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SELF-NARRATIVES AND SUBJECTIVATION OF SCIENCE TEACHERS

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ABSTRACT

(Auto)biographical investigations have demonstrated great promise to teacher education and when they advocate for themselves the ability to educate a teacher, it is because they have become central to disputes over the significance of teaching. The general objective was to investigate the subjectivation processes engendered in (auto)biographical research by science teachers. The methodology, inspired by Foucault, included reading, description and problematization of (auto)biographical narratives from three doctoral theses. The results show different discourses and discursive elements that demand and produce subject positions in Science teaching. The Science teacher who emerges from the narratives investigated here is a subject that is made up of multiple positions: auto-ethnographer, learner, conscious, hopeful, resilient, phoenix, converted, mediator, desirer of success, messianic, innovative researcher, autopoietic. We conclude that it is productive to focus on operative discourses in subjectivation processes. This exercise allows us to 'see and say' other connections between (auto)biographical research and teaching, particularly when it comes to research aimed at the renewal and reinvention of Science teaching.

KEY WORDS

(auto)biographical research; education; subjectivation; science teachers.



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NARRATIVAS DE SI E SUBJETIVAÇÃO DE PROFESSORES DE CIÊNCIAS

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RESUMO

As pesquisas (auto)biográficas têm feito grandes promessas à formação de professores e quando advogam para si a capacidade de formar um professor, é porque tornaram-se centrais nas disputas por significação da docência. O objetivo é investigar processos de subjetivação engendrados em pesquisas (auto)biográficas de professores de ciências. A metodologia, de inspiração foucaultiana, contemplou leitura, descrição e problematização de narrativas (auto)biográficas oriundas de três teses de doutoramento. Os resultados evidenciam diferentes discursos e elementos discursivos a demandar e produzir posições de sujeito na docência em Ciências. O/a docente em Ciências que emerge das narrativas aqui investigadas é um sujeito tornado possível a partir de múltiplas posições: autoetnógrafo, aprendente, consciente, esperançoso, resiliente, fênix, convertido, mediador, desejador de êxito, messiânico, pesquisador inovador, autopoietico. Conclui-se ser produtivo focalizar discursos operantes em processos de subjetivação, como exercício que possibilita “ver e dizer” conexões entre o (auto)biográfico e a docência quando se trata de pesquisas voltadas à renovação e reinvenção do ensino de Ciências.

PALAVRAS-CHAVE

pesquisas (auto)biográficas; formação; subjetivação; professores de ciências.



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RESUMEN

Las investigaciones (auto)biográficas han hecho grandes promesas a la formación docente y cuando defienden la capacidad de formar a un docente, es porque se han vuelto centrales en las disputas sobre el sentido de la enseñanza. El objetivo es investigar los procesos de subjetivación engendrados en la investigación (auto)biográfica de profesores de ciencias. La metodología, inspirada en Foucault, incluyó la lectura, descripción y cuestionamiento de narrativas (auto)biográficas de tres tesis doctorales. Los resultados muestran diferentes discursos y elementos discursivos que demandan y producen posicionamientos de sujeto en la enseñanza de las ciencias. El profesor de ciencias que emerge de las narrativas aquí investigadas es un sujeto hecho posible desde múltiples posiciones: autoetnógrafo, aprendiz, consciente, esperanzado, resiliente, fénix, convertido, mediador, deseoso de éxito, mesiánico, investigador innovador, autopoietico. Se concluye que es productivo centrarse en los discursos que operan en procesos de subjetivación, como ejercicio que nos permite “ver y decir” otras conexiones entre la investigación (auto)biográfica y la docencia, particularmente cuando se trata de investigaciones dirigidas a la renovación y reinención de la enseñanza de las Ciencias.

PALABRAS CLAVE

investigaciones (auto)biográficas; formación; subjetivación; profesores de ciencias.



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Self-Narratives and Subjectivation of Science Teachers¹

Marlécio Maknamara²

INTRODUCTION

Reflexivities, redemption of trajectories, sense assignments, resignifications of experiences, new capacities, achievements, emancipatory learning, teacher forms and repositioning, all illustrate that there has been a “biographical turn” in different traditions of educational research and in different countries. Taken in a nonessentialist sense, the capabilities and formative advantages of such research require the use of (auto)biographical narratives in order to identify what Fischer (1997) points out as the conditions of possibility for certain discourses³ about teaching to emerge as truths. This is necessary in order to explain that “we are what we are being not because we think, but because we were thought in certain ways” (Chaves, 2016, p. 217). If (auto)biographical research can also “denaturalize the web of fabrication that made us believe that we should see and be this way or that” (Chaves, 2013, p. 130), focusing it on subjectivation processes expands the dimensions of expression of what is formative in (auto)biographical and offers instruments for the diversification of its forms of analysis.

Since (auto)biographical research includes privileged instances into ways of seeing and saying teaching, (auto)biographical research can also be sources for investigations in which memories end up producing teaching, rather than just “telling” it. In the present article, the overall objective was to investigate the subjectivation processes engendered in (auto)biographical research by Science teachers participating in an Australian research group. I am focused on the subjectivation processes engendered in (auto)biographical research conducted by three Science teachers. To this end, I adopted as a methodological approach genealogy - as used by Foucault. The Foucauldian genealogical approach is linked to the analysis of the contingencies that make us who we are, highlighting the connections between knowledge and power in which the subject is produced.

The argument here is that the promise of self-knowledge offered by (auto)biographical research in education has inscribed “being a teacher” as an historically unique experience. (Auto)biographical research in education has demanded a teaching that is more apt to teach the more it knows itself. The promise of teaching self-knowledge contributes to a “self-prospecting technology” that enables an individual to situate themselves in a cultural map elaborated while (self) biographing. Such technology operates thanks to the action of a “topographic mechanism”, which works by articulating techniques of representation of the terrain on which a teaching self can move. But in what sense is such a problematization possible?

1 Developed with CAPES/Brazil Visiting Professor Scholarship.

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3 *Discourse* is not merely a linguistic fact, it must be understood in terms of its “strategic, action and reaction, question and answer, domination and avoidance, as well as fighting games” (Foucault, 2003, p. 9).

OUTLINING A MEETING BETWEEN (AUTO)BIOGRAPHICAL RESEARCH AND POST-CRITICAL ASSUMPTIONS

(Auto)biographical research has great promise as counterparts to teacher education (Galvão, 2005; Reis, 2008). They advocate for themselves the ability to train a teacher and they have become central to disputes over the significance of teaching. In the sense of these disputes over meaning, if a discourse comprises both knowledge production through language and modes of institutionalization of that knowledge (Hall, 1997), (auto)biographical research constitutes and is constituted by discourses. It provides a grammar through which it is possible to talk about a subject and ends up producing particular forms of knowledge about it. Since different discursive fields compete in the establishment of hegemonic meanings for the subjects of education and for the organization of their educational processes (Díaz, 1998), it is legitimate to approach such research in terms of the discourses that have concurred in it for processes of teachers' subjectivation. But in what sense does such legitimacy occur?

In recent years, a number of new forms of problematization of education, and in particular, of teaching have been taking shape from important shifts in social theory. Such displacements are synthesized and expressed in so-called post-critical theories in education. In their synthesis, these theories start from varied assumptions: the perspectivist view of knowledge; truth as composition; the productive character of language and power relations; the end of the universal, self-centered and indivisible subject; contingency and heterogeneity in the formation of subjectivity; privilege of difference and multiplicity over identity and sameness (Paraíso, 2021). Researching based on such theories and engaging in pedagogical subjects implies renouncing universalisms and essentialisms in the articulations between discourse, power⁴ and subject⁵. But how could (auto)biographical research be able to forge a subject (student, teacher, how many elements can be identifiable)?

By giving centrality to the role of language in the construction of social life, post-critical theories in education highlight that we live immersed in a web of discursively engendered social relations and practices and highlight the various artifacts and processes that assign meaning to places, things, phenomena, practices and subjects. For post-critical thinking, the fundamental question of language is not representation (with an empiricist sense in which words would simply correspond to things) nor mediation (with a pragmatic sense in which language should merely exchange meanings between subjects). The fundamental question of language in post-critical theorizing is creation - here language is neither decal nor exchange, language is trick, it is the production of meanings and truths⁶. This leads us to assume that no pedagogical subject exists outside or before a corresponding discourse, a discourse that positions themselves as an individual subject to that discourse, a discourse that systematically cares to forge a subject to whom it apparently only refers when that same discourse says what it says about such a subject.

It is in the above sense that a pedagogical subject is constituted "piece by piece". If the truths said about individuals, the knowledge⁷ they institute and the divisions they raise act in the production of subjects (Maknamara, 2011), "the pedagogical subject is

4 *Power* is considered here in its fundamental aspects of "fluidity, mobility, capillarity and productivity" and beyond legal and sovereignty issues.

5 *Subject* has two meanings: "subject to someone for control and dependence, and bound to one's own identity by a conscience or self-knowledge" (Foucault, 1995, p. 235). Both refer to the exercise of power in order to regulate the conduct of an individual, whether by others or by himself.

6 By *truth* Foucault (2007a, p. 13) means the "set of rules by which one distinguishes true from false and is attributed to true specific effects of power".

7 *Knowing* as "a knowledge derived from what power looks with its own eyes" (Maknamara, 2011, p. 55).



constituted, formed and regulated, in pedagogical discourse, by the order, by the positions and the differences that this discourse establishes” (Díaz, 1998, p. 15). Pedagogical discourses - by describing and explaining, for example, what teachers and students are, and establishing truths for them - provide knowledge that is part of the constitution and regulation of those same subjects, even contributing to make hegemonic particular forms of subjectivity⁸. This means that analyzing modes of teacher subjectivation requires “understanding the subject’s positions in discourse through the different discursive practices understood as meaningful practices” (Díaz, 1998, p. 19). Therefore, this is a question for consideration in (auto)biographical research.

Post-critical theories show the nominalist/linguistic/productive character of (auto)biographical research. Thus, they show that (auto)biographical narratives act in the elaboration of teaching (of being a student, of ways of being a pedagogical subject, after all) more than simply narrate it (Maknamara, 2016, 2021). From a post-critical perspective, a storytelling is not just an organized linguistic structure that decals reality. Narratives constitute collections of truths about things and people of the world, they do more than simply shape the human mind just because they would only be sources of perception of the world. If narratives constitute collections with which one understands one’s world and that of others, it is because narratives regulate what one can see/say and think about the things of the world and about oneself. Narratives are more than a matrix of equating/comparing individuals in relation, a narrative does more than help someone express the things of the world or even transform the perception of others about those same things. Thus, an (auto) biographical narrative is the version of a life not because it is an interpretive act, but because narrating is creating: when someone tells something, they are fixing meanings about something, creating truths about it, inventing it, choosing things and leaving others out in its storytelling.

If narratives provide elements for constituting ways of being, to storytell would be a privileged way of constructing the self, not because every self would be a narrative construction mediated by culture. From an interactionist perspective, we would build and rebuild our selves guided by past experiences and according to the new situations we face, and the discovery and writing of the self would be mediated between thought and language. Post-critical (auto)biographical research, however, assumes that the self is not accessible once only and neither once and for all. Not because the self would result from a ceaseless and cumulative process in which a subject uses narratives to constitute itself, but because the self is not one-dimensional, not self-centered, not self-conscious, not autonomous, not coherent, not fixed, and not given. The self results from indeterminate processes in which an individual is led to recognize themselves as the subject of multiple discourses. It is in this sense that doing (auto)biographical post-critical research is to highlight the discursive plots that position us and lead us to position ourselves as subjects of certain types and not of others. And therefore, if the self is multiplicity and indetermination, a search of the self is always partial, precarious, and temporary.

Thus, the research proposal presented here assumes that (auto)biographical research discourses enable the articulation of elements of power (technologies⁹, mechanisms¹⁰ and techniques¹¹) that materialize real effects on Science teaching. It is in the sense that such research constitutes knowledge composed of normative practices,

8 *Subjectivity* here designates “the way in which the subject experiences himself in a game of truths in which he relates to himself” (Foucault, 2004, p. 236).

9 *Technology* is the result of the forces driven in the discourse so that knowledge and power can mutually produce and feed each other into a particular modulation of power (pastoral power, disciplinary power, biopolitics, etc.), seen by the different techniques and mechanisms which work in its favor. Technologies are of the order of the purpose of power (Maknamara, 2020).

10 *Mechanism* is the discursive element that portrays the operationalization of a technology, portrays the working of power gears: a mechanism spells out what power will do to get wherever it wants. Mechanisms are of the order of power processing (Maknamara, 2020).

11 *Techniques* are power operators, they express the most direct, incisive and factual portion of the power relation itself: they are the instrument through which things happen, they are of the order of the effect/result of power (Maknamara, 2020).

criteria, descriptions and prescriptions about Science teaching that it is taken as implicated in the subjectivation of these teachers. Such subjectivation is here problematized in terms of “what humans are enabled to do through the ways in which they are machined or composed” (Rose, 2001, p. 166), entering into these composition technologies that invoke teachers as subjects of a certain nature of conduct and that provide mechanisms and techniques by which such conduct should be thought, recognized, judged and exercised.

METHODS

The overall objective was to investigate the subjectivation processes engendered in (auto)biographical research by Science teachers participating in an Australian research group. To this end, I sought to map the bibliographic production of the group and locate paradigms, concepts, and methodological designs of (auto)biographical research, in order to identify the discourses that emerge from the narratives and the functioning of elements (technologies, mechanisms and techniques) that, by putting power into action in the discourses, intend the relationships that an individual establishes with others and with him/herself and contribute to processes of subjectivation.

For this purpose, I adopted genealogy as a methodological approach - as used by Foucault. The Foucauldian genealogical approach is linked to the analysis of the contingencies that make us who we are, highlighting the connections between knowledge and power in which the subject is produced. In this sense, the power effects linked to the discursive are configured as questions of analysis regarding “distinguishing events, differentiating the networks and the levels to which they belong” (Foucault, 2007a, p. 5). By highlighting the contingency of discourses, the Foucauldian perspective points out that an event does not constitute a decision or a treaty, but consists of “a relationship of forces that is reversed, a power confiscated, a vocabulary taken up and turned against its users, a domination that it is weakened, distended, poisoned and another that makes its entrance, masked” (Foucault, 2007b, p. 28). Then, I considered the regularities and power relations triggered in the discourses of the (auto)biographical narratives of the Science teachers, since it is up to discourse analysis to address the historical relations, the games of force, the concrete practices that the discourse articulates, puts into work and “brings to life”.

The pedagogical discourses, according to this approach, operate intersections between knowledge and power. If in a Foucauldian perspective power exists only in an act, acting as a way of ordering the possible field of action of others (Foucault, 1995) and if the power leaves marks of its exercise in the most different social instances, these marks are present in (auto)biographical research. The question is, how to find them in the writings that teachers produce about themselves? To reach such marks, to see the power at work in the writings of teachers about themselves, I took the discourse as “the articulating practice of elements through which effects of power are translated into fabrications of subjects” (Maknamara, 2011, p. 129). This understanding “makes it possible to locate in discourse what it has of so insidious yet subtle, what it has of productive though uncertain. It makes it possible, finally, to locate their power games” (Maknamara & Paraíso, 2013, p. 49). The productivity of analyzing subjectivation processes engendered by elements of power in discourse is becoming increasingly evident. “It is this ‘plus’ that needs to be made known and described” in relation to a



discourse (Foucault, 2005a). Pursuing technologies, mechanisms and techniques shows, in “anatomical detail”, how power takes shape in discourses.

Among the bibliographic production of the research group, an initial screening was made around the researchers who carried out their postgraduate studies (Masters and/or PhD) in that research group and who identified themselves in their writings as Science teachers (this was regardless of the disciplinary field from which they came - if from Biology, Chemistry or Physics, what could mean valuing possible discursive nuances from any of these fields). Researchers were then contacted by email inviting them to participate in the research. Only those who accepted and provided their theses and/or dissertations (three teachers) had their texts considered. Due to the volume of material received and considering the time available to carry out the research, I opted for other bibliographical productions of the same three participants that, at the same time, referred to their training processes in the research group and recovered the texts of their own theses/dissertations. Regarding ethical concerns, values, issues and procedures for accessing and problematizing the empirical material, I proceeded according to the ethical principles and procedures discussed in Maknamara (2021). At the end of the analysis, the researchers had access to the text of the article containing the analyses of their narratives and were asked about any possible changes and whether they preferred to appear anonymously or not in the article.

The empirical material was read to let only the narratives in question speak. It means that its reading was not oriented to the capture of formal and logical aspects of the texts, nor to the search for real meanings that would be uncovered by interpretation. The reading was made in order to capture the multiple possibilities of a discourse in terms of the things said (Maknamara, 2011), understanding that the empirical material shows the subtleties of power while apparently only witnessing the sayings and deeds of those who write about themselves. I tried to settle in the space between, in the midst of what the writings of themselves offered and opened as a possibility, that is, I tried to grasp the discourse in its affirming power, its power of constituting “domains of objects, on which one could affirm or deny true or false propositions” (Foucault, 1996, p. 70).

I sought to explore and partially account for the subject positions made visible and sayable in these self-writings. Although it was not a cartographic endeavor (Rolnik, 1989), I let myself be affected by the material at hand and remained open to what might emerge from it. I offered myself to capture sensations and surprises provoked by the encounters with the existential universes that the material suggested. I was aware of what, from the contact with such material, moved my thinking. I followed the clues left by particular combinations of fragments of the self-writings (taken from the narratives of each researcher I had access to) and the images I saw emerging from them. Fragments were chosen and arranged in a series of mutually significant excerpts, so as to make visible discourses and subject positions emerging from each of my associations.

RESULTS

All works I analyze here begin by defining themselves as autoethnographic research. It is challenging for me, although this term is not uncommon in Brazilian educational literature, according to Basoni and Merlo (2022). Autoethnography regards “the cultural study of one’s own people” (Van Maanen, 2011, p. 106). Blanco (2017) recognizes autoethnography as a form/genre of writing in which many variations of autobiographical narratives fit. Handled with post-critical lenses, publications focusing

on autoethnography - such as Reed-Danahay (1997) and Santos (2019) - make it possible to synthesize that “autoethnography” is a research discourse based on the following assumptions: the author's narrative positioning as a producer and product of self-centered research; proceduralism in apprehending the complexity of the relation between the researcher and their object of investigation; immersion in depth and diversity of elements that make that relation; recognition that both research and its effects on the researcher take place within a culture, crossed by competing meanings and senses.

In all the works analyzed here, however, it was not just that they said that they carried out a qualitative research of an autoethnographic nature. Moreover, in the location in question here the authors claim themselves as **researchers of autoethnography**. This position is not trivial, not only from the point of view of the importance that autoethnographic research has in the humanities, but also from the fact that innovations in ways of knowing have been “fundamental to the processes by which the human subject has been introduced into government networks” (Rose, 1998, p. 39). In the publications on autoethnography, and in the works analyzed here, there are attributes and exercises to qualify subjects who research in this field.

These attributes and exercises can be easily recognized in those teacher sayings when they talk about autoethnography. The attributes include: openness to search visibility and text exposure (to be bold); interpretative effort to understand oneself and understand someone in a past that teaches and enables facing future challenges (to be cautious); and to have sensitivity to alterity and imbrication with other subjects with whom someone dialogues in a specific cultural context (to have empathy). The exercises include: digging into the past (to be introspective) and paying attention to thoughts, feelings and emotions (to be curious); telling details of a trajectory thoroughly (to be rigorous); analyzing their trajectory considering horizontality and the reciprocal influence of subjects and objects that constitute the research (to be reflexive); and the relativizing of fixed notions of identity and cultural differences (to be detached). This all goes back to the fact that “what makes a body, gestures, discourses and desires identified and constituted as individuals is one of the first effects of power” (Foucault, 2007c, p. 183).

There is, therefore, a discourse that constitutes those teachers as researchers of autoethnography, which leads them to talk about themselves and to position themselves as autoethnographers, which makes each one recognize and make themselves recognizable as autoethnographers. A single poem in which a researcher reflects on her career and is able to illustrate a range of qualities required by autoethnographic research, presented in the form of what is already acquired and desirable in their teaching: “playing language games”, “making use of different paths”, “opening mind and heart closed”, “looking at different faces and roles”, “pursue with passion”, “explore one's identity”, “fight in a different voice”, “choose to remain empowered”, “shape one's mind”, and “play with dialectical thinking” (Y, p. 265).

But would all this only be due to autoethnography? It is possible to assume the response is “no”. Endowed with these attributes and the abilities of autoethnographers, the researchers are able to reveal in the material here analyzed the various other discourses that contribute to their constitution as Science teachers. But what would have led them to choose such a search, an autoethnographic search? What kind of discourses are these?

The products that result from the autoethnographic research analyzed here testify to the occurrence of something called “transformative learning”. But what is it made of? What would it be capable of? According to one of the researchers, the functioning of this kind of learning “affects our frames of reference, changes how we understand our experiences, and redefines our world” (Y, p. 266). “Thinking critically and reflexively about myself (professionally and personally) and getting me to review my future life” (p. 266) would be effects of this kind of learning identified by one of the researchers. Let's



not forget if there is transformative learning, there is transformative education. To have a transformative learning experience implies to have been subjected to a transformative education. It all starts with learning to be the subject of a transformative education. But after all, how would that be possible?

If you still do not know what it is, do not give up, because one of the research subjects was led to argue that "unusual information should encourage us to continue as learners" (Y, p. 275). In the discourse on transformative education, unusual information gives courage to learn. But being a **learner** subject presupposes the need to establish a double relationship with the unusual: to have courage in front of it as well as to have the aptitude to produce it:

With a transformative agenda, I have set up the challenge of involving my students (the people) in reflections about themselves and their students, and to subordinate the theories, didactic principles, and even the content, under these reflections. (E, p. 309)

When I have to choose...I am questioning what the truth is, I am questioning what the values are, I am questioning what hegemony is. (Y, p. 276)

By showing how my identities were influenced and, in some way, imposed by various curricula used in Mozambique [my country], I could help science teachers, curriculum planners and schools to reflect on re-evaluating how to teach science, which science to teach. (C, p. 131)

Although these researches place transformative education in different ways, they all talk about an education centered on demanding positions from its followers. Transformative education demands teachers are **aware** of what the practice of questioning can mean to someone or to oneself. The discourse of transformative education makes a teacher the **bearer** of the results of transformative education in his life and to be able to project them onto other subjects, and to multiply transformative learning. The discourse of transformative education is the discourse of education that presupposes and promises to transform, to cross one form and to pass from one form to another. What forms can these be?

Subverting theories, principles and content, launching challenges, engaging students, making choices, questioning, showing and promoting the production of "identities" are all concepts that teachers may need to adopt. The discourse of transformative education seems to demand a way of being a teacher: to be connected to the open, fragmentary, dynamic, fluid and uncertain reality, characteristic of our so-called postmodern times. These are times of social atomization, of discrediting the great universal reports, of an ethics and aesthetics of accomplishment and performance (Lyotard, 2008). In this scenario, being a transformative educator seems to require the figure of a **resilient teacher**: an elastic, flexible subject, adaptable to different kinds of changes, needs and problems posed by their work.

Transformative education is also heralded as a perspective capable of "negatively affecting the learning of those who find comfort in the realm of an objectivist epistemology" (Y, p. 267). This discourse leads us to assume that "a transformative perspective will question structures and what is taken as the norm" (E, p. 304). In this sense, the discourse of transformative education forges a **hopeful teacher** whose autoethnographic narrative "is valuable to beginning educators and researchers returning to their universities and having to deal with restricted worldviews" (Y, p. 266) and "dealing with differences when they return home" (Y, p. 276). But how to identify

differences in teaching profiles and worldviews? How to distinguish ways of being a teacher aligned with such discourse?

There is a subjective capacity calculator technique, the **teacher profiling technique**. It is a characterization technique, an elaborative and distinctive technique for teaching profiles. Through the availability of capacities, attributes, abilities, reasoning, this technique produces the distinguishable gradients on the horizon capable of sheltering teaching subjects demanded by transformative education. A first possible gradient is offered by a “rite of passage”. A phoenix teacher profile is demanded by the rite of passage, that is, to make autoethnography according to the transformative education. The **phoenix teacher** is willing to move forward and resurface from their own ashes caused by autoethnographic researches:

With a desire to inquire into my own epistemological position in my professional practice, I embarked on the journey of this research in which I was willing to pass through the complexity of a metamorphosis. (E, p. 308)

My hope was that... I could also explain why my former student-teachers were not making good use of the 'locally available materials technique' in their classrooms, as I had taught them. But that did not work out. I felt wedged and to progress it was necessary, as I learned later, to take the questions personally. The opportunity to do so arose during my masters and doctoral research in which I drew on multiple epistemologies to conduct art-based, critical, interpretive and auto/ethnographic inquiries. (C, p. 130)

My transformative learning involved critical incidents, metaphor analysis, concept mapping, consciousness raising, writing stories, repertory grid analysis, and participation in social action. (Y, p. 267)

The rite of passage triggered by the teacher profiling technique shows the traffic towards the teacher transformation, the crossing from one profile to another. It materializes the Foucauldian notion that a discourse is “a fundamental locating force in which power relations are exercised and subject positions are activated” (Díaz, 1998, p. 23). The different subject positions generated by a pedagogical discourse objectify each other and show, in their possible locations and hierarchies, how this same discourse makes its power distribution. And if there is a passage from one position to another, the crossing is so real that it also enables a teacher profile capable of recognizing oneself after the transformation. They are the **converted teacher**:

It took me years to construct the idea of curriculum as a possibility of freedom. And that was the transformation I endeavored from embracing transformative research in my masters and doctoral voyages. ... I felt as though I was going through a metamorphosis in which the caterpillar became a butterfly. (E, p. 307)

If I was indigenous in the way described by colonizers I would never have learned so-called Western science. (...) After a few moments of relief, however, the storms came as I questioned my professional self: am I a colonizer by not allowing knowledge other than Western science in my classroom?. (C, p. 135)

At the beginning of my inquiry, colonizers were only 'the others', indigeneity was a symbol of being oppressed, and western science was something that I could worship as the answer provider. Now I am aware that these are all part of me; I am also part of the problem. (C, p. 144-145)



I am committed to practicing emancipatory ethics and an ethic of care (...) [that] helps me avoid the hegemony of technical interest, that shapes the teachers' role. (Y, p. 267) I practice an emancipatory ethic by establishing a communicative classroom environment with critical discourse opportunities. I encourage my students to challenge my ideas and assumptions, as I challenge theirs. (Y, p. 267)

I also teach my students to adopt dialectical thinking in order to understand and reconcile conflicting perspectives in chemistry education. (...) I direct them to create learning designs that focus on their students' experiences, characteristics and competences. (Y, p. 268)

I continue to reflect and reconceptualize my own identity within the different roles of my life. (Y, p. 267)

In the sayings that were analyzed, one learns, transforms and resurfaces to be a converted teacher. A conversion that makes someone position oneself as someone conscious and someone that stimulates awareness, a learning paradigm transformer, a teaching role reminder. Between relief and concern, the converted teacher questions, identifies relationships and progress, recognizes problems, cares, establishes the environment, encourages, asks, directs and continues to reflect. Converted in relation to themselves and to the others, they can facilitate the transformation of other people. Thus they can be a **mediator teacher**:

I have learnt to be a mediator of their critical thinking as they need to learn how to express their critical voices in the classroom (...) I also stimulate them to become aware of their agency to change society and to empower their own students to do the same. I often remind them of this teaching role... (Y, p. 271)

I speak from a privileged standpoint, because I not only experience but am able to see these walls. I know about the extra work I have to do in order to be heard. (...) I have come to see from a privileged standpoint that there are many who cannot see these walls, either because they belong to the taken for granted norm or because they are accustomed to living within these walls so that they see them as natural. (E, p. 305)

The “converted” and “mediating” positions demanded by the transformative education discourse enable a teacher to recognize that a doctorate in transformative education has enabled him to “be enlightened on how to promote Mozambican culture in science classes. As a teacher, and then as a teacher trainer, my main concern has been to understand myself and how I can help my people” (C, p. 129). There is even an explanation for this concern: “The inclusion of knowledge embodied among the different ethnic groups in Mozambique can help challenge students and teachers to analyze the ethics inherent in that knowledge” (C, p. 138). But these positions triggered by the profiling technique are only necessary and enabling all this because they are forged at the intersection of the discourse of transformative education with a critical discourse of curriculum. Critical curriculum theorizing questions assumptions of the dominant social and educational arrangements and gives space to a very diverse set of notions, concepts, interests and demands: it is part of this set to bet on knowledge as a driver of attitudinal change and progress, to question the validity and legitimacy of embodied knowledge in the curriculum, analyzing the relationships between the social grammar of the curriculum and the production of consciousness, to postulate forms of awareness, resistance and

cultural politics in order to make the curriculum function as a public sphere in favor of freedom and democracy (Silva, 2002).

This discursive intersection also leads a teacher to **wish to be successful** and to realize and to enumerate that, for this, her practice would need to perform “(1) a transformative ethics and dialectical thought, (2) enrich students' worldviews, and (3) help them build identities as transformative teachers” (Y, p. 267). Leading to such a position makes a teacher face a challenge of different orders: ethical (turn to transform), cognitive (dialectically thinking), aesthetic (enriching worldviews) and political (identity building). It is a position that leads the teacher to accept a visibly immense challenge: it demands a **messianic teacher**. They resemble a shepherd, the central figure of a pastoral-type power. Pastoral power, according to Foucault (2008, p. 173), is a beneficent, to take-care power that exerts itself over a flock and that has no other reason to be than to do good, in which the shepherd “guides to a goal and serves as an intermediary towards that goal”.

Messianic teaching directs consciousness. Faced with a class where the minority of students do not want to be teachers, the messianic position identifies the need to “enable them to explore their identities”, decides to “put more emphasis on the importance of internalizing the values of being a teacher” and “employ transformative learning strategies”, carefully enumerated: “reflective writing”, “metacognition” and “praxis and socialization” (Y, p. 270). One goes as far as pointing a way to reflective writing: “I ask my students to write reflections on questions such as 'why would I like to be a teacher?', 'who am I as a teacher?', 'what's my view as a teacher?'” (Y, p. 270-271). The result? We have a testimony: “I am convinced that transformative learning is the way to engage my students in understanding their developing teacher identities” (Y, p. 270). Thus, a Science teacher is produced between the shepherd's testimony and the confession of their sheep.

But if this discourse demands ways of looking at, recognizing, and evaluating teaching and curriculum models, it can also lead to ways of researching them. If autoethnographic research requires connection between the personal and the cultural, it leads researchers to elaborate explanatory versions of their culture. They elect, describe and analyze. At the intersection of the personal and the cultural, the self-knowledge provided by autoethnographic research leads teachers to “strive to empower students”, to “design and adapt their own path to create changes in student projects” (Y, p. 266), to question themselves more and more about “the process of living in contradiction” because they have been colonized: “to what extent has this process tampered with people? (...) How is this dilemma reflected in other aspects of our social life?” (C, p. 133). Thus, there is also a teacher profile capable of reinventing both ways of doing and ways of orienting research according to the discourse of transformative education. It is the **innovative researcher**:

I embarked on a journey across what I thought to be unstable but rewarding territory, which had as its main purpose bringing my students into the foreground of their research and, only after them, the topics to be researched. (E, p. 309)

I am required to supervise my students' research projects, in which they implement and evaluate innovative teaching approaches in local schools. A transformative teaching approach that I introduced to them is ethical dilemma story teaching” (Y, p. 271). Accompanying educating teachers who teach and research their practices with these stories requires “continuous mentoring as they develop new knowledge about qualitative research and chemistry learning. (Y, p. 272)



An innovative researcher guides research on innovation in education, introduces approaches, continually supervises, remains transformative, makes strategic choices for their research approach to continue. Their mentoring practice is described as composed of a range of “transformative research” subjects: “new stories of ethical dilemmas, socio-critical problems, socio-emotional learning, green chemistry, culturally responsible teaching, STEAM education, conceptual knowledge, and mental modeling” (Y, p. 273). It is a subject led to give visibility and sayability to a way of doing and orienting research in a fragmented society, surrounded by ethical, ecological and cultural dilemmas from different sources and scales, consisting of individuals whose minds and emotions are increasingly unstable, calculable and exploitable. In such a society, in which organization has become a central task to manage subjectivities (Rose, 1998), ways of being a researcher are also the target of power investments: one is encouraged to do research in one way and not in others, conventions for a knowledge that is deemed appropriate are done, a specific type of researcher is forged.

The figure of the innovative research subject is only possible because “the academic universe has also been permeated by the discourse of permanent innovation” (Fontenelle, 2012, p. 100) in times of “knowledge capitalism”. These are times when business becomes increasingly academic and academia becomes increasingly business-oriented, times of knowledge production that should yield utility and value, times of “scientific research that should turn to wealth production” (Fontenelle, 2012, p. 107). Perhaps this is why such distinct discourses (critical discourses of society, ecological discourses, pedagogical discourses of cultural or methodological appeal, discourses of socio-emotional competencies and mental modeling) are disputing meanings for the so-called transformative research and the production of its related researcher. Perhaps this is why, today, “being innovative” in some educational research is precisely this: coupling different and even disparate discourses, emanating from a myriad of social claims and market demands that are also animated by the principles of utility, value and wealth, broaden what was until then acceptable in the educational field. In this sense, it is useful to remember that while a discourse apparently only describes niches and ways of doing research, it ends up producing the subject “researcher” that has interests in it: someone able to do and guide research according to its purposes. Thus, the search for answers to themes, challenges and questions made possible by a discourse actively participates in the production of pedagogical subjects and related objects. More than that, it ends up producing the very reality in which a teacher can exist and act. But how to tell it reflexively?

The discourse of transformative education in the autoethnographic researches I analyzed also demands subjects in constant evaluation of themselves and the reality that surrounds them. The result is the simultaneous production of imaginaries (collection of images) and imaginations (images in action). For this, there is a **technique of double diagnosis**, operating by means of self-radiography (scanning and examination of images of what is considered to be the composition of the self, constituent of the self) and sensing the teaching reality (exposure of information about everything that may be seen as a target of interest to the teacher's life). This double diagnosis assumes the characteristics of a well-known technique, the “conscientious examination” technique. Such a technique presupposes the extraction of inner truths, the scanning of soul movements, the delimitation of thoughts (Candiotto, 2008); a detailed inspection of oneself valued since antiquity as a form of relationship between the subject and his truth (Foucault, 2006) and captured by Christianity until found after all at the base of the arts of governing (to conduct a behavior) in the West (Foucault, 2008). But what does it reveal here?

Due to the double-diagnosis technique, it is possible to see a teacher affirming that transformative education “continues to direct my current teaching values, beliefs and

practices” and that because of this perspective they were led to portray “the role of my cultural beliefs in shaping my identity and practice as a teacher of chemistry teachers”, to deal with the “considerable challenge of staying empowered as a transformative educator in the face of the hegemony of the prevalent positivism paradigm” (Y, p. 266). It is also due to that technique that another teacher analyzes his country's education system as being subjected to a system marked by a colonial past in which “since independence, however, we have only made cosmetic transformations”, a system whose transformation “must begin with Mozambican teacher educators” (C, p. 129). The **autopoietic teacher** is produced: crossed by Maturana and Varela's notion of “autopoiesis” (Moreira, 2004), they are someone capable of doing themselves justice, capable of reflexively re-establishing their own organization in congruence with their environment.

In the discourse of transformative education, the technique of double diagnosis leads an autopoietic teacher to recognize that “official discourse during the colonial period determined that my identity was characterized by submission, ignorance, humility, and acceptance of fatality” (C, p. 133). This same technique incites the teaching autopoietic dimension: it leads to revelations so profound that it makes them wonder whether they would be able to proceed with the research or would have less difficulty in doing so, depending on the social and cultural markers they recognize crossing their selves:

I doubted whether I would be able to talk about indigeneity due to colonial influence attached to bad personal memories. (C, p. 130)

I have indeed learned that gender, skin color and even language and geographical origin are also brick walls. (...) Perhaps if I was a white male I would be more easily heard. I have thought that maybe there would not be walls stopping me from doing certain things, that my views on innovative research paradigms, for example, would be more easily accepted. (E, p. 303-304)

And after examining themselves and everything around them, what would be left for these teachers to do? How to make sure you are on the path of transformative education? This is where a technique comes in that shows how well a teaching subject is suited to his or her reference system (the transformative educator): the **calibration of the self technique**. There is a calibration of the self technique in the discourse of autoethnographic research animated by transformative education. Through the exercise of questioning and the practice of confessing desires and expectations, this technique allows us to show how well a subject is suited to what is expected of him/her. Once “certified” about their dreams, desires and questions, it is possible to more accurately distinguish some places of subject made available by autoethnographic research inspired by transformative education.

The calibration of the self technique is a certifying, normalizing technique. Normalizing individuals is putting them under the yoke of a norm. A norm regards an element that circulates between “the disciplinary order of the body and the random events of a biological multiplicity” (Foucault, 2005b, p. 302). Thus, if “a norm always gives space for comparison between individuals who are under its effect” (Maknamara, 2011, p. 48), normalizing individuals is making them subjects of a specific norm, it is making them the effect of a norm: it is in this sense that the “normal”, in terms of subject position, is a production created by the arbitrariness of a norm. And the normal, in the sayings here analyzed, is to pursue transformation:



I use Ndo'nkodo as a metaphor for my writing, which entails both joy and discomfort in my practice as a teacher educator in an African university as I endeavor to cultivate transformative paradigms in research. (E, p. 301)

I am emphasizing the narrative power of Ndo'nkodo for transforming, healing and resisting (...). By listening to others' experiences readers are moved to learn from stories similar to those they may have experienced or from stories they have never heard before. (E, p. 302)

How can I teach you without knowing who you think you are? How can we create a better world without sharing the meaning of 'better'? How can we describe to each of us who we think we are? How can we accept discovering that we are wrong? (C, p. 144)

The desires, expectations and questions above reveal interests. If questions can reveal interests, if an intention can be delineated in different questions, it is in the midst of one of these questions that the calibration technique leads a teacher to confess a desire: "to develop a teacher education system whose main objective is to enable undergraduates to know 'the self that teaches'" (C, p. 129). There is a self that teaches and it needs to be discovered by every person who sets out to teach. This link between teaching, "mobilizing to learn", and being aware of self, demands a subject position. It emerges from the following reasoning: it is taught to transform the world ("create a better world") and one can only teach so well ("mobilized to learn") when one knows the thinking of the person to whom one is teaching ("how can I teach you without knowing who you think you are?"). A reasoning that takes up the discourse of transformative education and articulates it with the constructivist discourse to demand an **engaged constructivist teacher**.

In constructivism, teaching is a matter of a certain understanding of psychological development (rational, scientifically verifiable) and learning (a cognitive question, a question of ways of thinking, pedagogically organizable). It is an informed discourse of how students think, develop and learn. Therefore, in constructivist discourse, knowing how students think is fundamental to teaching, since "particular disciplines, truth regimes, bodies of knowledge, make both what can be said and what can be done possible, both the object of science as the object of pedagogical practices" (Walkerdine, 1998, p. 145). "Who you think you are" and the possibility of "discovering that we are wrong" are questions of "how do you think", are possible questions for a teacher interested in teaching, transforming, healing and resisting, like an engaged constructivist.

But to teach is not enough, knowledge of the self is important in the form of the others to whom one addresses as a teacher. In the sayings found in this research it is also important that knowledge of "the self who teaches" comes to assume the form of self-knowledge. Here, self-knowledge is not only a casual option or possibility, but emerges as an important formative necessity in the autoethnographic research analyzed. But why is self-knowledge so important, why is self-knowledge a value in these discourses, for what would it serve anyway? It is the transformative teachers who wrote autoethnographies of themselves who answer us:

By making clear who I am and which curricula are appropriate for our complex situation, my colleagues and students may benefit as they are likely to be facing the same problems of curricula and identity. (C, p. 130)

I expect that my student teachers will eventually inspire their own students to achieve a better future for the nation and the world. (Y, p. 266)

As a chemistry teacher educator I struggled to empower my student teachers to become inspiring chemistry teachers. (Y, p. 266)

In empowering my students I start with reflections on self-understanding. (Y, p. 276)

To demonstrate the value of self-knowledge in teacher education and in the performance of a teacher, autoethnographic research triggers discourses of social identity (peers deal with the same problems) and solidarity in teaching and research (the possibility of mutual benefit) and end up revisiting the figure of the **change agent teacher**. Endowed with the privileged vision for a desirable curriculum that is provided by self-knowledge, this teacher is also a promoter of cultural identity - a **cultural agent**, as said by one of the researchers: "in the role of a cultural broker (...) I help them to make sense of these different cultures and motivate them to consider the contributions of western science to their everyday lives" (Y, p. 269). When, in the discourse of transformative education, the change agent and the cultural agent meet, there is the possibility of a teacher asking themselves the following question: "What am I: following or leading?" (Y, p. 265). It requests a teaching that questions themselves with reasonings from the discourses of entrepreneurship! This is an **enterprising cultural agent teacher**.

The culture of entrepreneurship, by taking the figure of the executive as an example of conduct, and focusing on the production of "investments", "innovations" and "abstract riches", has generated a repertoire of explanations and constructions of reality that demand of the educational field subjects, that need to be "proactive, innovative, inventive, flexible, with a sense of opportunity, with remarkable ability to bring about change" (Costa, 2009, p. 181). Considering that not everything that can be done in the name of entrepreneurship culture could be transformative or no longer conservative, there would be a paradox in the production of an entrepreneurial cultural agent teacher and the discourse of transformative education. But the enterprising cultural agent does not seem to weaken or be out of the discourse of transformative education - perhaps that kind of teacher would otherwise recover the autopoietic, the resilient, and the messianic aspects.

If it is known that "contemporary teachers have shared a set of certainties that articulate their belonging to a pedagogical idea identified as critical, radical, emancipatory, transformative" (Coutinho & Sommer, 2011, p. 87), it is expected that such articulation will bring together relatively different, and even conflicting, positions. After all, each pedagogical discourse (and here I refer to the discourse of transformative education in connection with the culture of entrepreneurship) "has its way of structuring culture in its various expressions or manifestations" (Díaz, 1998, p. 19). The more positions the discursive domain of transformative education proliferates, the more force it has within that pedagogical idea, since power concerns a game of struggles and affronts that can reinforce, invert, or transform force correlations that constitute the domain in which they exercise themselves. All these variations, which the calibration of the self technique makes possible to distinguish, only reinforce the inventiveness of the discourse of transformative education in producing and articulating types of subjects related to it, in exercising power.

CONCLUSIONS

Since the general objective was to investigate the subjectivation processes engendered in (auto)biographical research by Science teachers, the narratives analyzed here show that they are animated, at their point of departure and arrival, by the discourse of



transformative education - an education centered on demanding positions from its followers. This discourse provides a variety of meanings (about teaching, curriculum and the very researchers that make use of it) that contribute to the production of particular ways of thinking and acting in Science teaching when it comes to pursuing the promise of teacher self-knowledge. Such discourse has in its favor a “self-prospecting technology” that enables an individual to situate themselves in a cultural map elaborated while (self) biographing. I have shown that this technology operates under a “topographic mechanism” that articulates techniques of representation of the terrain on which a teaching self can move. These techniques are the “teacher profiling technique”, the “double diagnostic technique” and the “calibration of the self technique”.

The teacher profiling technique elaborates and distinguishes teaching profiles. It is a subjective capacity calculator technique, a technique of characterization of teaching profiles. Through the availability of capacities, attributes, abilities and reasoning, this technique produces the distinguishable gradients on the horizon capable of sheltering teaching subjects demanded by transformative education. The double diagnosis technique enables the production of teaching imaginaries and imagination. I have shown this production of images in terms of both imaginaries (collection of images) and imaginations (images in action) made visible in a discourse. The double diagnosis also seems to favor the continuous incitement of related practices: once images about what concerns the work of a teacher and about themselves are made available, it is easier to question, wish and have expectations about those images. This is how the discourse of transformative education makes subjects available, who at all times pose to themselves and reveal in their narratives questions, expectations and desires.

For the refinement of prior art products there is the “calibration of the self technique”. It shows whether the results achieved towards transformative education are accurate or eventually need to be corrected. It ensures the reliability of the subject production instrument (autoethnography) by comparing the measured value (subject positions resulting from images produced since diagnosis) with the traced standard value (transformative educator). It establishes a relationship between what is indicated by the measuring instrument, the system of measurement (ability to reveal desires and expectations, to question, to reflect) and what is agreed upon for the greatness (the self) of measure (transformative education). Through questioning and revealing desires and expectations, this technique allows an individual who reflects on themselves thinking about self-transforming and to make transformations to show how much the images produced by themselves in their diagnosis make them the subject of a so-called transformative education. It makes its actuation work as an exercise in setting teacher profiles relative to the ideal of the transformative educator.

The Science teacher who emerges from the narratives investigated here is a subject made possible from multiple positions as: autoethnographer, learner, conscious, hopeful, resilient, phoenix, convert, mediator, successor, messianic, innovative researcher and autopoietic. In their perhaps better-finished version, they may figure as an engaged constructivist or enterprising cultural agent. They consist of a subject capable of moving between: their self-knowledge; being willing to move forward and to rise from the ashes caused by their self-knowledge; being aware of what the practice of questioning can mean to someone or to themselves; having courage in the face of the unusual and having the aptitude to produce it; accepting immense challenges; being an elastic subject, flexible, adaptable to different types of changes, needs and problems posed by their work; be able to recognize in oneself another self after transformation and to facilitate the transformation of others; be able to reinvent ways of doing and ways of orienting research according to the discourse of transformative education; be a subject in constant assessment of themselves and the reality around them; one capable of doing oneself, of

reflexively re-establishing their own organization in congruence with one's surroundings. They are a subject as great as the one promised by (auto)biographical research.

Heavily crossed by psi pedagogies, individuals have been called upon to observe, locate, internalize, excavate, decipher, represent and recognize themselves as subjects endowed with openness, curiosity, interest, and courage for self-knowledge and to launch themselves in games of the true and the false about their attributes, skills, abilities, needs, reasoning, expectations and desires as subjects of education. All of this makes (auto)biographical research inscribe "being a teacher" as an historically unique experience. Teaching nowadays also requires that teachers face the possibility of being a teacher capable of exercising their knowledge of themselves.

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