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**Public Policies for Access to Higher
Education in Brazil: Majors in Natural
Sciences and Mathematics in Rural
Education Undergraduate Courses**

**Daniel Fernando Bovolenta Ovigli
Professor
Federal University of Triangulo Mineiro
Brazil**

**Ariane Baffa Lourenco
Post-Ph.D.
University of Sao Paulo
Brazil**

**Pedro Donizete Colombo Junior
Professor
Federal University of Triangulo Mineiro
Brazil**

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Athens Institute for Education and Research
8 Valaoritou Street, Kolonaki, 10671 Athens, Greece
Tel: + 30 210 3634210 Fax: + 30 210 3634209 Email: info@atiner.gr URL:
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Daniel Fernando Bovolenta Ovigli

Ariane Baffa Lourenco

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Abstract

Teacher education for rural education turns out to be a public policy that has taken shape since the last decade in Brazil, especially after the rules that established operational guidelines for basic education in rural areas. In 2006, the first offerings of undergraduate degrees in rural education with majors in Natural Sciences and Mathematics took place in four different states of the country, in regional areas that have historically had an insufficient number of teachers to meet these demands. An announcement released by the Ministry of Education in 2012, called public universities for submitting their proposals for new courses, showing their demands and potentiality for offering them. Considering that they are recent, there is a limited number of academic productions about these majors in rural education undergraduate courses. Given the situation outlined above, the current paper carries out a study on the characteristics and theoretical frameworks that guide teacher education to work in rural areas - majors in Natural Sciences and Mathematics - offered by Brazilian federal public institutions benefiting from the 2012 project. Empirical material was built through a literature review and an analysis of some pedagogical projects, electronically available, relating to ongoing courses was conducted. Importantly, 42 university proposals were approved in the context of that public announcement and include higher education institutions located in all federation states, except São Paulo. At last, this study aimed to render some contributions to formulate public policies in order to establish an education system that meets the needs of the course attendees, with a view to building an effective education in/of the countryside.

Keywords: Rural education, teacher education, science education, mathematics education

Introduction and Context

In a brief historical retrospective on the Brazilian education, one can see that the skills of its labor force were not important in the first four centuries of its social formation. This generated a certain lack of commitment on the part of the ruling elites in relation to the school learning of the lower classes (Ribeiro, 2012). Even though there were some rural education initiatives¹ in the 19th century, it is only from the 1930s that an educational model focused in that system begins.

However, it is in the mid-1980s that land occupations and marches to push for land reform in the country intensify, giving rise to social movements that started fighting for access to free and good quality public education for the rural population, in all levels. The creation of a basic education system in rural areas was subsequently considered and it is becoming this learning setting in which rural workers perceive themselves as different and recognize the importance of fighting for their education. However, they are not always successful in transferring to the school practices of their descendants the understanding they have on the value of land conquest and on an agricultural policy that is beneficial to them. It is here, with much realism, that the relationship between the struggle for land and the struggle for school appears (Arroyo, 1999).

According to Caldart (2003), schooling is not the initial priority in the rural workers and landless people's struggle; it is a necessity imposed by the reality of school children who follow their parents during the land occupation and by the questions posed by these children and their parents about the youngsters' future.

In this context, it is necessary to distinguish between a school in the rural area and a school FOR the rural area. The first concept refers to an education provided in the countryside, most of the time reproducing educational practices already occurring in urban schools. The construct education for the rural area, however, reflects an education directed to the social actors who live in the rural area, a differentiated education that meets the demands of this population, with methods and ways to deal with their reality in a special way.

The education offered in rural areas differs from the education in cities not just in its content, since it also needs to provide all the theoretical and conceptual support offered in an urban school. However, it also needs to act in a way to relate to the reality of their learners. This means bringing to the school elements that will make them reflect and be able to transform the reality in which they live in. Proposals and guidelines have emerged due to the action of social movements for an education in rural areas focused and designed for rural people (Brazil, 2008).

¹ A rural education model can be defined as education that takes place in the countryside, without considering their environmental specificities. The education field, however, considers the specificities of the population that lives in these areas, their knowledges and practices.

Thinking of an education for the rural area is to think of an education that values and understand the history of the social players involved in order to understand History itself, contextualizing the events and, above all, respecting their local reality, their specificities and needs.

Ribeiro (2012) says there are three aspects that show the essential difference between the traditional rural education in the countryside, and the proposal of a basic education for the rural areas. The latter is being built jointly by family farmers, educators and advisors linked to rural social movements and by institutions that congregate and/or support them:

- a. the traditional rural education is linked to the capitalist system of production and society. So, it is based on the dualism rural/urban and the exploitation of the workforce; on the other hand, the basic rural education proposal is neither finished, nor closed, nor imposed: it is being built by the several sectors involved with education (workers, educators, technicians, etc.);
- b. they have different purposes: while the rural school is committed to the logic of productivity, the school for the rural area worries with the formation of the citizen in and for the rural area, with skills to face the challenges of production and contemporary life;
- c. curriculum, objectives and methodologies are also different: in the rural school, they are directed to the capitalist system; in the basic school for the rural area, the memories of the struggles and productive experiences are the curricular base. Thus, besides scientific knowledge, the school for the rural area reflects upon the experiences of their social players.

Therefore, the understanding of these differences is essential in order to establish a good quality education "in the" and "for the" rural areas. It is also necessary that educators, technicians, directors and educational agents see this education mode with its specificities and use them in a good way so that the teaching-learning process will happen in a rich and meaningful way for all those involved in it. What one looks for is therefore, a humanitarian school that promotes the formation of not only citizens but also of individuals, who are the transformers of the reality they live in.

In this regard, the so-called movement "For a Rural Education", carried out by social movements linked to the rural area, brought a reflection to our society that took hold in the 1980s. It points towards public policies for rural education from pre-school to higher education, a school that is for rural education and in rural areas, and with pedagogical processes that meet the rural needs, not the urban. This project also pointed out the need for teacher training programs to prepare teachers to educate for life. In it, educators are more than teachers and the school is more than schooling; it advocates a pedagogical construction for rural education in rural areas. The movement also defends that governments take responsibility for the implementation of public policies guaranteeing access of rural population in rural areas to basic Education, continuing training

for teachers, Youth and Adult Education and a Higher Education policy (Caldart, Paludo and Doll, 2006).

Given the situation outlined above, the current paper carries out a study on the characteristics and theoretical frameworks that guide teacher education to work in rural areas - majors in Natural Sciences and Mathematics offered by Brazilian federal public institutions.

Rural Education as Public Policy in Brazil: Making the Road by Walking It

The genesis of the institutionalized rural education as such in Brazil goes through its contextualization within the Federal Government policy, given by its National Education Program in Agrarian Reform (PRONERA).

Created in 1998 and linked directly to the Minister's Office, it is a Federal Government policy, carried out by the National Institute of Colonization and Agrarian Reform (INCRA), the Ministry of Agrarian Development (MAD). It aims at expanding the formal education levels of workers of land reform, and has become an important instrument of knowledge democratization in rural areas, as it proposes and supports formal education projects at all educational levels.

This program sprang from the organized demand of rural social movements and became real through the partnership established between the federal government and higher education institutions. In the 2003-2004 biennium, PRONERA signed agreements with different universities and settlers' organizations and rural areas, aiming to expand the program's actions. 27 agreements were signed for the then Normal High School, in order to train high school teachers to work in the early years. Projects aimed at the professionalization in other areas were also expanded, reaching Agriculture, Nursing, and Cooperative Management, through 15 new agreements (Brazil, 2014).

On the undergraduate teaching, PRONERA established partnerships with universities and research institutes in order to train professionals in the areas of Education, History, Geography and Agronomy, in a total of 13 new agreements to meet the need of settlers benefited with areas of the country's land reform (Brazil, 2014).

This was the beginning of a course project called "Degree in Rural Education". It is a specific course for the settled population, for teachers from public schools in rural areas, for other education professionals with expertise in alternative educational experiences of rural education, in government programs aimed at expanding access to basic education of rural people, in addition to youngsters and adults residing in rural communities. The course, therefore, is justified and has its relevance due to the demands posed by the social reality of rural Brazil, in which the need for professional training of its inhabitants is being recognized. The proposal is also based on the assumption that the history and culture of these rural communities are the starting points for any

educational proposal and research to be developed in these communities (Arroyo, 1999).

The pedagogical proposals of Rural Education Degree use the Pedagogy of Alternation, created in France in the 1930s. It was concerned with serving the farmers' children who had to face educational lags in the countryside and the disinterest of these young people with the traditional school, which was not contextualized with the specifics of field. The Pedagogy of Alternation as it is called, consists of a link between the two educational times of alternation – school-time (ST) and community-time (CT). In the ST, the student stays in the school in a boarding-school regimen and, in the CT, the student returns to his home community to put into practice the issues they have studied at the ST. Besides that, the student also takes home, as assignments, texts to study. This is a different form of organizing the education process, combining theory and practice in different space-time, which requires from the trainer and also from students, specific formative paths that have not been considered in teacher training courses in general (Oliveira, 2010).

While recognizing that the growth (in quantitative terms) in the number of courses across the country is a worthy achievement, it is essential to establish reflective processes on such initiatives since, as the number of courses increases, the proposal for training teachers for rural becomes more and more important. Thus, comes the need to investigate what has been done on this topic. The aim is to analyze the pedagogical projects of undergraduate courses in Rural Education - qualifications in Natural Sciences and Mathematics, in order to map the professional profile of graduates of these courses and the legal frameworks that legitimize this offer.

With this study, we seek to contribute to the discussion of issues and problems in order to enrich and promote a debate on these courses and their qualifications, their difficulties, their progress and their limitations, even in a preliminary way, since these courses are quite recent in the Brazilian scenery.

The Qualifications in Natural Sciences and Mathematics in the Rural Education Degree

Events, Social Movements and Education Statistics

Previous events and movements to the II Field Education Seminar 2004, which occurred all over Brazil, were a milestone in the expansion of participatory debate for a specific policy dedicated to the training of teachers for rural education.

Therefore, the years after 2004 are characterized as a prosperous period with regard to advances in the institutionalization of teacher education policies for schools for the rural education as well as the strengthening of PRONERA. Pio (2011) systematized actions to the construction and implementation of teacher training program for the rural education:

- II Rural Education Seminar (2002)

- Second National Conference for a Rural Education (CNEC) (2004)
- Creation of the General Coordination of Rural Education in the Ministry of Education (MEC) (2005)
- Creation of a General Coordination of Rural Education at the National Institute of Colonization and Agrarian Reform (INCRA)/Ministry of Agrarian Development (MAD) (2006)
- Rural Education State Seminars promoted by MEC in almost all Brazilian states, in 2005 and 2006
- Two Rural Education Research Seminars (2005 and 2008)
- Creation of "Knowledge of the Earth" Program (2005)
- Creation of PROCAMPO Program - Degree in Rural Education (2006)

It is also worth mentioning several initiatives by the state and local departments of education, by social movements and by universities, representing a cycle of affirmative actions of Rural Education within the state structure, especially in the executive branch, as well as in within civil society and educational institutions.

Educational statistics also show the actions developed. According to the Institute of Applied Economic Research (IPEA), the data from 2010 show that 82.22% of young people aged 15 to 17 years attended school, but only 52.18% were enrolled in high school. There was, however, a drop in High School enrollment in the Midwest, South and Southeast of the country from 2005. The 2010 School Census reports that, for this same age group (15-17 years), only 36% of young people are in high school. This situation is worse in rural areas, where just over a fifth of young people in the same age range is in high school. As for teachers of the final years of Elementary School and High School, 43.76% of them have finished High School or equivalent and just over 50% hold a university degree.

The National Education Research in Agrarian Reform (PNERA) showed that among the 8,679 schools in settlements, only 373 offer High School Education (Brazil, 2007). The shortage and the lack of teacher training are among the many factors responsible for this situation, which led to the creation and dissemination of Rural Education Degree courses for all administrative regions. More recent initiatives have been realized by means of development provided by the selection edict No. 02, released on August 31, 2012 by MEC, and focused on the areas of Natural Sciences and Mathematics, considered a priority due to the shortage of human resources in these areas.

Data released by the National Institute of Educational Studies Anísio Teixeira (INEP) in 2010 states the need of around 235,000 teachers for Secondary Education in the country, mainly in the areas of Natural Sciences and Mathematics. The study also points to a shortage in the supply side for the second stage of Elementary Education (grades 6 to 9) in the settlements (Brazil, 2007). Regarding the High School, it is possible to say that the number of schools in settlements that provide this level of education is greatly reduced:

only 4.3% of Brazilian schools and 8.8% of the Southeast schools (region of the authors) are located in settlements.

In 2004, for example, the second stage of Elementary Education was offered in 42.7% of schools (20,026 students) and only 8.8% of the schools analyzed offered High School Education (5,963 students). These data indicate that schools in settlements did not offer High School education to meet the demand. Hence, it is a natural consequence these students not attend High School, for lack of supply of the schools themselves.

There are also many rural youngsters who are out of school in the Southeast region (Brazil, 2007). The reasons, according to their families, include the distance (45.4%), lack of appropriate classes at the school level (17.3%), school absence in the settlement (18.7%), lack of vacancies (23.5%) and the lack of interest of children in school (31.9%).

Also according to the document, there is a significant number of teachers working in the final years of Elementary School and in Secondary Education who do not hold a degree, contrary to the law. This situation becomes more serious in small cities, on the outskirts of large cities and in the countryside itself.

Due to some of these difficulties, the Operational Guidelines for the Basic Rural Education (CNE/CEB 01, of April 3, 2002) points to the need to rethink the organization of the school, knowledge, and pedagogical practice. The document states that curriculum and learning are related to work and the diversity of the rural area in all its aspects: social, cultural, political, economic, gender, generation and ethnicity (Brazil, 2002).

This implies thinking alternative paths for the training of rural educators. The feasibility of this Rural School project goes through the commitment to understand and incorporate the needs of the rural population and their relationship to knowledge socially produced and demanded by their subjects. This context requires professionals who are able to break free from the discipline, narrow and fragmentary vision that guides, in general, teacher education courses in the country, especially in the areas of Natural Sciences and Mathematics. It has to do with thinking and carrying out an organization of pedagogical work based on a more comprehensive and integrated view of society, nature and man (Lima et al., 2009).

The above guidelines also highlight the need to reflect upon a concept of education, learning, and educators training, which is able to understand the demands put forward by the rural population. A document with the proposal of a National Plan for Training of Rural Education Professionals, prepared by the Ministry of Education Working Group, says:

Professional training is a challenge that has to do with the future of basic rural education (...) in order to overcome the challenges, and enable the work of skilled professionals within the educational policy principles already pointed out for rural schools, teacher training needs to be broader, extrapolating the strict training for disciplines that now prevails in the university courses (Brazil, 2009, p.2).

In this context, there is the intention of a specific degree in Rural Education. Experts linked to universities and social movements are called in to collaborate, presenting MEC with a concrete proposal for rural teacher training, based on these new elements mentioned previously. At the beginning of 2006, as mentioned before, the working group introduced the proposal to establish a "Full Bachelor's Degree in Rural Education" for teacher training focused on Basic Education in rural schools. These courses would be maintained by universities interested in participating in the project, with support and/or institutional partnership of MEC.

The Support Program for Higher Education Degree in Rural Education (Procampo) begins at this stage. The program supports the implementation of regular courses of Bachelor's Degree in Rural Education at public institutions of Higher Education throughout the country. These courses focused on training educators to teach in the final years of Elementary and Secondary education in rural schools, grouped into areas, among which Natural Sciences and Mathematics, as two majors. Four universities started pilot-classes in 2005, namely: University of Brasilia (UNB), Federal University of Minas Gerais (UFMG), Federal University of Bahia (UFBA) and Federal University of Sergipe (UFS) (Antunes-Rocha, 2009; Lima Et Al., 2009).

The Graduate's Professional Profile

In the midst of this process, in 2010, a presidential decree introduced a national education policy and also the Brazilian National Education Program in Agrarian Reform. In this context, these undergraduate majors were stimulated to have a different proposal, since they train teachers by areas of knowledge and not by disciplines, taking an innovative curriculum design. Pedagogy of Alternation (university-time and community-time) is employed in this sort of courses because a significant number of their undergraduates carried out their activities in rural schools.

MEC's selection notice, dated 2012, approved 44 courses (linked to 44 universities), mostly with qualifications in the areas of Natural Sciences and Mathematics across the country, except in the state of São Paulo. Classes usually had 60 positions and a special entrance examination, to meet the qualifications; the course lasts 08 semesters, when at its end the Dissertations of Completion of Course are presented, closing the eighth time-school and community-time.

As for the dynamic curriculum, it seems that the pedagogical projects emphasize educational processes organized through a complex system (Pistrak, 2003), pointing to possibilities of changing the traditional work organization in the teacher education curriculums. In this sense, the main issue is how to link school life, not just its discourse, to a process of social transformation through Natural Sciences and Mathematics, making it a place of people's education, so that they can see themselves as subjects who are able to build a new society.

In today's context of Rural Education, students, teachers and training areas coordinators find themselves in a process of building a new concept of education and rural area (Pio, 2011). According to this author (p. 18):

The dialogue between the actors involved is intense, in the sense of building a new way of thinking and acting in teacher training, reviewing and analyzing the steps already taken within the course, seeking to find new paths. In other words, the teacher training project within this Bachelor's degree is built on the very act of making it happen, with the effective participation of all those involved. The Rural Education Bachelor's Degree is happening in a different way from other degree courses already offered and consolidated in universities where the proposal is carried out and the other universities in the country. The fact that it is offered to a very characteristic target audience regarding their origin, history, life and society expectation, with a strong component of political engagement, has consequences for the teacher's profile dealing with the course and the type of choices that are made.

Moreover, the analyzed projects explicit links and relationships between:

- i. individuals and their relationship with earth/nature, according to majors in Natural Sciences and Mathematics,
- ii. individuals and their links to work and technology in the countryside,
- iii. individuals and their relationships with society, showing the struggle for land, and
- iv. education and individuals, considering this is a teacher education course.

The pedagogical projects also express the following training profile:

- a. enabling teachers for multidisciplinary teaching through Natural Sciences and/or Mathematics for managing processes of Elementary and Secondary Education in rural schools;
- b. training educators to work in Rural Elementary and Secondary Education schools, so that they are able to manage educational processes and develop pedagogical strategies aimed at teaching autonomous and creative subjects, enabling the building up solutions for issues about their reality, related to building sustainable development projects for rural areas and the country;
- c. ensuring a specific pedagogical elaboration/reflection on labor education, on technical, technological and scientific education to be carried out especially in Secondary Education school as well as in the last grades of Elementary Education;
- d. developing training strategies for multidisciplinary teaching in curriculum organization by areas of knowledge in rural schools;
- e. helping with the construction of alternatives for the pedagogical and school work organization, enabling the spread of Elementary and Secondary Education in/for the rural areas, with the speed and quality required by the social dynamics in which their subjects participate, and by the historical inequality they suffered.

Final Considerations

A key point for a rural school of good quality is to have a political-pedagogical project (PPP) that is geared to the needs of the population it serves. Therefore, it is important that this project is planned and carried out with the help of those who need it. A PPP that meets people's needs is the one that respects their reality and make them aware of their social status, bringing alternative and perspectives which will enable them to form a critical citizen who is able to fight for changing the word around them (Antunes-Rocha 2009).

It is also necessary people committed to and aware of the cause so that they can build it effectively. Thus, those working with these proposals for teacher training need to be prepared to know and act in a reality that may be very different from theirs and, above all, they must be prepared to respect this reality. Some questions arise in this reflection movement on the training proposal:

- How does the university uses the knowledge of each community and, hence, the academic knowledge?
- Is there a methodology in which all disciplines work in a common way the dialogue between both forms of knowledge?
- What is the participation of the elder on the traditional knowledge and folk wisdom of each community within the curriculum of different courses?
- What are the forms of interconnecting the traditional cultures in each of the proposals?
- Will the university make use of the rural communities knowledge adding it to the methodology? If so, how?
- What is the benefit society will have from the already systematized research carried out by universities on the rural communities?

The experience in teacher education for rural education, therefore, allows us to understand other realities, very different from that related to the urban education model and, therefore, is a new area of proposition, development, and research. Romanowski and Ens (2006) draw our attention to the fact that the debate on public policies in education should take in consideration the making of constant assessments.

Considering the factors listed above, little is known about what actually is carried out with regard to teacher training practices for rural education in Brazil. Further studies are still necessary, focusing in the analysis of problems and issues, the outcomes regarding teacher training, the theoretical and methodological foundations, the contributions to the educational system, among other things. This training profile needs also important to be discussed, widely and appropriately, with the other sectors and/or social groups, especially those mentioned in the studies, as an aid to the formulation and evaluation of public policies in education.

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