who "listen to me reflect and whom I also consult or ask for opinions about different situations so they can analyze my decisions or actions, and in this way, I can gain more confidence or improve some aspect they might mention as constructive criticism."

Finally, there is a form of social reciprocity that is completed when Florencia herself becomes a "significant other" for her students. She formulates this as a project: "I would like to leave as traces a good memory of me as a person and meaningful learning, so that when they are about to do something or find themselves in a conversation with others about a given topic, they can think or say: 'this is something teacher Florencia taught me'." Beyond the desire, there is evidence that this is already happening: the autistic student who tells her "with you I was able to, I feel comfortable" is proof that Florencia is now operating for others in the same way that her teacher educators operated for her—as someone who enables, sustains, and recognizes.

A final reflection on metareflection

This analysis cannot be concluded without briefly addressing one of the most significant findings in Florencia's writing: her capacity for metareflection. Throughout the text, but especially in Axis 4 of the guide, Florencia not only narrates her experiences; she reflects on them, identifies patterns, connects her biography with present pedagogical decisions, and, above all, is surprised by her own reflections.

There are several moments in which Florencia makes this metacognitive operation explicit. For example, when she analyzes why seeing her students' progress gives her so much pleasure, she herself discovers its biographical origin: "It is interesting how with one question I can continue reflecting and, even more, find the origin of the feeling expressed in my own biography." Or when she writes: "If I could talk to that Florencia who was starting her university life, I would tell her not to feel guilty for not understanding complex content and to let go of the idea that this situation meant she was not a capable person."

This exercise of speaking to her past self from the present is the clearest evidence that the reflective writing device has mobilized a level of awareness of her own trajectory that goes far beyond a chronological description of events. Florencia is constructing meaning from her history, and that meaning is directly informing her current pedagogical decisions.

Before moving on to the discussion of these findings, a visual synthesis is presented to show how the three dimensions of the relation to knowledge—epistemic, identity, and social—interweave in Florencia's trajectory and, above all, how they are activated in her concrete pedagogical decisions. Table 1 condenses the analysis, showing, for each dimension, the main configurations identified, the biographical moments or experiences that support them, and the ways in which these biographies are translated into her teaching practice during the practicum. The purpose of this synthesis is to highlight that

none of these dimensions operates in isolation: each of Florencia's pedagogical decisions—not highlighting error in a negative way, contextualizing content in everyday life, building a climate of safety—has simultaneous epistemic roots (her way of understanding what it means to learn chemistry), identity roots (her history of pain and reconstruction), and social roots (the others who enabled or hindered her). This inseparability is precisely one of the central contributions of Charlot's perspective for understanding the complexity of teacher education.

Table 1 Dimensions of the relation to knowledge: Biographical configurations and pedagogical practice in Florencia's trajectory

Dimension	Identified configurations	Key moments/experiences	Translation into teaching practice
EPISTEMIC – Relation to chemical knowledge	Fascination mediated by activity (early secondary): Pleasure comes from mastering search, comparison, and bibliographic synthesis activities.	Library work: "generated enthusiasm to want to know more."	Prioritizes everyday contextualization: begins an electricity lesson with the phenomenon of lightning.
EPISTEMIC – Relation to chemical knowledge	Tolerance of the mechanical (late secondary): Chemistry as a knowledge-object with intrinsic value, regardless of how it is taught.	One of her previous degree programs: "I was not managing to connect it with the lab practicals."	Central pedagogical goal: students should be able to answer "What is this for?".
EPISTEMIC – Relation to chemical knowledge	Loss of meaning (university): Abstract, decontextualized knowledge, with no theory–practice link. Accelerated pace prevents internalization.		Quality vs. quantity: prefers to allow time to internalize content; designs activities that connect theory with concrete experience.
EPISTEMIC – Relation to chemical knowledge	Re-signification (teacher education): Chemistry gains meaning when placed within the horizon of "teaching." Connection between everyday phenomena and theory as key.	Teacher education program: "Chemistry made sense again when I could understand it through everyday phenomena."	
IDENTITY – Construction of the teacher self	Identity crisis (university): Feelings of "not being capable," shame, fear of asking questions. Internalization of academic disadvantage as personal failure.	Teacher who says "you should already know that": leads to "fear or shame of asking questions."	Does not highlight errors negatively: uses them to strengthen learning.
IDENTITY – Construction of the teacher self	Withdrawal (university): Isolation, decision to drop out. Feeling of having "failed" her parents despite not experiencing pressure from them.		Message to students: "one result does not determine your abilities"; builds a climate of safety ("that they do not feel afraid" as an explicit objective); personalized support and scaffolding.
IDENTITY – Construction of the teacher self	External recognition (teacher education): Mother names her as having a "teacher's soul." Teacher educators recognize her ability to "translate" content.	Mother: "I always knew you had a teacher's soul." Teacher educator: "You are going to be a very good teacher."	Autistic student: "with you I was able to, I feel comfortable" as confirmation of her emerging teacher identity.
IDENTITY – Construction of the teacher self	Reparative project: "Being the teacher I would have liked to have" as the axis of her teacher identity.	Reflection: "the pleasure of seeing others' progress arises as a way of 'repairing' my own experiences of frustration."	
SOCIAL – The role of significant others	Obstructing others (university): Teachers who assume prior knowledge, invalidate questions, and operate from a meritocratic logic. A climate that generates fear instead of enabling desire.	University teacher: invalidating response generates shame.	Group and individual dialogue and proximity as central strategies; emphasizes the importance of participation for learning; uses examples of her own misconceptions ("we learn from mistakes too").
SOCIAL – The role of significant others	Enabling others (secondary and teacher education): Secondary teacher with "different" activities that mobilize desire. Teacher educators who legitimize "not knowing," recognize abilities, and provide empathetic support.	Co-operating teacher: "not knowing is okay, we are human" → permission to be fallible. Teacher educator: recognition of her ability to translate content → building confidence. Inner circle (parents, partner, friends): emotional and reflective support.	Horizon: "leaving traces" as a person and as a teacher; operates as an "enabling other" who recognizes and supports.
SOCIAL – The role of significant others	Generational reciprocity: Florencia becomes an "enabling other" for her students, offering what she received (and what she did not receive).	Autistic student: "with you I was able to, I feel comfortable."	

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Discussion

The analysis of Florencia's trajectory reveals a process that recent literature has begun to conceptualize as biographical repair:[5,7] the conscious transformation of personal experiences lived as academic failure, disadvantage, and devaluation into pedagogical strategies deliberately oriented toward not reproducing that pain. This mechanism, documented across various teacher education contexts,[9,6,28] takes on specific features in Florencia's case that allow it to be extended and nuanced in the existing literature.

The mechanism of biographical repair: from adverse experiences to inclusive pedagogy in chemistry

Florencia exemplifies, in almost a paradigmatic way, what Esping[7] describes as the wounded healer archetype: a pre-service teacher who turns experiences of failure, disadvantage, and weakened academic self-efficacy into an explicit commitment to creating emotionally safe and validating learning environments. Her statement "being the teacher I would have liked to have" is not a rhetorical phrase, but the organizing axis of concrete pedagogical decisions that cut across her entire practice during the practicum.

The literature identifies three psychological constructs that mediate this transformative process: determination (grit), self-efficacy, and pedagogical empathy.[5,8] In Florencia's case, these three elements operate in an intertwined fashion. Determination is evident in her persistence despite multiple difficulties: initial academic disadvantage, changing degree programs, and rebuilding her confidence. Dobbins[8] argues that teachers who have overcome academic struggles tend to hold high expectations for their students precisely because they know the effort required to learn under adverse conditions. This resonates with Florencia's practice, in which she combines conceptual demand with emotional scaffolding: she does not reduce the difficulty of the content, but builds conditions for students to access it without shame.

Reconstructive self-efficacy is perhaps the most visible process in her narrative. Wilson and Kittleson[6] distinguish between "educative struggle," which promotes growth, and "debilitating struggle," which erodes perceived competence. Florencia clearly experienced the latter in one of her previous degree programs: the accumulation of invalidating messages ("you should already know that") generated fear of asking questions, withdrawal, and ultimately dropping out. However, the recognition she received in the teacher education program—especially her educator's comment about her ability to "translate content"—served as a turning point in rebuilding her positive self-image. This pattern is consistent with findings by Lutovac and Flores,[14] who show that failure can be transformed into an identity resource when woven into narratives of overcoming validated by significant others.

Pedagogical empathy derived from having experienced difficulties similar to those faced by her students is perhaps the most powerful component of her reparative project. Grace and Benson[22] argue that teachers who have experienced marginalization develop a particular sensitivity toward struggling students, which translates into concrete practices of inclusion. In Florencia's case, this becomes evident in her approach to error: where she herself received comments that generated shame, she constructs a "pedagogy of error" (Aragón-Barreto, 2022) that re-signifies error as a learning opportunity. Her explicit message to students—"one result does not determine your abilities"—is precisely the one she never received and would have needed.

What this case adds to the literature is empirical documentation that this process of biographical repair does not occur spontaneously; it requires specific conditions. Wrench and Garrett[5] note that transforming failure into a pedagogical resource demands "safe spaces for constructive reflection" and "support from mentors." The reflective writing device implemented with Florencia operated precisely as such a space: the dialogic meetings with her educator functioned as what Kosmidou and Sfyroera (2023) call a "cornerstone" for deepening reflection, transforming visceral experiences into conscious pedagogical knowledge.

The role of the structured reflective writing device in conscious transformation

One of the central contributions of this study is its documentation of how an explicit reflective device facilitates and accelerates the process of biographical repair. Research in teacher education frequently reports that students produce superficial reflections or "mere descriptions of experience" without critical analysis.[19,24] Fraser et al.[24] find that pre-service teachers lack "discursive depth in connecting theory with practice" when they are not provided with structured scaffolding.

Florencia's case responds directly to this gap. The four-axis reflective guide—grounded in validated frameworks for promoting critical reflective writing[24,5]—helped to overcome the primary challenge identified by Hagan and Magennis-Clarke:[19] students "do not know what to write" nor "how to write" in the reflective genre. The explicit structure provided Florencia with conceptual scaffolding to systematically connect lived experiences, theoretical frameworks (Charlot, PCK), and projections of future action. What distinguishes this case is the level of metareflection achieved. Florencia does not only narrate and reflect on experiences; she also makes the reflective process itself explicit: "It is incredible how with one question I can continue reflecting and, even more, find the origin of the feeling expressed in my own biography." This metacognitive awareness is an indicator of what Kosmidou and Sfyroera (2023) term "transformative reflection": reflection that does not merely describe practice but reconfigures the teacher's understanding of themselves and of their profession.

The dialogic component was equally crucial. Almutawa and Alfahid[29] report that solitary reflective writing can be "demanding" and may generate difficulties in selecting what to reflect on. In contrast, the iterative feedback that Florencia received in meetings with her educator functioned as what Fraser et al.[18] describe as "multiple resources" that work better than isolated interventions: the written guide provided structure, but face-to-face dialogue allowed for deepening, emotional validation, and interpretive challenge.

This finding has direct implications for teacher education programs. If biographical repair is an effective mechanism for developing inclusive pedagogies—as growing literature suggests[9,28]—then reflective devices cannot be optional or reduced to bureaucratic forms; they must be genuine spaces of accompaniment in which teacher educators act as "enabling others" who recognize, support, and constructively challenge.

Disciplinary specificity: Biographical repair in the double transition between scientific fields

A distinctive contribution of this study is its documentation of how biographical repair operates in a double disciplinary transition: from chemistry as an object of study to chemistry as an object of teaching. Previous literature has focused mainly on teachers who remain within the same disciplinary field (e.g., Wilson & Kittleson, 2012, in elementary science; Lutovac & Kaasila, 2021, in mathematics).[6,14]

Florencia's case shows that repair can occur across related but distinct scientific fields, adding complexity to the phenomenon.

Florencia does not reject or invalidate her previous trajectories related to this disciplinary field; rather, her experience there functions as a "pedagogical antimodel".[12] What she repairs is not the discipline itself, but the epistemic and emotional climate in which it is taught. This aligns with Nardo's[30] findings that teacher identities linked to scientific practice vary significantly depending on how those practices were experienced during training.

Moreover, Florencia's case resonates with what Philpot et al.[31] describe as "kicking at the habitus": confronting and subverting dominant academic habits. Faced with university experiences in which she perceived teachers' responses as delegitimizing her questions and accentuating her sense of disadvantage, Florencia constructs in her chemistry classes a radically different culture, one that validates students' questions and provides close support. This operation is not automatic; it requires, as Vázquez and Tejada[32] argue, "dynamic reconstruction of identity" through reflective questioning of deeply rooted beliefs about what it means to teach science.

Empirical contribution from a specific Argentine teacher education context

This study documents a case of biographical repair in the training of chemistry teachers in Argentina, providing empirical evidence from a Latin American context in which this phenomenon has been less explored than in Anglophone literature. López and Linares,[9] for example, document similar processes in Chile: biographical experiences of discrimination inform social-justice-oriented pedagogies. Florencia's case resonates with these findings, suggesting that in initial teacher education programs where students with highly heterogeneous educational trajectories converge, guided biographical reflection can catalyze productive identity transformations.

Florencia's trajectory—marked by initial academic disadvantage, changes in degree, and experiences of teacher invalidation—echoes the conditions Tsimane and Downing (2020) identify as conducive to transformative learning. What this specific case suggests—without claiming generalizability—is that when teacher educators create explicit spaces for critical reflection on adverse trajectories, students can transform pain into conscious pedagogical knowledge.

The device implemented with Florencia does not "solve" a systemic problem, but it does open questions for teacher education in contexts of educational inequality: What happens when these experiences remain implicit? How can processes of biographical repair that may involve revisiting trauma be accompanied ethically and pedagogically? These questions call for situated research that acknowledges contextual specificities without essentializing them.[33–39]

Conclusion

This study provides empirical documentation of the mechanism of biographical repair in science teacher education within a Latin American context. Florencia's case shows that adverse experiences can be transformed into inclusive pedagogies when structured reflective devices and sustained dialogic support are provided. Guided writing enabled her to consciously connect biography, theoretical frameworks, and practice, going beyond merely descriptive reflections. The findings have direct implications for initial teacher education programs: critical biographical reflection should not be optional or reduced to bureaucracy, but rather a systematic component accompanied by teacher educators who act as "enabling others."

Particularly in contexts where unequal educational trajectories are the norm, such devices can catalyze productive identity transformations.

As a single case study, the value lies in a deep understanding of a singular process rather than in statistical representativeness. The thick description provided supports what Stake[20] calls "naturalistic generalization": readers can assess resonances with their own contexts and adapt the reflective device to local specificities. Analytically, the study extends biographical repair theory[7,8] by documenting how it operates in a double disciplinary transition and through structured reflective scaffolding—conceptual contributions that are transferable beyond this specific case.

It is crucial to acknowledge that, as an instrumental single case study, this research cannot establish a direct causal link between dialogic accompaniment and the biographical repair processes observed. The design focuses on a deep understanding of how the process unfolds in a paradigmatic case, not on the comparative effectiveness of interventions. Other factors—such as the teacher education curriculum, the specific institutional culture, or the maturational process inherent to the practicum year—may also have contributed to Florencia's identity transformation. Future studies with comparative designs (cohorts with and without dialogic accompaniment) or longitudinal designs (following multiple residents) would be needed to isolate the specific effect of the reflective device and establish more robust causal relationships.

Future research could explore the sustainability of these transformations during the first years of professional practice, systematic comparison between reflective devices with and without dialogic accompaniment, and the emotional cost of revisiting biographical trauma during initial teacher education. Longitudinal studies that follow teachers from initial preparation through professional consolidation would enable us to understand the full trajectories of biographical repair and the enabling conditions for them.

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Conflicts of interest

The author declares there is no conflict of interest.

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