

An Experience of Instruction University Teachers in the Paradigms of Science

Francisca Maria Sousa, Marilda Aparecida Behens, Patrícia Lupion Torres, Raquel Pasternak Glitz Kowalski

Pontificia Universidade Católica do Paraná, Curitiba, Brazil

Email: marildaab@gmail.com

How to cite this paper: Sousa, F. M., Behens, M. A., Torres, P. L., & Kowalski, R. P. G. (2017). An Experience of Instruction University Teachers in the Paradigms of Science. *Creative Education*, 8, 1315-1328. <https://doi.org/10.4236/ce.2017.88093>

Received: March 29, 2017

Accepted: July 21, 2017

Published: July 24, 2017

Copyright © 2017 by authors and Scientific Research Publishing Inc.

This work is licensed under the Creative Commons Attribution-NonCommercial International License (CC BY-NC 4.0).

<http://creativecommons.org/licenses/by-nc/4.0/>



Open Access

Abstract

Teacher instruction promotes debates on the paradigms that underpin the pedagogical practices of university teachers. This article presents part of a research whose general objective was to analyze the constructs and knowledge necessary for teacher instruction to subsidize teaching in the view of paradigm of complexity. We chose to investigate the problem: how to contribute to the change of the pedagogical practice of university teachers, experiencing research activities on the constructs and knowledge that welcome the paradigm of complexity in innovative teaching action. With this vision, action research was developed through a qualitative approach, which included nine doctoral students/participants, from the Educational Paradigms and Pedagogical Instruction group (PEFOP), from the Theory and Pedagogical Practice in Teacher Instruction series, from the Stricto Sensu Post Graduation in Education of a large university in the state of Paraná. The theorists who supported the study were: Morin (2001), Moraes (2012), Behrens (2007, 2011, 2014), Garcia (1999), Zabala (2002), Torres et al. (2012), among others. In face-to-face meetings, theoretical and practical reflections on the pertinence of innovative methodologies were provided from the perspective of the complexity paradigm, the construction of abstracts on the subject, the construction of conceptual maps, and the portfolio as an evaluation and sharing tool of the group's activities. As a result, the participants elaborated articles as a means of producing knowledge among the peers explaining and defending why they chose to teach in a vision of complexity as the advancement of their profession. By constructing the knowledge, we find in research the vision of totality with a view to involving the student as a subject in the construction of his own knowledge, making him autonomous, critical and reflective and provoking him to seek the transformation of society and global reality. These constructs instigated teachers to rethink their pedagogical practice.

Keywords

Teacher Instruction, Pedagogical Practice, Paradigm of Complexity

1. Introduction

In contemporary society, fast changes in the working world and technological advance configure a virtual society and information and media communication on impact on the teacher's instruction. Therefore, on the twenty-first century, it seems necessary for every educational institution, since they are responsible for the basic to the higher education that must evolve to propose a redefinition of guidelines assigned to the previous centuries.

In view of this assumption, it is pertinent to reflect on the practices carried out during the instruction process of the university professor. As an example, we report the research developed with doctoral students of a large university in the State of Paraná. It made it possible for the students to reflect on their practice in an innovative paradigm, both for those who work as teachers and for those who carry out pedagogical functions.

Research of this nature has made us reflect and discuss about the theoretical conceptions that approach on the formation of the university professor facing the need to overcome the conservative educational paradigms in search of innovative paradigms which can give support to the confrontation to the educational problems of the contemporary society.

With this purpose, the objective of the research was to: Analyze the constructs needed for teacher instruction to subsidize teaching in the paradigm of complexity view. For that, the problem was investigated: How to contribute to the change of the pedagogical practice of the university professor, experiencing research activities on the constructs and knowledge that shelter the paradigm of complexity in the innovative teaching action.

The activities were carried out through an action research developed in the group Educational Paradigms and Pedagogical Instruction (PEFOP), of the Theory and Pedagogical Practice Line in Teacher Instruction, of the *Stricto Sensu* Post Graduation Program in Education, from a private university in Paraná. The action research allowed the analysis that the teacher needs to develop the capacity to reflect on his own practice, which the complexity paradigm impacts on the instruction and the teaching performance. The theorists that subsidize the work were: Behrens (2007, 2011, 2014), Moraes (2012, 2015), Zabala (2002), Morin (2001), Marcelo (1999), Torres et al. (2012), among others. The action research was developed in a continuous process consisting of eight phases, which were developed through instruments such as the elaboration of exploratory texts and conceptual maps constructed in each phase by the participants who composed the portfolios with individual and collective analytical syntheses from the readings, contributions and reflections of the researchers on the subject. These instruments favored the critical reflections among the researchers based on the theory proposed by scholars of the themes. Thus, the construction of small analytical texts and conceptual maps provided a schematic summary of what was discussed and learned through the readings and reflections made during the meetings. In this sense, we also included as a research tool the portfolio construction that added the advances of the investigative process, and thus these

contributions favored the production of knowledge and the sharing of the activities developed by the group.

Therefore, the activities built and analyzed contributed significantly to the construction of knowledge via shared practice, thus enabling us to investigate the constructs and knowledge for the development of a pedagogical practice that met the requirements of the new educational paradigms and contributed with the changes of the educational context which involves the different modalities of education of the contemporary society.

In the face-to-face meetings of the PEFOP group, theoretical and practical reflections related to the pertinence of innovative methodologies were provided, through which we could perceive that there is a need to overcome the reproduction paradigm for its production of knowledge. This finding has led us to seek possibilities for innovation, such as the redefinition of criteria for selection and organization of the constructs and pedagogical knowledge of university professors, as well as the change of limiting pedagogical conceptions, with the development of critical awareness in teachers so that they can question the knowledge considered valid and critically recreate the contents they transmit, thus contributing to the transformation of education.

Based on this inquiry, provoked by our concerns, we aim to broaden our discussions about theoretical-practical and methodological approaches, which support the formation of university professors, with the aim of contributing to the construction of a pedagogical practice in a complex vision that allows the teacher to add to itself changes in its practices, since previous models have proved to be ineffective and inefficient in solving problems. Due to the demands of constant changes in the social reality of society, the need to review the pedagogical practice of teachers at different levels of education arises in the educational scenario.

Therefore, we continue to discuss the understanding of the concept of teacher education, in a vision of complexity, since it is a relevant reflection that fosters discussions about educational paradigms within the framework of pedagogical practices of university teachers.

2. The Concept Teacher Instruction: A Necessary Analysis

The need to make a few remarks about the concept of teacher instruction is justified by the centrality of the issue on the research, as well as that, in various human practices, and the high degree of its complexity, the issue of instruction needs to be understood from its multiple dimensions. Given this assumption, is reflected about the concept of “instruction” and “teacher instruction”, explained by Garcia (1999) and Zabala (2002), among others.

There are three opposing trends in relation to the concept of instruction as Garcia (1999). The first is related to the inability to use the concept of instruction as defining technical language on education. According to the theory above, to be understood as formation as technique is assuming the position that violates the formation dimensions that cannot be investigated and, therefore, refuse If

use. Certainly, this is not the position taken by those who develop an educational practice.

The second trend relates to the use of the concept of instruction to identify multiple concepts and sometimes contradictory. According to this author, this tendency argues that instruction is not limited, as a concept, to a specifically professional field, but to multiple dimensions. On this direction, the fact to understand no need for specific instruction for a field generated mistakes in the attribution of meaning that currently relates to the concept of instruction.

According to this theory, on the education field it is observed the generalization of continuing education, converted into a distributor of knowledge labeled and small securities. Given this understanding, Garcia (1999) points out that “Enriquez proposes to abandon definitely this term instruction.” This proposing becomes inconsistent, since, in education instruction is built from the development and evidenced d s knowledge for continued teacher instruction, through critical reflection.

The third trend identified by Garcia (1999) is that, currently, has no sense to eliminate the concept of instruction, since that theoretical instruction is not a general concept that includes education and teaching, needs subordinate to them.

Thus, according to Garcia (1999: p. 2), the concept of formation is generally associated with an activity, where there is a transforming instruction. The author states that the concept of instruction “[...] includes a comprehensive human development that must be taken into in the face of other highly technical concepts.”

According to understanding this author, Zabala (2002), contributes with the thought of Marcelo (1999), stating that the personal dimension, that involves the concept of instruction, binds to an axiological search regarding purposes, goals and values, and not the purely technical or instrumental. In face on this understanding, we realized that the referenced theorists postulate existence of a personal component evident in instruction.

By the reflections about the concept on instruction, we note that the above mention theorists involve the personal dimension as a part of the discussions arising emergence of conceptions of instruction and teacher instruction. Thus, enabling this instruction as one of the theoretical fields of formation constituting as Zabala (2002) which is understood as:

An area of knowledge, research and theoretical and practical proposals that, in the context of didactics and school organization, studies the processes through which teachers in instruction or in the exercise are individually or in a team, in learning experiences through which acquire or improve their knowledge, skills and dispositions, and enable them to intervene professionally on the development of their teaching, curriculum and school, in order to improve the quality of the education students receive.

As quoted you realize that concept of instruction of teachers will not be a simple task, as it involves an understanding of the processes covered in this scenario

instruction of teachers in their practical exercise, from the theoretical knowledge in education as disciplinary configurators. In this sense, after analysis of some decisions on the formation of concepts, especially the teachers, it is considered relevant to the definition mentioned by Garcia (1999: p. 45), stating that the instruction of teachers as:

Preparation and professional emancipation of the teacher to critically, reflexively and effectively carry out a teaching style that promotes meaningful learning in students and achieves innovative thinking and action, working in team with colleagues to develop a common educational project.

According to this quotation, we understand that the instruction for this proposal defined through a process of professional development reflected and promotes in its students a meaningful learning.

In fact, of the complex of definition of what the teacher instruction, we emphasize the thought of Behrens (2007), stating that all areas of knowledge, and particularly education, have been influenced by the paradigms of science, which are present in the historical trajectory of humanity.

On this sense, for instruction teachers understudy as field that involves theoretical and practical proposals, has constituted historically in the context of practices pedagogical, and thus teachers learn involve significant practices.

3. Pedagogical Practices and University Teaching: Refining the Methodologies Permeated by a Complex Paradigmatic Perspective

The advancement of technology and digital, where there the need for innovation and renewal of educational processes, began to permeate actions and reflections about knowledge and pedagogical actions, of which there is also the urgent need for new paradigms and conceptions throughout the educational context.

For Capra (1996: p. 25), “[...] the new paradigm can be called a world view holistic, which conceives the world as an integrated whole, and not as a dissociated collection of parts.” He adds that the paradigm and can also be called ecological vision “[...] the term ‘ecological’ It is used in a much broader sense deeper than usual.” According to Behrens (2011: p. 54), in the late twentieth century, suggest new names for innovative paradigm, such as systemic, holistic and emerging another. No. But “[...] the meeting point among the authors who contributed their studies on innovative paradigm is the totality vision and challenge of seeking to overcome the production of knowledge.”

The innovative paradigm, also called systemic or holistic (Capra, 1996), welcomes the sight of totality and urges teachers to rethink their practice, to involve the students as subjects in the construction of their own knowledge, making it autonomous, critical and reflective and causing him to seek the transformation of society and the global reality. On this context, it is the contribution of Ferguson (1992: p. 276) When he states that:

Old assumptions raise questions about how to achieve standards, obedience, and right answers. The new ones lead to the question of motivation for lifelong learning, reinforcement of self-discipline, arousing curiosity, and stimulating creative risk in people of all ages.

To propose a stablish pedagogical practice in the paradigm of complexity, compatible with the changes in science and society, Behrens (2011: p. 56) suggests that “to be built an alliance, a web, with the systemic (or holistic) vision, progressive approach and teaching with research”. On that way, because it is a new vision of education, with which it considers the emergence of new roles for teachers and students, it is here the understanding of how characterized m in each approach, the following categories: student, teacher, methodology, evaluation and school approaches.

Considering the contributions of Behrens (2011), Ferguson (1992) and Capra (1996), it is understood that in the systemic or holistic paradigm, the students becomes autonomous to produce with criticality and creativity their knowledge, surpassing the position viewer to be involved in the educational process. On the way, the teacher through a relevant teaching action, meaningful and relevant, respecting the multiple intelligences and the individuality of the student, helps you and encourages him to discover new possibilities for learning and new ideas. On this context, the methodology seeks a balance between theory and practice, with a view to an education that addresses the whole brain (right and left) to the integral formation of the student, in a process that favors autonomy individual development and collective. On the approach, the evaluation is procedural, considering the differences and abilities of everyone, and its function is to provide the student and teacher information to facilitate the learning process (Behrens, 2011).

On the sense, we say that says Behrens (2007) when she says that the innovative paradigm that accompanies the knowledge society requires profound changes in regard to worldview, man, time, space, among others. Certainly, these changes are reflected in the general education, particularly in higher education and in teaching and learning processes. Although holistic or emergent paradigm referred to by the author in this Century entry it was renamed by Morin (2001) Paradigm of Complexity. As referred author, the understanding of the complexity means giving the tight and reductionist view of living in the universe, which is presented, since it is presents itself full of uncertainties, contradictions, challenges increasingly complexities.

In this same line of thought, Moraes (2015) understands that the complexity paradigm necessarily requires methods capable of dialoguing with emergencies and uncertainties, to understand the circular causality that moves the complex systems, to recognize this complementarity in antagonisms and paradoxes that, in fact, both enriched in thought and social and cultural structures.

The construction of knowledge, according to Morin (2001) that meets the paradigm of complexity requires ontological, epistemological and ecological knowledge, considering the importance and the necessity that man must know

that he is a relation with themselves, with others and with the world and when relation is consciously, brings significant changes to improve on the reality of which it is part. Corroborating with the same thought, [Moraes \(2015\)](#) emphasizes that reality works from a complex dynamic, i.e. a dynamic systemic-organizational nature, which is also present in humans, as constituting the basis of its operative multidimensionality. Thus, even according to the author, the complex world requires a complex, relational and problem-solving thinking.

Given the above, it is understood that the teacher's role becomes essential during questioning itself about the social function of educational institutions today. Moreover, this leads us to reflect on the importance of teaching, which, historically, seen as having knowledge and player and that today are being challenged to take a new perspective in your instruction, which includes a review of their practice and the way it deals with the teaching-learning process.

In relation to university teaching, the situation becomes even more complex, since, in this scenario formative, crisscross up multiple dimensions, that are highlighted by [Veiga, Amaral, & Dalben \(2013\)](#), such as: the teacher-student relationship and content, and the relations of production with the knowledge in the materiality of the world of life and work, the advances of science, culture and research, among others. Thus, it is necessary that the teacher in face of this reality has a critical and reflective stance, keeping himself open to paradigmatic changes in science and becoming able to innovate practice.

In the case paradigmatic changes, reflect thoughts respect the contributions of [Yus \(2002\)](#), emphasizing that the holistic paradigm or complexity search restore many of the disruptions generated by traditional or mechanistic paradigm, aiming at the connection between man/nature and mind/body that has lost so well, so that reconnect all the himself of the world that we are part and, therefore, to start a new relationship with our fellow human beings and with nature in general.

On this sense, the teacher needs to seek new horizons, to better understand the theories behind education, choose to facing paradigms for complexity and learn to take advantage of new technologies for the use of information and knowledge construction. However, this is not to accomplish everything at once, but rather to be open and willing to experience new ways and teaching practices.

As stated, we highlight some methodological procedures that contribute significantly to the development of a pedagogical practice that significantly contributes a critical pedagogical relationship between teacher and students, who favors autonomy collective and interactive rite, developing more complex intellectual abilities.

In face of this, we point to Methodology Project as one of the possibilities to come to meet the paradigm of complexity, as advocated by [Behrens \(2014: p. 105\)](#), when commenting such perspective:

Demand by the guiding teacher operatizing situations of innovation and creativity involving the students, favoring in this way the process of dialogue and knowledge building, the allied the critical positioning, creative and transformative.

Behrens (2014) proposition involves the Project Methodology: contextualization, the questioning, the individual research, group discussions, individual production and the production of knowledge among peers. To this author, pedagogical practice made possible by means of this methodology implies a significant change in the teaching action, since it requires teacher involvement with students in their processes of learning in coordination with the real problems of society.

Another methodological procedure we highlight is the use of concept maps as a teaching resource, which according to Veiga, Amaral, & Dalben (2013), to be designed by a theoretical-practical perspective, can be represented as a two-way street that favors the educational ideal facing emancipation, in which teaching, learning, research and evaluation, as part of the teaching process, are held in common, collective and dialogical way.

From this viewpoint, we underline that the conceptual maps “provide a schematic summary of what was discussed and learned through the teacher’s pedagogic practice” (Gómez, 2004: p. 108).

The mentioned theorists emphasize that these sources on features of p reoccupation in the search of significant learning that results in a change of meaning of the experience.

Thus, we present one of the conceptual maps carried out during the PEFOP research group, based on Behrens (2007) in the article “The paradigm of complexity in the formation and professional development of the university teacher” [Figure 1].

It is observed that, in the schematic presentation of the map drawn from the text, are the main points highlighted, perceiving visibly relevant aspects discussed in PEFOP research, special items that should be included in teacher instruction.

The maps and analytical exploratory texts made up the portfolio, which according to Villas (2004), is considered an evaluation procedure, consistent with the formative assessment, which allows the student to follow the development of his work by formulating their learning goals. Given this understanding, the referent author explains that, when using the portfolio in the process of instruction practice, it is necessary to consider some guiding principles, such as reflectivity, autonomy, self-assessment, among others. These points as Villas (2004), will be important to work with portfolio, to avoid some risks that the teacher can take during practice, such as the: resistance by the students and teachers be a simple evaluation tool, when it should be a continuous evaluation process.

However, the portfolio needs to be ethically evaluated and should be planned and conducted based on respect for the student and his participation. Thus, this feature provides the student the opportunity to record continuously the experiences and significant achievements of their learning.

We included also in PEFOP research discussion, critical use of technology as a methodological tool for teaching and learning, which has been, in contemporary

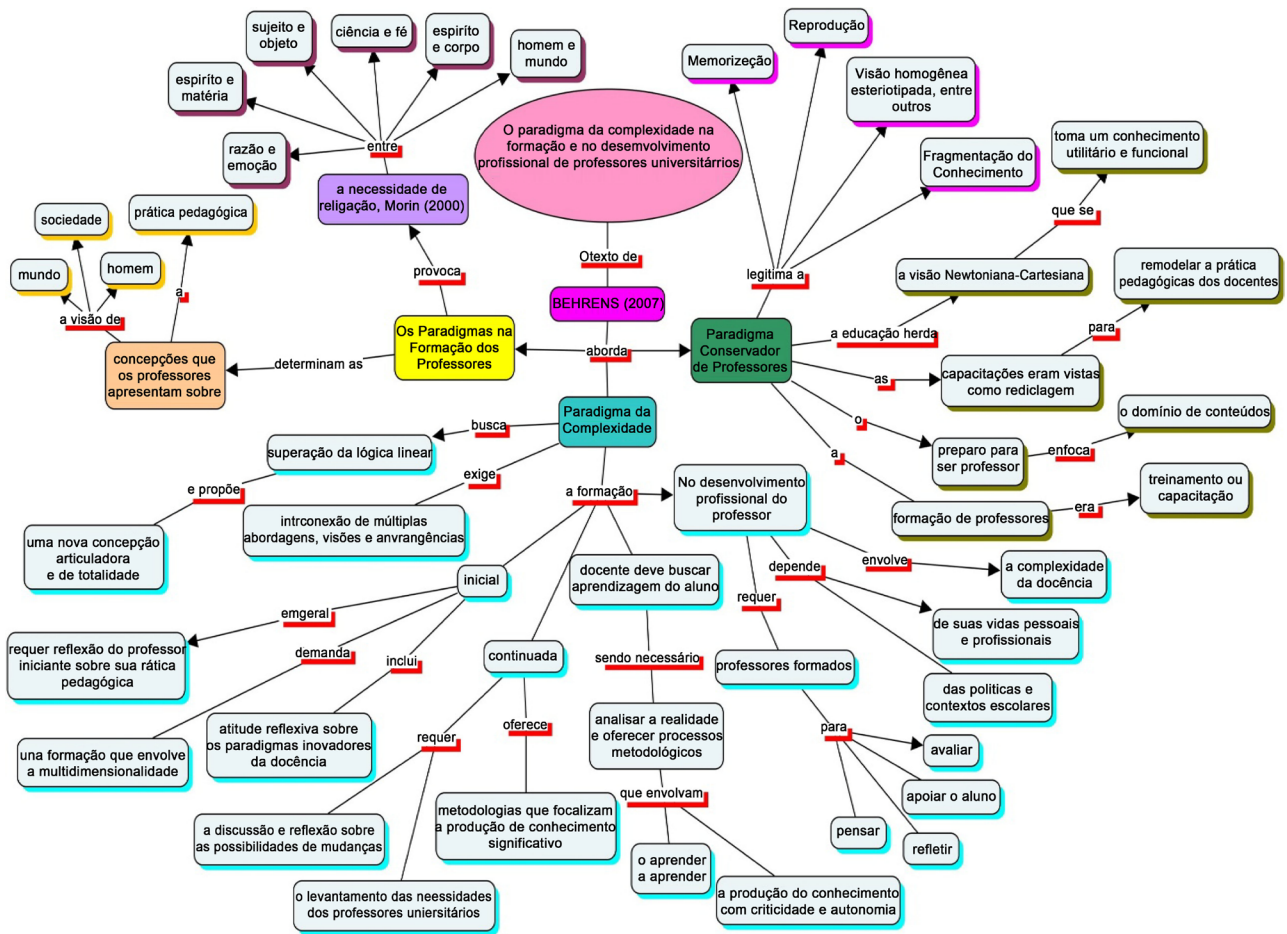


Figure 1. Conceptual map: The paradigm of complexity in the formation and professional development of university teachers, from Behrens (2007: p. 439).

times, much discussed among the field of education theorists. Among these, [Torres et al. \(2012\)](#), for which information and communication technologies favor the collective construction of knowledge, as the use of online communication interfaces facilitates the collective creation of real time text, by, for example, chat forums and discussion list, and others, and thus, strengthens and extends the processes and collaboration, adding participants from different backgrounds and professional experience, without geographical boundaries. Thus, the contribution between pairs provides the realization of a production and consistent understanding single group, since the whole process is shared.

Through this perspective, we understand that the use of technology provides an educational aiming at a new way to build knowledge through a complex thought that prioritizes reflection and criticality, from the collective work among teachers, students and researchers in search of the reach of quality and prosperity of teacher’s practices.

We strengthen the thought evoking [Moran and Behrens \(2013: p. 30\)](#) that when addressing about the technological resources, explained that:

The internet and mobile digital technologies bring exciting challenges, ex-

panding the possibilities and problems in a world increasingly complex and interconnected, signaling very profound changes in the way of teaching and learning, both formally and informally, over a life longer time.

It is observed that the arguments of the author warn that the educator must realize the possibilities and problems brought by the complexity of the world around him and the interconnection capacity between people who are favored by digital technologies.

We believe that the methodological procedures that have contributed in the preparation and development of pedagogical practice of university teaching, which must turn to meet the paradigm of complex perspective, provides of theoretical and practical that can strengthen increasingly moral the instruction of teachers through reflections arising from constructive practices.

4. Description and Location of the Investigated Universe

The study conducted in the Paradigm Educational and Pedagogical Instruction group (PEFOP), took place during 14 meetings and was developed in the Research Line entitled “Theory and Pedagogical Practice in Teacher Instruction”, the Stricto Sensu Post Graduation in Education in a University of Paraná.

The meetings were organized through the following methodological procedures: preparation by the mediators of a plan of action consisting of contextualization, problematizing, thematic programming, methodology, evaluation process and the proposition of the eight research phases collected in a portfolio proposed during the purpose of which was to analyze the constructs needed for teacher instruction in order to subsidize teaching in the view of the paradigm of complexity. Nine PhD students who experience teaching in Basic Education and Higher Education and two female PhD professors, research mediators and coordinators of the PEFOP Study Group participated in the research process.

5. Process Methodological

The study received as a methodological approach to the qualitative research, type action research. According to Alarcão (2003), between different forms of research, action research highlighted to be underlined this type of research the idea that the experience reflected and conceptualized has a great educational value in that participants understand the reality and therefore learn when they are actively involved in the process.

We emphasize that the literature attributes the term action research to Kurt Lewin, who is according to Pereira (2001), developed his studies in the fields of Philosophy of Science, Psychology and Social Science, and greatly contributed to the development of research in education. Pereira (2001) states, further, that Lewin, in his research on intergroup relations, proposes an action research model spirals with reflective cycles which is composed of phases that involve planning, execution and recognition or investigate the facts and evaluation, and so forth. Pereira (2001) points out that to Kurt Lewin, action research is conceived as a

realistic positioning of the action, always followed by a self-critical and objective reflection and evaluation of results.

However, Thiollent (1998) defines action research as a kind of social research with empirical basis that is designed and carried out in close association with an action or solving a collective problem, in which researchers and participant's representative of the situation or problem are involved in a cooperative and participatory manner.

According to the theoretical reflections done throughout PEFOP research, we understand that research action, while methodology research needs to be developed between pairs in one investigative process from the questioning and the contextualization of the subject proposal. The process allows the development of a continued reflective action about their own practice, which implies impactful instruction and in educational performance.

In this sense, the research on the constructs necessary for teacher instruction in order to subsidize teaching in the paradigm of complexity perspective involved eight phases carried out from the discussions about the constructs and knowledge that involve the pedagogical practice of the university teacher in a complex vision. The proposal of methodological research was permeated by continuous critical-reflexive attitudes about the practice of teachers in the light of the paradigm of complexity. Thus, starting from the contextualization and the problematizing of the topic and the initial discussion about the subject addressed, the analysis of the study was started.

In the first phase, the survey coordinators presented the themes that supported the reflections in discussion with the group and presented a plan of action that contemplated the proposed research, addressing the topics to be studied. They discussed with the group the objectives pro jobs, problematizing and contextualization, and the methodology to be worked. Including in the discussion to practice evaluative that accompanied the entire investigative process, highlighting, through and a critical view, the theoretical conceptions and practices that involves the paradigm of complexity in the formation of university teaching.

In the second phase, the topics selected for the reasoning of research favored critical reflection among scholars and the pes searchers about the searchers reflections propose overcoming the old assumptions that generate questions about how to achieve standards compliance and correct answers, characterizing, thus, the pair conservative paradigm that permeated teacher instruction over the previous centuries, and XXI century, witnessed its stuffiness in the midst of the practices of the educational Brazilian scenario. In this sense, it becomes relevant to reflect on the new paradigms that lead to motivation for learning of all the life, through d self-discipline, d the curiosity awakens and d stimulating creative risk.

In the third phase, 17 conceptual maps were prepared by participants that contributed to significant way active enhancing our ability to synthesize, to analyze and to structure the concepts and main ideas of the authors of studies text

data. This has carried out throughout the investigative process, subsidized critical and reflexive view through theoretical discussions listed in the texts and conceptual maps around the themes propose.

The fourth phase was developed through the realization of production small texts which the participants had, during the meetings, the central ideas of the authors recommended. The texts addressed ideas to relationship of issues that involve reflections on the pedagogical practices for complexity paradigm. The subjects treated with the respective authors, were: “Transdisciplinary and Education” and “Ecology of Knowledge: complexity, transdisciplinary and education” (Moraes, 2012); “The Principles of pertinent knowledge” (Morin, 2001); “Conceptual framework of the instruction of teachers” (Garcia, 1999); “Reflective School and new rationality” (Alarcão, 2003); “Understanding the professional development of teachers: experience, professional know-how and competence” (Day, 2001); “The paradigm of complexity in instruction and professional development of university teachers” and “The emerging paradigm connection with the complexity paradigm of a globalized approach” (Behrens, 2007, 2011, 2014); “Integral education: a holistic education for the twenty-first century” (Yus, 2002); “Focus and complex thinking: a proposal to the school curriculum (Zabala, 2002).”

On the fifth phase, performed reflections from the discussions between the group members and through the mediation of the debate by the coordinated. The activities in to support our research, highlighting the contributions of the production of knowledge, as research carried out through action research enables dialogue between the participants of the process, in relation in the cooperative and participatory mode.

In the sixth phase, during the investigative process, we noted the importance of using the Virtual Learning Environment (VLE), called Eureka. This space at a room in which the activities was than by researchers prior to the meetings. Thus, we emphasize that were constituting an individual portfolio with access display for all the group, to socialize the texts studied in the literature, the conceptual maps and sharing d and videos surveyed by d the internet, among other activities.

In seventh phase, we product through the studied texts, articles which allowed a critical reflection on the construction of knowledge individually and collectively. At that stage, it was possible to realize the importance of research in the process of instruction through the practice of university professor in knowledge production.

In the eighth phase, a process evaluation was carried out of individually constructed activities and in the group, through the construction of the portfolio, which enabled us to monitor our productions and self-evaluate the actions that were developed during the research process. The activities evaluated were as follows: 17 conceptual maps were constructed individually, using the technical resource called CmapTools; abstracts texts prepared; who supported the construction of an article, addressing innovative paradigms in university teaching that

was elaborated, presented and defended by the doctoral students for the pairs involved in the research.

The evaluation process mediated through the portfolio allowed to monitor the development of the activities and the participation of the all group members during the teaching process-learning critical and creative sense evaluation thru portfolio construction in the process of instruction practice enhanced the ability to reflecting and the construction of autonomy and self-assessment of capacity by the participants involved in the research.

6. Final Considerations

We believe that the reflections and activities carried out in the PEFOP group, through the action research, provided the participants with the construction of differentiated constructs and knowledge regarding teacher instruction that meets the complexity paradigm, since the objective proposed by a scientific investigation goes beyond giving ready answers to the constructed inquiries, because it is possible, also, to propose questions that would subsidize the pertinent reflections in the scope of the researched topic.

By constructing the knowledge, we find in research the vision of totality with a view to involving the student as a subject in the construction of his own knowledge, making him autonomous, critical and reflective and provoking him to seek the transformation of society and global reality. The vision of complexity combines constructs that allow the balance between theory and practice, aiming at an education which contemplates the whole brain (right and left side) for the integral formation of the student, in a process favors autonomy and individual development and collective. These constructs instigate teachers to rethink their pedagogical practice.

As results, we believe that the research pointed to the paths that embrace the knowledge and constructs of pedagogical practices in the paradigm of complexity, as we described in the phases of the research reported and have positive repercussions on the personal and professional life of the research participants. The investigative process alerted those involved and provoked possibilities for the reconstruction of a pedagogical practice that meets the requirements of the new educational paradigms and contributes with significant changes in the Brazilian educational context.

References

- Alarcão, I. (2003). *Reflective Teachers in a Reflective School. Our Collection of the Season, v. 104*. São Paulo, SP: Ed Cortez.
- Behrens, M. (2007). The Paradigm of Complexity in Instruction and Professional Development of University Teachers. *Journal of Education, Porto Alegre/RS, 63*, 439-455.
- Moraes, M. C. (2015). *Transdisciplinary, Creativity and Education: Ontological and Epistemological*. Campinas, SP: Papyri.
- Behrens, M. (2014). Project Methodology: Learning and Teaching to Produce Knowledge in a Complex View. In P. L. Torres (Org.), *Complexity: Networks and Connections in*

- Knowledge Production* (pp. 150-168). Curitiba: SENAR.
- Behres, M. (2011). A Portfolio as Assessment Procedure. In *Paradigm of Complexity: Design Methodology, Teaching Contracts and Portfolios* (pp. 103-110). 3rd Edition, Petropolis: Voices.
- Capra, F. (1996). *The Web of Life: A New Scientific Understanding of Living Systems*. São Paulo: Cultrix.
- Day, C. (2001). *Development Teacher Professional: The Challenges of Lifelong Learning*. Lisbon: Porto Editor.
- Ferguson, M. (1992). Fly and See: New Pathways for Learning. In *The Aquarian Conspiracy* (pp. 264-305.). 7th Edition, Rio de Janeiro: Record, Translated by Carlos Evaristo Costa.
- Garcia, C. M. (1999). *Teacher Instruction: For Educational Change*. Lisbon: Porto Editor.
- Moraes, M. C. (2012). Transdisciplinary and Education. In S. M. Magalhães, & R. C. Souza (Eds.), *Teacher Instruction: Links in the Complex Dimension and Transdisciplinary* (pp. 73-90). Goiania: Liber Books Publisher.
- Moran, J. M., & Behrens, M. A. (2013). *New Technologies and Pedagogical Mediation*. Campinas, SP: Papyri.
- Morin, E. (2001). *The Seven-Knowledge Necessary for Future Education*. Brasilia: United Nations Educational, Scientific, and Cultural Organization.
- Pereira, E. M. A. (2001). Teacher as a Researcher: The Action Research Approach in Teaching Practice. In C. M. G. Geraldi, D. Fiorentini, & E. M. A. Pereira (Eds.), *Cartographies of Teaching-Teacher(a)-Researcher. Collection Readings in Brazil* (2nd ed., pp. 153-181). Campinas, SP: Reading Association of Brazil.
- Thiollent, M. (1998). *Methodology of Action Research* (4th Ed.). São Paulo: Authors Associates.
- Torres, P. L. et al. (2012). *Open Educational Resources and Social Networks: Colearn and Professional Development*. <http://oer.kmi.open.ac.uk/>
- Veiga, I. P. A., Amaral, A. L., & Dalben, A. I. L. F. (2013). *New Plots for Technical Education and Study*. Campinas, SP: Papyri.
- Villas, B. (2004). *BMF Portfolios, Evaluation and Pedagogical Work*. Campinas, SP: Papyri.
- Yus, R. (2002). *Integral Education: A Holistic Education for the Twenty-First Century*. Porto Alegre: Artmed.
- Zabala, A. (2002). *Globalizing Focus and Complex Thought. A Proposal for the School Curriculum*. Porto Alegre: Artmed.

Submit or recommend next manuscript to SCIRP and we will provide best service for you:

Accepting pre-submission inquiries through Email, Facebook, LinkedIn, Twitter, etc.

A wide selection of journals (inclusive of 9 subjects, more than 200 journals)

Providing 24-hour high-quality service

User-friendly online submission system

Fair and swift peer-review system

Efficient typesetting and proofreading procedure

Display of the result of downloads and visits, as well as the number of cited articles

Maximum dissemination of your research work

Submit your manuscript at: <http://papersubmission.scirp.org/>

Or contact ce@scirp.org