

SECTION: ARTICLES

Continuing education for teacher educators in the area of natural sciences: which elements to consider?¹

Franciele Siqueira Radetzke²
Roque Ismael da Costa Güllich³

ABSTRACT

The process of continuing teacher education in higher education is taken as the guiding theme of the discussions presented here. We intend to bring results of a research in which we seek to understand the constituent elements of this process. To account for the discussions, we have invested in the analysis of narratives produced by six teacher educators who participate in the continuing education actions developed by the project named Formative Cycles in the Teaching of Science. The production of monads (ROSA; RAMOS, 2015), through textualization of the narratives, is the way which was used to deal with the results. The elements that stood out, among all the ones to be considered, are: Formative Dialogue; Systematization of Experiences and Reflective Narratives. The text is an invitation to the dialogue with regard to Research-Training-Action as a context that provides the dialogue about being and making teaching in science in a critical and reflective way.

Keywords: Higher teaching. Formative elements. Narratives. Science teaching. Continuing teacher education.

How to cite this document – ABNT

RADETZKE, Franciele Siqueira; GÜLLICH, Roque Ismael da Costa. Continuing education of teacher educators in the area of natural sciences: which elements to consider? *Revista Docência do Ensino Superior*, Belo Horizonte, v. 11, e024488, p. 1-17, 2021. DOI: <https://doi.org/10.35699/2237-5864.2021.24488>.

Received on: 18/08/2020
Accepted on: 26/11/2020
Published on: 24/04/2021

¹ The authors were responsible for translating this article into English.

² Universidade Federal da Fronteira Sul (UFFS), Cerro Largo, RS, Brasil.

ORCID ID: <https://orcid.org/0000-0002-3222-7977>. E-mail: francielesradetzke@gmail.com

³ Universidade Federal da Fronteira Sul (UFFS), Cerro Largo, RS, Brasil.

ORCID ID: <http://orcid.org/0000-0002-8597-4909>. E-mail: bioroque.girua@gmail.com

Formación continua de profesores entrenando el área de ciencias de la naturaleza: ¿qué elementos a considerar?

RESUMEN

El proceso de formación continua del profesorado en la educación superior se toma como el tema principal de los debates presentados aquí. Tenemos la intención de traer resultados de una investigación en la que buscamos comprender los elementos constitutivos de dicho proceso. Para llevar a cabo las discusiones, hemos invertido en el análisis de narrativas producidas por seis formadores de docentes que participan en las acciones de educación continua desarrolladas por el Proyecto Ciclos Formativos en la Enseñanza de las Ciencias y las Matemáticas. La producción de mónadas, a través de la textualización de las narrativas, es la forma utilizada para tratar los resultados. Entre los elementos a considerar se destacaron: Diálogo Formativo; Sistematización de Experiencias y Narrativas Reflexivas. El texto es una invitación al diálogo con respecto a la Investigación-Capacitación-Acción como un contexto que proporciona el diálogo sobre ser y hacer que la enseñanza de las ciencias sea crítica y reflexiva.

Palabras clave: Enseñanza superior. Elementos formativos. Narrativas. Enseñanza de las ciencias. Formación continuada del profesorado.

Formação continuada dos formadores de professores da área de ciências da natureza: que elementos considerar?

RESUMO

O processo de formação continuada de professores no ensino superior é tomado como temática norteadora das discussões aqui apresentadas. Temos como intenção trazer resultados de uma pesquisa em que buscamos compreender os elementos constituintes de tal processo. Para dar conta das discussões, investimos na análise de narrativas produzidas por seis professores formadores que participam das ações de formação continuada desenvolvidas pelo projeto Ciclos Formativos em Ensino de Ciências. A produção de mônadas (ROSA; RAMOS, 2015), mediante textualização das narrativas, é a forma utilizada para tratar dos resultados. Entre os elementos que constituem o processo de formação continuada, destacaram-se: Diálogo Formativo; Sistematização de Experiências e Narrativas Reflexivas. O texto é um convite ao diálogo no tocante da Investigação-Formação-Ação como contexto que proporciona interlocuções sobre o ser, o estar e o fazer docente em ciências de forma crítica e reflexiva.

Palavras-chave: Docência superior. Elementos formativos. Narrativas. Ensino de ciências. Formação continuada de professores.

INTRODUCTION: FROM THE FORMATIVE CONTEXT EXPERIENCED TO THE RESEARCH OBJECTIVES

The processes of construction of teachers' identities and the aspects related to the professional development of being a Professor⁴ are factors to be considered in continuing education programs when the intention is to promote the improvement of pedagogical practices. Silva and Schnetzler (2000) have explored three reasons to justify continuing education for teachers:

[...] the need for continuous professional improvement and critical reflection on one's own pedagogical practice, since the effective improvement of the teaching-learning process only happens through the teacher's action;

the need to overcome the distance between educational research contributions and their use for classroom improvement, implying that the teacher is also a researcher of his own practice;

In general, teachers have a simplistic view of the teaching activity, conceiving that to teach it is enough to know the content and use some pedagogical techniques (SILVA; SCHNETZLER, 2000, p. 3).

With this view, the research presented in this writing led us to look at the continuing education of Teacher Trainers⁵ in the area of Nature Science and its Technologies (NST), since we understand their role as essential in the constitution of those who can transform the classroom space: the future teachers. This is why we believe in the potential of the continuous training processes of the NST Teacher Trainers, with a view to a dialogue about their teaching conceptions, to improve initial teacher training (NÓVOA, 1995; SCHÖN, 1992; SILVA, SCHNETZLER, 2000; ZEICHNER, 1993). The research aims at undergraduate degrees in the area of NST, in view of the proximity of our research and teacher education experiences. Moreover, we understand initial teacher education as the field of preparation of future professional teachers for their pedagogical performance and also as the space for the construction of knowledge about pedagogical practice (TOZETTO; MARTINEZ, 2016). Thus, initial training "[...] is more than a place of acquisition of knowledge techniques, but it is a key moment of socialization and professional configuration" (NÓVOA, 1995, p. 18).

⁴ In the text, the word Teacher is used with initial capital letters in order to demarcate the weight of the expression TEACHER, as well as the meaning of the letter "P" attributed by Nóvoa (2007) from five other "P's" for training and action of the Teacher: P for Practices; P for Profession; P for Person; P for Sharing and P for Public.

⁵ Here we take the higher education teachers as Teacher Trainers and we dedicate ourselves especially to analyze the effect of the training linked to the degrees, given their importance in the training of new teachers.

Thus, we start from the view that it is during initial teacher education that the construction of schemes that will guide teaching activities begins (IMBERNÓN, 2001) and, thus, we bet on the need for continued education processes in higher education (HE). At the same time, professional development needs to go beyond the concepts of improvement of techniques and professional updates and give voice to one's own pedagogical practice, or rather, to one's own understanding of what it means to be a teacher (research of one's own practice: action research). In this way, the construction of teaching identities is not a product, but a process that takes place in the understanding of the profession, its challenges and goals (NÓVOA, 2007).

In the present study, the central intention is to understand the elements that constitute the continuing education process in which the NST Teacher Trainers participate, which is the extension project: Formative Cycles in Science Teaching. This project is an opportunity to support the training of teachers (in initial and continuing education) through systematic meetings, which have been taking place once a month since 2010, favoring the dialogue between students in initial training, teacher trainers and teachers of basic education - triad of interaction (ZANON, 2003). The training process is based on critical rationality, which implies thinking of training through the Research-Training-Action (IFA) model (ALARCÃO, 2010; CARR; KEMMIS, 1988; CONTRERAS, 1994, 2002; GÜLLICH, 2013), in which reflection is central and has a formative essence. In this model, the examination of one's own practice implies a look in, on and for action, that is, the knowledge built in the investigation serves as "guides for new experiences, which also gives learning a cyclical and developmental character" (ALARCÃO, 2010, p. 53).

It is pertinent to highlight that the teachers participating in the research had already been experiencing the continuing education process developed by the Formative Cycles in Science Teaching when we searched for their conceptions. Next, we describe the research methodology used, in order to highlight the constituent elements of the continuing education process experienced by the Teacher Trainers, as well as present the teachers participating in the study.

METHODOLOGY: THE PATHS WALKED AS SOURCES OF INSPIRATION

Six Teacher Trainers in the area of NST, who work with initial teacher training at the undergraduate level, were considered for the research. Two are from the Biological Sciences area, two from Physics and two from Chemistry, three with post-graduate training in the basic area of Biology, Physics or Chemistry and the other three with post-graduate training in Education. The data production was developed based on narratives about personal life

stories told orally by the CNT Teacher Trainers, which were audio recorded and later transcribed.

The whole study was carried out so that the ethical principles of research with human beings were met, keeping confidentiality and anonymity of the teachers involved. For this, authorization was requested for the use of the information obtained through the Free and Informed Consent Form, approved by the Research Ethics Committee (CEP-UFFS). The request was met under protocol number 3.398.28. In the discussion, the Professors were called PES, referring to Professor of Higher Education, added to B (PESB), when they are from the basic area, and E (PESE), when they are from the teaching area, and also Bio, Physics or Chemistry, corresponding to the respective areas of initial training of each one (Biology, Physics or Chemistry). For example, PESBBio: Basic Biology ES Teacher, and PESEQuí: Chemistry ES Teacher.

The time of participation of the Trainers in the Formative Cycles in Science Teaching varies according to the year of joining the Federal University of the Southern Border (UFFS), that is, the search for formation movements is individual and, in most cases, reflects the year of joining the respective institution. PESEBio and PESEQuí had their professional activities at UFFS started in 2013, and in the same year they began to participate in the training cycles. PESEFís started at UFFS in 2013 and began participating in the project in 2014. PESBFís joined the UFFS as a Professor in 2013 and started to participate in the Formative Cycles in Science Teaching only in 2015. PESBBio participates in the training cycles since 2017, coinciding with the beginning of his professional activity at the UFFS, Cerro Largo campus. And PESBQuí began working at UFFS in 2015 and in the same year wanted to participate in the project. This demonstrates the particularities to be considered during the research, as well as the interactions that emerge from the collective training provided by the Formative Cycles in Science Teaching.

When searching for understandings about the continuing education process carried out with the Teacher Trainers, it is important to recognize the elements that are part of such discussions. To this end, we have invested in the production of narratives about the life and training histories of the Trainers and we have carried out with them the textualization process through the elaboration of monads, which:

are fragments of stories that, together, narrate the conjuncture of a time and place. Methodologically, they are excerpts from the interview transcripts that are recreated through textualization, production of a title, and editing. They are expressed as short chronicles, stories with a generally open beginning and end, which leave gaps so that the reader or listener can also creatively perceive the truths they contain (ROSA; RAMOS, 2015, p. 147).

The narratives are extremely important for the subjects, because through them the analysis is triggered and it is possible to submit the experienced processes to a reflection on what happened, being, therefore, formative-constitutive of new questions, concerns and understandings (IBIAPINA, 2008). In its essence, narratives are loaded with many meanings, feelings and understandings about teacher education (CUNHA, 1998; REIS, P., 2008). And as a research methodology, they allow "a better understanding of teachers' knowledge through the analysis of their own words" (REIS, P., 2008, p. 6), constituting a useful space for personal and professional development.

In this way, it is through the life stories of the CNT Teacher Trainers, which portray the meanings of their participation in the Formative Cycles in Science Teaching, that we seek to highlight the constituent elements of this process, believing that "through life stories, the elaboration of new proposals about teacher training and the teaching profession can pass" (NÓVOA, 2007, p. 25).

It is worth mentioning that the production of narratives can be done in several ways, among the most used are written and oral. For the research, we chose the oral production in view of the direction of the representations, focusing on the dialogue for the scope of the research: contributions and challenges of the continuing education proposed by the Formative Cycles in Science Teaching. In this way, the production of narratives by the Trainers occurred through an interlocution with open questions between the researcher and each Teacher participating in the research individually about the process of continuing education experienced. After being audio recorded, the narratives were transcribed.

The way we found to rescue the convictions brought by the narratives was through the production of monads. For Rosa and Ramos (2015, p. 146), to work with narratives and transform them into monads "is to work with openings, with the possibility of interlocutions with others, without trying to answer all the questions, often even creating new ones. Thus, from the narratives produced by the teachers participating in the research, our intention was to try to bring the understandings in a way that represented a portion of the whole presented, that is, with a beginning, middle, and end.

Thus, in methodological terms, we built three monads according to the narrative aspects highlighted by Reis, P. (2008), which are: i) the development of an action triggered by a conflictual situation, real or imaginary; ii) the tensions and conflicts experienced by the protagonists, and; iii) how the conflicts were overcome. In this way, the monads are organized, in a collective way, as directed clippings of the narrations of the Teachers participating in the research. For each narrative aspect (REIS, P., 2008) we built a monad considering excerpts from the narratives of all participating teachers.

The intention of relating the trainers' narratives with the aspects pointed out by Reis, P. (2008), which in general, they all presented, is justified by the fact that it provides detailed focus on the constituent elements of the continuing education process in the Formative Cycles in Science Teaching. The idea of collective interweaving is due in a special way to one of the propositions presented by the training cycles themselves, which are characterized as a collective and collaborative training environment, through which reflection is triggered by the group's training dialogue (GÜLLICH, 2013).

Thus, from each of the three monads produced - whose titles are: 1) Between comings and goings: the why of participation; 2) Between comings and goings: the challenge of participation, and; 3) Between comings and goings: the meaning of participation - the constituent elements of the continuing education process brought by the group of Teacher Trainers in the area of CNT were defined in each stage of their narratives.

After interpretation and discussion of the monads in detailed stages, the formative elements that stood out in each one of them were organized based on the interactions that followed, allowing a better explicitness and focus of the research problematic for later externalization.

In the sequence, we show the collective construction of the three monads, with attention to the elements that emerge in each of the situations.

FROM NARRATIVES TO EMERGING FORMATIVE ELEMENTS

The monads constructed are characterized as directed clippings of the narratives produced by the Teachers, keeping the context experienced and the main situations emphasized. In a first moment, among them, we tried to highlight justifications that would strengthen for the Teacher Trainers the search for continued education, in synthesis: what were their purposes? In this sense, the initial investigation focused on the formative needs that these teachers have contemplated in the course of their activities, referring to the first stage of the narratives highlighted by Reis, P. (2008): development of an action triggered by a conflicting situation.

In this stage, the aspects inferred from the teachers' narratives include processes of: **reflection on pedagogical practice** (PESBFís, PESBQuí, PESBio, PESEBio, PESEFís, PESEQuí); **dialogue with basic education** (PESBQui, PESBFís); **sharing of knowledge** (PESEQuí, PESEFís, PESEBio) and continuous process of **teacher constitution** (PESEBio). The perspectives of the investigated teachers regarding the participation in the Formative Cycles in Science Teaching can be observed in a tether that converges in the construction of monads, now with several "projections" merged in the same principle: what brings them to the continuing education?

MONAD 1

Between comings and goings: the reason for participation

So, it is a process for those who are not in the Teaching area, but at least have the intention to improve every day this question. I have difficulty with this writing, with this self-reflection. Because I think that we can't lose contact first with what is being done at the basic level, can we? It is well, I think, to see the pedagogical practice and also to put myself as a basic education teacher, because we cannot escape the fact that we are training teachers. So this is the formation that is always continued [...] always wanting new looks, new possibilities, new knowledge that is presented to all of us, to all levels of formation that are there [Formative Cycles in Science Teaching]. If I didn't want to, I wouldn't have to do it, because the municipality didn't require it at that time, I started to come because I wanted to participate, and I think it is important that we are always learning, to be in a continuous process of constitution, that it is not because I am here that I know more than others, right? But we always learn by listening to others, so there is always something there that will add to your training and even to rethink other things that we are doing (PESBBio; PESBFís; PESBQuí; PESEBio; PESEFís; PESEQuí, 2019).

Some tensions also emerge from the process of Teachers' participation in the formative cycles, converging to the second stage of the narratives according to Reis, P. (2008): the tensions and conflicts experienced by the protagonists.

These expressions are understood by us as challenges and future projections to be worked on. Among the challenges, we can indicate aspects such as **(re)thinking methodological situations** (PESBBio, PESBQuí, PESBFís, PESEFís, PESEBio); **production of reflective writing** (PESBBio, PESBFís); **need for participation** (PESEBio, PESEQuí). At this point, the projections of the narratives deserve attention, since they refer to the wishes of the Teachers. Moreover, they may represent starting points for their own investigations and for other various narratives and reflections. The following monad brings together the situations listed as challenging by the Teacher Trainers:

MONAD 2

Back and forth: the challenges of participation

[...] I have difficulty in this writing, in this self-reflection. I don't know if I will achieve this one day, being almost 50 years old already comes with a baggage of almost 20 years in undergraduate teaching, but that traditional teaching. But I am breaking through every year, and the Cycles can give a bigger jump to this. And we are always in metamorphosis

[transformation], as I say, right? So this is my concern, is to always try to bring reality and already be thinking, placing oneself in that environment and not in a distorted way. If we could talk more, we would have many more things, but we are always limited by time, aren't we? How do you teach a student who is seeing it for the first time? It is necessary] to see what in fact they [students] need to learn. I always tell Teacher R that I don't like to write and that's why I see the Cycles as an opportunity for me to see my practice and the feelings of basic education teachers. But it is part of this will to want, because it is much more practical to stay at home than to come here and want to change, to leave the comfort zone, to think something different. [...] independent, of course I have several students from the Chemistry course who do not participate in the Cycles, they are outside students, anyway, they work, but they participate, they are the scholarship holders (PESBBio; PESBFís; PESBQuí; PESEBio; PESEFís; PESEQuí, 2019).

In the last stage of the narratives, we sought to observe the Teachers' understandings about the contributions that the Formative Cycles in Science Teaching have offered regarding the challenges highlighted by them. Hence, we think of projections of the practice to gain voice in the world of research, of actions, of formations of new narratives, thus placing themselves as perspectives. This characterizes the third stage of the narratives highlighted by Reis, P. (2008), which is: the way conflicts were overcome.

What we aim in this part of the discussion is to understand the meaning that the continuing education process (in this case, the Formative Cycles in Science Teaching) has for the Teachers. Among the narratives it is possible to observe the commitment of the Teachers, allied to the teaching in which professional development achieves meaning when permeated by the understandings that: "You are a trainer, but you are not formed, you are in a process, as I told you, of constitution. We are learning every day" (PESEBio). Thus, the following emerge as contributions: **formative dialogue or shared formation** (PESBFís, PESBQuí, PESBio, PESEBio, PESEFís, PESEQuí); **reflective writing process** (PESBFís, PESBQuí, PESBio, PESEBio, PESEFís, PESEQuí); **(re)signification of pedagogical practice** (PESBFís, PESBQuí, PESBio, PESEBio, PESEFís, PESEQuí). Such considerations can be observed in the following production:

MONAD 3

Coming and going: the meaning of participation

And the Cycles [help me] to think more about this criticality of my being a teacher. It is this part, more of the pedagogical part, that I feel that the Cycles provide us. It doesn't matter if one is a transformer or a conservative, one is traditional, one is critical, it is necessary that all

of these be in our group so that this group can move, because the formation of the Cycles is, I perceive it as a constant movement. When you start to participate in a formative process you broaden your view, you start to question yourself, and then you will have more subsidies for a discussion. Because for me, besides the formation, it is the moment when we find ourselves in the group. The fact that we are all there together, you know, to see, to look at the whole group of those who do, of those who are there, this is all very important to me, this collective. I think that the most important thing, the most important meaning of the Cycles, is the collectivity and the sharing that we have inside, the theoretical issues, the lived experiences, it is a very great richness (PESBBio; PESBFís; PESBQuí; PESEBio; PESEFís; PESEQuí, 2019).

So far, the "gaps" (ROSA; RAMOS, 2015) through which we have looked at the training processes contained in the Teachers' narratives have made it possible to think approximations and weave interactions strengthened with readings and observations carried out in the research process. Now, we focus on discussing the approaches made, in which the constitutive elements of continuing education can be indicated, towards a possible synthesis.

THE CONTINUING EDUCATION OF TEACHER EDUCATORS IN THE AREA OF NATURAL SCIENCES: WHICH ELEMENTS TO CONSIDER?

One of the advantages of working with IFA is that not only data, results and corroborations emerge from the narratives, but also new understandings, new stories, new thoughts and propositions. Thus, the considerations made in the previous section, deduced from the monads, add up, indicating the constituent elements of the continuing education process experienced by the Teachers.

According to this thought, we highlight the main comprehensions emerging from the voices of the Professors participating in the research, which emerged from the interactions between the monads that stood out, their nuances and conflictual relations, from the interactions with the literature and those of the researchers authors of this text, producing the constituent elements that were recurrent in the process of continuing education of Teacher Trainers of the area of natural sciences analyzed, being them: formative dialogue; systematization of experiences; reflective narratives.

Similarly, Person and Güllich (2016) demarcated the constitutive elements of the continuing education of teachers looking at the Formative Cycles in Science Teaching, among which they highlighted: dialogue, reflective narratives, mirroring of practices, experience report and systematization of practices. For Person and Güllich (2016), these are the elements that provide the opportunity for reflection processes on teachers' knowledge and actions.

Based on these considerations, the study with CNT Teacher Trainers focuses on three elements, according to general propositions, compared in the production of our results and in the studies of Person and Güllich (2016): dialogue, sharing of experiences, and reflective writing. We understand these elements as fruitful projections to be considered in continuing education processes.

The formative dialogue highlighted by the Trainers refers to the sharing of knowledge with peers and also with professionals from other training levels (undergraduates and Basic Education Teachers), as well as the interaction with references in the area. In the words of Person and Güllich (2016, p. 294), "the dialogue becomes an essential element in the continuing education of Science Teachers, because it is through it that the interactions between the subjects are triggered".

For PESEQui: *"the most important meaning of the Cycles is the collectivity and the sharing that we have inside, of theoretical issues, of lived experiences, it is a great richness"*. Alarcão (2010, p. 49), when working with reflection as a movement of formation, emphasizes that the dialogue based on experience assumes a triple dialogue: "a dialogue with oneself, a dialogue with others including those who before us built knowledge that are references, and a dialogue with the situation itself".

In a collaborative way, the subject is enabled to discuss his own practice, reaching other perspectives through the sharing of knowledge when put into discussion. For PESEFís: *"so this is the training that is always ongoing [...] always wanting new looks, new possibilities, new knowledge that is presented to all of us, to all the levels of training that are there"*. When referring to the levels of training, it is worth highlighting the triadic model of interaction proposed by Zanon (2003), on which the Teacher Trainers, from basic education and in initial training act collaboratively, aiming to enhance discussions in the logic that everyone teaches and also everyone learns.

Such perspectives reach the other constituent element of the continuing education process highlighted by the teachers: the systematization of experiences, which we will discuss next.

In processes of systematization of practices and experiences, the Teachers are asked to discuss the experience reported by their peers, as highlighted by PESBFís: *"I always say to Professor R that I don't like to write and that is why I see the Training Cycles as an opportunity for me to see my practice and the feelings of the basic education teachers"*. In Person and Güllich's (2016) conception, the systematization process starts from the report of an organized writing that has already undergone the first reflection, having become experience (BONDIA, 2002). Considering that:

when teachers narrate their experiences, reflection is triggered in the training group, it is at the moment when the other socializes his practice that the other will constitute himself, as well as himself by the interaction with this other of discourse (PERSON; GÜLLICH, 2016, p. 300).

In this direction, we highlight the need for studies and training in groups so that problematizations occur on conceptions and teaching practices, promoting means of investigation of the space in which they work, what we may call situated context (PERSON; Bremm; GÜLLICH, 2019). For Maldaner (2000, p. 110), "continuing education is an intrinsic need for pedagogical practice, which is always more complex and increasingly demanding in terms of knowledge that initial training cannot handle. In this way, the interactions and reflections produced by the triad of subjects (ZANON, 2003) become mediators of the initial and continuing training of Basic Education Teachers and Teacher Trainers, all understood as Teachers in training (PERSON; GÜLLICH, 2016) when they become active subjects of the process (CARR; KEMMIS, 1988). For PESEFís:

[...] the importance is, as I told you before, to think of new models to act and develop the work in the classroom and this also influences the students that are there, it affects not only me, it affects all of them as well. They start to think of other ways and bring them up for discussion in class and this causes me to change my class, because every semester we see what worked and what didn't, always rethinking. Although the subjects are always the same, there is a sequence, but the way each semester is different from the previous one, we are always trying to improve (PESEFís).

Thus, the fact that undergraduates are participating in these processes of reflective interaction contextualizes the experiences, thus providing an opportunity for more critical thinking about teaching (PERSON; GÜLLICH, 2016). This aspect is directed to the statements of Maldaner (2000), when understanding the need for the training of teachers and researchers in the process of interaction already in the initial training, allowing the continuity and expansion of such processes.

This emphasizes the need for teachers to place themselves as participating subjects and producers of the training process, realizing the importance of the collective and taking the training process into their own hands (IMBERNÓN, 2001). It is at this point that reflective writing in IFA processes needs to be observed, as highlighted below.

The writing of reflective narratives has still been considered as a factor to be built, since the Teachers show difficulties regarding this process, as highlighted: "I do not have this habit of writing, I have difficulty in this writing, in this self-reflection" (PESBBio). Such position refers to the interviewed teachers of the basic areas of Biology and Physics, who in their narratives highlight such difficulty, but, in the midst of the dialogues of the training collective Formative

Cycles in Science Teaching, they seek to make these reflections. Despite this, the writing process is taken as necessary, because it allows the monitoring of evolutionary processes (PORLÁN; MARTÍN, 2001), considering that when Teachers write: "takes back the formative dialogue of the group for themselves and thus, appropriating the formation process, reflects on their action, investigates it" (GÜLLICH, 2013, p. 299).

Person and Güllich (2016) emphasize the potentials of writing when referring to the basis for an adequate IFA, which seeks critical reflection and research on one's own practice.

be writing in logbooks, training diaries, or class diaries, because writing ensures the process of reflection guided (by informed practice, which will establish itself as a timeline to be well understood/investigated) and mediated (by group discussions and readings) (PERSON; GÜLLICH, 2016, p. 302).

Porlán and Martín (2001), when discussing the use of the teacher's diary in the teacher's constitution, refer to its sociability and the importance of the exchange of reading among peers as a formative movement. This is because it is a process of interaction, collecting and interpreting different voices and enabling the knowledge of other situations and their own (REIS, P., 2008).

The dialogue and reflection achieved in the narratives told about one's own experiences, by themselves, constitute a strong personal and professional development and, in addition, may trigger other behaviors, such as:

- a) questioning their competencies and their actions; b) becoming aware of what they know and what they need to learn; c) the desire for change; and d) establishing commitments and setting goals to achieve (REIS, P., 2008, p. 4).

In this direction, PESEQuí highlights the need to, in the continuing education moments: "seek the experiences of the classroom, make the teachers talk about their classroom, there are times that we need to reinforce theoretical texts to go understand things that occur in the classroom and in practice.

In this way, when PESBFís states: "and there, we have this contact and also with all of you who participate, and between the dialogues and the presentations, right? It is also possible to observe our practice as trainers, so I see this, this possibility in the Cycles," we can infer that such observations could be enhanced as they are dialogued in reflective and shared writing processes among peers, considering that reflection contributes to the construction of experiences.

From the understandings undertaken and, also, based on the referential that guided the discussions (NÓVOA, 1995, 2007; IMBERNÓN, 2001; REIS, G.; OSTETTO, 2018; ALARCÃO, 2010; GÜLLICH, 2013), it is worth noting the relevance of taking the subject Teacher as the author of his training, so that, through reflective writing, systematization of experiences and formative dialogue, he can develop as a professional teacher investigator of his own practice and his training process.

PROPOSITIONS: HOW TO THINK ABOUT PROJECTIONS AND CHALLENGES

In the current panorama of education, we observe the continuing education process as a decision to be strengthened, considering that the interest for one's own education was one of the factors highlighted in the narratives of the investigated teachers. We believe that, among the actions developed in continuing education groups, we should first observe the causes that bring Teachers to such a space and, based on the elements highlighted by them, observe challenges and opportunities. We consider that the analysis of the formative aspects, that in this study compose our "projections", also point us to propositions under construction, because they need to be in movement: in steps, being reviewed as a cycle (of self-reflective spirals) that, by reaching new stages, becomes more comprehensive and enables other various discussions.

During the discussions, the proximities between the "projections" in the three moments of the narratives (why/unfolding, challenge/conflict and meanings/overcoming), besides producing the elements to be considered, in the interaction with these, produced some understandings and propositions. Among them: the triadic formative context favors the discussions and the reflection of the practice; the dialogues need to be guided by the teaching situations experienced in the school and university contexts; the reflective writing movement is vital for the professional development; the continuous formation is the basis for a fruitful teaching constitution in times and spaces of formative dialog.

Thus, the organization of discussion spaces anchored by the IFA (the context) favors the dialogue about the production of teaching identities, through which teachers construct and understand ways of being and being in the profession, and beyond that, they care to understand the professional development in the classroom. We understand that if the intention is to improve teaching and learning in basic education, it is also necessary to do so in the initial training, and this is where the trainers have their great challenge. We launch the continuing education process of the Trainers as a means to qualify teaching by means of which a formative dialogue, the systematization of experiences and the narrative writing are necessary as part of the formative process, constitutive of the research of the experience

during their training. These are links through which everyone teaches and also learns, and therefore make the process reflective, critical, and formative.

REFERENCES

- ALARCÃO, Isabel. *Formação reflexiva de professores: estratégias de supervisão*. Porto: Porto Editora, 2010.
- BONDIA, Jorge Larrosa. Notas sobre a experiência e o saber de experiência. *Revista Brasileira de Educação*, São Paulo, n. 19, p. 20-28, abr. 2002. DOI: <https://doi.org/10.1590/S1413-24782002000100003>.
- CARR, Wilfred; KEMMIS, Stephen. *Teoría crítica de la enseñanza: investigación-acción en la formación del profesorado*. Barcelona: Martinez Roca, 1988.
- CONTRERAS, José. ¿Que és?. *Cuadernos de Pedagogia*, n. 224, p. 7-12, abr. 1994.
- CONTRERAS, José. *A autonomia de professores*. Tradução: Sandra Trabucco Valenzuela. São Paulo: Cortez, 2002.
- CUNHA, Maria Isabel da. *O professor universitário na transição de paradigmas*. Araraquara: JM Editora, 1998.
- GÜLLICH, Roque Ismael da Costa. *Investigação-Formação-Ação em Ciências: um Caminho para Reconstruir a Relação entre Livro Didático, o Professor e o Ensino*. Curitiba: Prismas, 2013.
- IBIAPINA, Ivana Maria Lopes de Melo. *Pesquisa colaborativa: investigação, formação e produção de conhecimentos*. Brasília: Líber Livro Editora, 2008.
- IMBERNÓN, Francisco. *Formação docente e profissional: formar-se para a mudança e a incerteza*. São Paulo: Cortez, 2001.
- MALDANER, Otávio Aloísio. *A formação inicial e continuada de professores de Química: professores/pesquisadores*. Ijuí: UNIJUÍ, 2000.
- NÓVOA, António. Formação de professores e profissão docente. In: NÓVOA, António. (coord.). *Os professores e a sua formação*. Lisboa: Dom Quixote, 1995. p. 15-34.
- NÓVOA, António. *Vidas de professores*. 2. ed. Porto: Porto Editora, 2007.
- PERSON, Vanessa Aina; GÜLLICH, Roque Ismael da Costa. Demarcando elementos constitutivos da formação continuada de professores de ciências. In: BONOTTO, Danusa de Lara; LEITE, Fabiane de Andrade Leite; GÜLLICH, Roque Ismael da Costa. *Movimentos formativos: desafios para pensar a educação em ciências e matemática*. Tubarão: Copiart, 2016.

PERSON, Vanessa Aina; BREMM, Daniele; GÜLLICH, Roque Ismael da Costa. A formação continuada de professores de Ciências: elementos constitutivos do processo. *Revista Brasileira de Extensão Universitária*, Chapecó, v. 10, n. 3, p. 141-147, 2019. DOI: <https://doi.org/10.24317/2358-0399.2019v10i3.10840>.

PORLÁN, Rafael; MARTÍN, José. *El diario del profesor*. Sevilla: Díada Editora, 2001.

REIS, Pedro Rocha. As narrativas na formação de Professores e na investigação em educação. *Nuances*, São Paulo, v. 15, n. 16, p. 17-34, jan./dez. 2008. DOI: <https://doi.org/10.14572/nuances.v15i16.174>.

REIS, Gabriela Alves de Souza Vasconcelos dos; OSTETTO, Luciana Esmeralda. Compartilhar, estudar, ampliar olhares: narrativas docentes sobre formação continuada. *Educação e Pesquisa*, São Paulo, v. 44, n. 1, p. 1-18, 2018. DOI: <https://doi.org/10.1590/s1678-4634201844180983>.

ROSA, Maria Inês Petrucci; RAMOS, Tacita Anselmo. Identidades docentes no Ensino Médio: investigando narrativas a partir de práticas curriculares disciplinares. *Pro-Posições*, Campinas, v. 26, n. 1, p. 141-160, 2015. DOI: <https://doi.org/10.1590/0103-7307201507601>.

SCHÖN, Donald. Formar professores como profissionais reflexivos. In: NÓVOA, António. *Os professores e a sua formação*. 1. ed. Lisboa: Dom Quixote, 1992.

SILVA, Lenice Heloisa de Arruda; SCHNETZLER, Roseli Pacheco. Buscando o caminho do meio: a “sala de espelhos” na construção de parcerias entre professores e formadores de professores de Ciências. *Ciência e Educação*, Bauru, v. 6, n. 1, p. 43-54, 2000. DOI: <https://doi.org/10.1590/S1516-73132000000100005>.

TOZETTO, Susana Soares; MARTINEZ, Flávia Wegrzyn. Os conhecimentos pedagógicos na formação inicial no curso de Ciências Biológicas. *Atos de Pesquisa em Educação*, Blumenau, v. 11, n. 3, p. 755-778, 2016. DOI: <http://dx.doi.org/10.7867/1809-0354.2016v11n3p755-778>.

ZANON, Lenir Basso. *Interações de licenciandos, formadores e professores na elaboração conceitual de prática docente: módulos triádicos na licenciatura de Química*. 2003. 451f. Tese (Doutorado em Educação) – Faculdade de Ciências Humanas, Universidade Metodista de Piracicaba, Piracicaba, 2003.

ZEICHNER, Kenneth M. *Formação reflexiva de professores: ideias e práticas*. Lisboa: Educa, 1993.

Franciele Siqueira Radetzke

Science teacher for the final grades of elementary school in the city of Porto Lucena. Master's degree in Science Teaching in the Graduate Program in Science Teaching (PPGEC/CAPES) at the Federal University of the South Border (UFFS). PhD student in Science Education at the Universidade Regional do Noroeste do Estado do Rio Grande do Sul (Unijuí).

francielesradetzke@gmail.com

Roque Ismael da Costa Güllich

PhD in Science Education from the Regional University of the Northwest of the State of Rio Grande do Sul (Unijuí). Researcher Leader of the Group for Studies and Research in Science and Mathematics Teaching (GEPECIEM). Professor and coordinator of the Graduate Program in Science Teaching (PPGEC/CAPES) at the Universidade Federal da Fronteira Sul (UFFS).

bioroque.girua@gmail.com