Revista Brasileira de Educação do Campo
Brazilian Journal of Rural Education
ARTIGO/ARTICLE/ARTÍCULO
DOI: http://dx.doi.org/10.20873/uft.rbec.e9760

Rural Education and Science Teaching: Experiences in a riverside school in the Southwest Amazonas

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ABSTRACT. This work is the result of a research developed in the academic master's degree in Science and Humanities Teaching at the Federal University of Amazonas - Campus Vale do Rio Madeira. It aimed to discuss the extent to which the integration of traditional/popular knowledge about plants contributes to the development of scientific education for students at a riverside school in the Southern Amazonas state. It is a qualitative and descriptive field research, which was developed with 15 students of the 7th, 8th and 9th grades of a riverside school located in a traditional community in a municipality of the Amazonas state. The investigation was based on participatory activities, such as: questions, practical classes and drawings. Based on the development of activities, we have found out that there is a lot of knowledge about plants in the life of these students, in addition to the importance of articulating their knowledge with scientific concepts in the teaching of Natural Sciences. In general, we highlight how important it is to discuss the integration of knowledge in rural education, with methodologies that prioritize multidimensional methods, considering social, cultural and environmental knowledge.

Keywords: rural education, science education, science education.

Educação do Campo e o Ensino de Ciências: Experiências em uma escola ribeirinha no Sul do Estado do Amazonas

RESUMO. Este trabalho é resultado de uma pesquisa desenvolvida no mestrado acadêmico em Ensino de Ciências e Humanidades na Universidade Federal do Amazonas - Campus Vale do Rio Madeira. Teve como objetivo discutir em que medida a integração dos saberes tradicionais/populares sobre plantas contribuem para o desenvolvimento da educação científica de estudantes em uma escola ribeirinha na região sul do Estado do Amazonas. É uma pesquisa de campo, qualitativa e descritiva, desenvolvida com 15 estudantes de 7º, 8º e 9º anos de uma escola do campo, situada em uma comunidade tradicional em um município do Amazonas. A investigação se deu a partir de atividades participativas, como: perguntas, aulas práticas e desenhos. Com base no desenvolvimento das atividades, constatou-se uma riqueza de saberes sobre plantas na vida dos referidos estudantes, além da importância da articulação de conhecimentos vividos com conceitos científicos no ensino de Ciências da Natureza. De uma forma geral, destaca-se quão importante discutir a integração de saberes na educação do campo, com metodologias que priorizem abordagens multidimensionais, considerando saberes sociais, culturais e ambientais.

Palavras-chave: educação do campo, ensino de ciências, educação científica.

Educación rural y enseñanza de las ciencias: experiencias en una escuela ribereña en la región sur del Amazonas

RESUMEN. Este trabajo es el resultado de una investigación desarrollada en la maestría académica en Docencia en Ciencias y Humanidades de la Universidad Federal del Amazonas - Campus Vale do Rio Madeira. Su objetivo era discutir en qué medida la integración del conocimiento tradicional / popular sobre las plantas contribuye al desarrollo de la educación científica de los estudiantes de una escuela ribereña de la región sur del estado del Amazonas. Se trata de una investigación de campo, cualitativa y descriptiva, desarrollada con 15 alumnos de 7º, 8º y 9º años de una escuela en el campo, ubicada en una comunidad tradicional de un municipio del Amazonas. La investigación se basó en actividades participativas, tales como: preguntas, clases prácticas y dibujos. A partir del desarrollo de actividades, se constató una gran riqueza de conocimientos sobre las plantas en la vida de estos estudiantes, además de la importancia de articular conocimientos vividos con conceptos científicos en la enseñanza de las Ciencias Naturales. En general, se destaca la importancia de discutir la integración del conocimiento en la educación rural, con metodologías que prioricen enfoques multidimensionales, considerando el conocimiento social, cultural y ambiental.

Palabras clave: educación rural, educación científica, educación científica.

Introduction

The Law of Bases and Guidelines of National Education (LDB) No. 9.394/1996 defines the objectives and duties of school education in the Brazilian territory, based on the principles expressed in the Federal Constitution of 1988 that ensures the right to education for all citizens, which must be guaranteed regardless of the localities in which they reside, such as family farmers, extractivists, artisanal fishermen, riverside inhabitants, settlers of the agrarian reform, rural wage earners, remnants of slaves, indigenous people, peoples of the forests, *caboclos* and others, that produce their material conditions of existence from work in rural areas, with the perspective of safeguarding the rights of each citizen.

Rural populations, therefore, have the right to education in the locality where they live, with an educational system adapted and adapted to the peculiarities of each region. In addition, the contents and teaching methodologies must be consistent with the needs of the students, prioritizing the characteristics of the communities through calendars adapted to local production cycles and climatic conditions. Caldart (2002) reinforces that the priority of ensuring education is a human right that seeks to ensure full, social and citizen development, but this right cannot be treated as a commodity, a service or a compensatory policy.

In this sense, the need for rural education is highlighted, which we will call Countryside Education in this work, which complies with the precepts ensured in the LDB, considering a sensitive look at the Brazilian populations living in the countryside, prioritizing heterogeneity, social, cultural and environmental diversity. From the perspective of Arroyo (1999), it is an education that approaches the man of the countryside, with regional characteristics and, above all, thought about the principle of their rights in education, science, technology and culture with characteristics guaranteed in the legislation for the Countryside Education.

In the Amazon Region, the presence of heterogeneous populations stands out, especially indigenous and traditional riverside communities, which reinforces, according to Hage (2005), the need to think about public education policies that present true “lenses” in the context of the countryside in the Brazilian scenario and, specifically, in the Amazon Region, which is heterogeneous in the sense of production, the environment, and social and cultural issues in the region.

Considering the peculiarities of the different contexts of countryside schools, this work prioritizes an approach to

Countryside Education in a riverside school in the Southern Amazon state, the result of an extract from the dissertation entitled "Traditional Knowledge, Science Teaching and Ethnobotany: Possibilities and Challenges for Scientific Education", defended in the Postgraduation Program in Teaching of Sciences and Humanities of the Federal University of Amazonas - Campus Vale do Rio Madeira. In particular, in this work, the objective is to discuss to what extent the integration of traditional/popular knowledge about plants contributes to the development of Scientific Education for the students of the São Miguel Municipal School. The adopted methodology focused on didactic strategies that prioritize articulations of lived knowledge with scientific concepts in the teaching of Natural Sciences, showing how essential the process of Scientific Education is based on articulations of social, cultural and environmental knowledge in school.

Countryside Education: teaching of science and its peculiarities

In Brazil, the conquest of the right for Countryside Education in official documents was the result of the social movements of the peasants who fought for education to reach social groups until then excluded from the educational context.

The relevance and need for a differentiated education for Countryside Education was reaffirmed from the development of the Curricular Guidelines for Countryside Education, an important fact in the Brazilian scenario, since it is a fundamental step to guarantee education as a right universal in all forms of education, ensuring quality public education for the rural population.

The Operational Guidelines for Basic Education in Countryside Schools contemplate the definition of the identity of the rural school, as a link with the reality of the students, in the collective memory they present, in the science and technology available in society and in the social movements, in defense of projects that integrate solutions to issues related to the social quality of collective life in the countryside (Brasil, 2002, Art. 2).

These guidelines can contribute to the pedagogical practice of the teacher since they present possibilities to reorganize their educational methodology and bring it closer to the reality of the countryside inhabitants (Brasil, 2002). In this sense, Henriques et al. (2007) highlight the need for Countryside Education to be related to sustainability and diversity, since there is a strong relationship between human beings and other existing ecosystems.

Despite the guidelines and other public policies that establish the conditions to educate the countryside people, there is still a long way to go, especially when observing the reality experienced in education and in rural schools. Initially, it is necessary to look at each region, with public policies that allow the effectiveness of rights with equity and observing the local and individual specificities.

For Molina and Azevedo (2004), Countryside Education must be seen as a space sensitive to social, cultural and environmental relationships, with the constant participation of the subjects who inhabit these places. It is a heterogeneous space, where each region has its peculiarities that differentiate it from the others, where it is necessary to value the differences between peoples, wealth, diversity and its role as a producer of different cultures.

Although there are educational and curricular policies for Rural Education aimed at ensuring quality education, according to the peculiarity of each region, there are several difficulties and challenges to overcome in relation to Countryside Education. Among them, we can mention the insufficiency and physical precariousness of many countryside schools, access difficulties, high rate of distortion by age-grade, lack of qualified teachers, predominance of multigrade classes and lack of updating of pedagogical proposals.

When reflecting on the role of the school in the context of the riverside communities, it is understood that it is necessary to interact with the reality of the communities and build an education model that is "immersed" in the local cultural aspects and their multiple aspects, making it an institution that has characteristics which include the daily reality (Pinto & Vitória, 2015).

With the previous notes, there is a need to assess the countryside itself and its knowledge in the educational process, so school subjects need, above all, the contextualization and connection between the different knowledge. In this sense, this work highlights the teaching of Natural Sciences, which is often presented in a decontextualized way and with fragmented knowledge and outside the reality of the students.

The UNESCO report (2005) portrays the Sciences developed in schools in our countryside in the following way:

> ... in the Brazilian school, **Scientific Education has traditionally been bookish and decontextualized, leading students to decorate, without understanding the concepts and applicability of what is studied**. Thus, the experimental sciences have been developed

> unrelated to experiences and, as a result, few students are attracted to them. Most get bored, have a hard time teaching, and lose enthusiasm. In other words, the school is not prepared to promote a stimulating environment for science and technology education (UNESCO, 2005, p. 03, *bold marks are ours*).

It is evident, in this UNESCO document, that one of the greatest difficulties in science teaching, especially natural sciences in countryside schools, is the lack of context that contributes to the formation of unmotivated children and adolescents with teaching, since it makes no sense to learn scientific concepts in a memorable way without the proper relationship with everyday events.

The effective teaching of science in schools is possible when the meaning of certain contents present in the curriculum is known, and it is essential to combine the knowledge of professional, social, cultural and environmental training in each region, being necessary, according to Carvalho et al. (2013, p. 3), “teach real science from science teaching”. This implies integrating scientific knowledge with traditional / popular knowledge in the teaching of Natural Sciences.

The countryside schools need to experience the ways of life, the livelihood of the communities, the culture in the teaching of Natural Sciences, providing students with access to different school knowledge at all levels of education. Based on contextualized teaching practices and committed to the student in their real context, this can make it possible "to understand the use of life sciences, their relationship with technology and various phenomena, the development of scientific culture" (Krasilchik & Marandino, 2007, p. 30).

This also implies the effective possibility of constructing scientific knowledge in the perspective indicated by Chassot (2002, p. 91) when affirming that “science is a language; thus, being scientifically literate means knowing how to read the language in which nature is written”, which will allow men to read the natural and social world. Therefore, scientific literacy is considered an ally to promote viable alternatives that compromise education.

The teaching of Natural Sciences in the riverside context can contribute to scientifically literate students, based on a teaching that integrates different knowledge, knowledge and practices, above all, that does not follow the standards and models of the city. Countryside schools must allow students to learn science in accordance with the events of their life, and not only with the use of scientific concepts outside the real context,

in addition to allowing the investigation of phenomena and their reflection.

According to Enisweler, Kliemann and Strieder (2015), it is necessary to consolidate Countryside Education with practice in the teaching of Natural Sciences, and one of the ways to do this is to adapt the methodologies in the teaching and learning processes in the countryside schools. For Kovalski and Obara (2010), the teaching of Natural Sciences in countryside schools can contribute to the rescue of traditional knowledge, but for this reality to be achieved it is necessary to use strategies and methodologies to link traditional knowledge with knowledge of the students from the riverside communities.

In this context, it is understood that countryside schools are rich and privileged spaces for the preservation and rescue of traditional/popular knowledge that provide quality Scientific Education to citizens who are part of this context. In addition, it is necessary to think about schools with social quality, with public policies that, in fact, benefit the countryside people, the resignification in the curriculum, the valuation of multiculturalism and, above all, views that go beyond the barriers of the isolation.

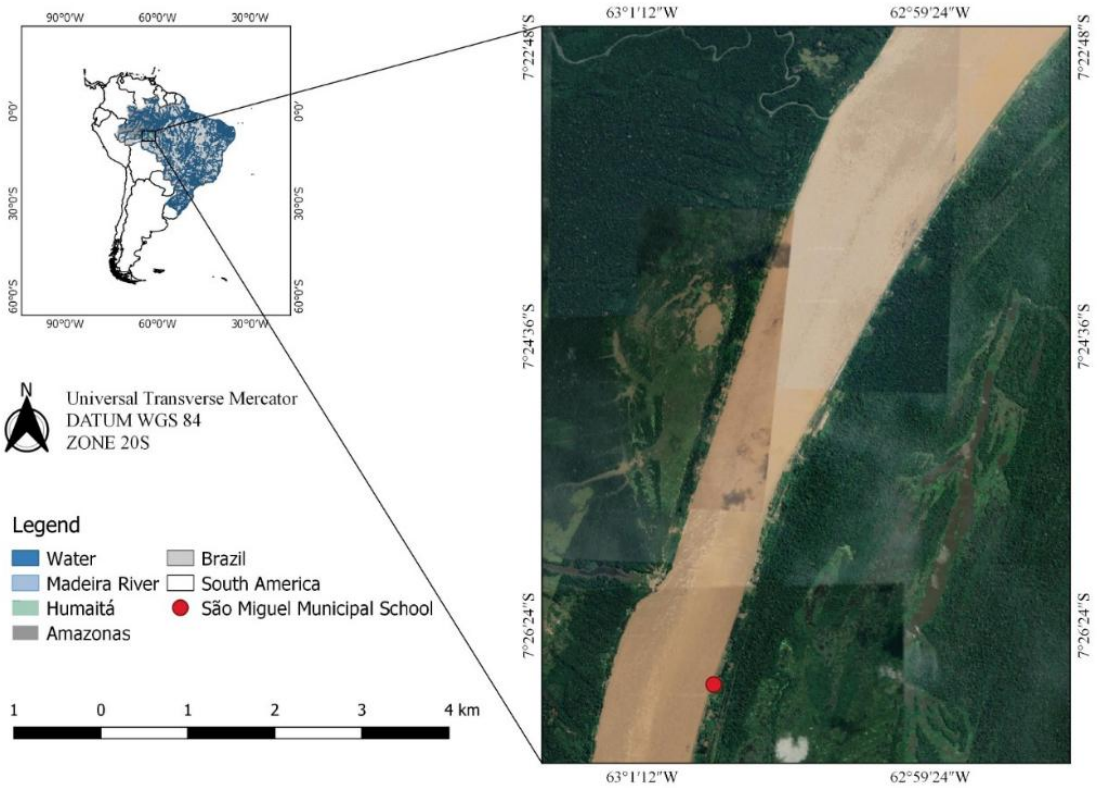
Research context: study area and methodological procedure

This field research adopted a qualitative and descriptive approach, with the aim of discussing to what extent the integration of traditional/popular knowledge about plants contributes for the development of students. It demands the effective participation of the researcher in the riverside, countryside and school communities to understand the multiple relationships that were established in the development of the teaching of Natural Sciences.

The instruments developed for data collection were participatory activities, such as: questions, practical classes and drawings. For the data and thematic analyses, we searched support in Minayo (2001), according to whom, the notion of themes that arose in the course of the research should be articulated with the objective and theoretical framework.

The study area of this research includes the São Miguel Municipal School, founded under Decree No. 031/96 of October 25, 1996, located in a traditional riverside community at 8 km from the urban area of the Humaitá-AM municipality (Figure I).

Figure I - Location of the study area.



Source: Universal Transverse Mercator.

To preserve the anonymity of the school students, it was decided to identify them with the name of the medicinal plants that they mentioned during the activities. Thus, the target group for the research was of 15 (fifteen) 7th, 8th and 9th grade primary school students, aged between 13 (thirteen) and 17 (seventeen) years old, with the proper authorization of their parents.

This research was developed within the scope of the activities of the academic master's degree in Teaching of Sciences and Humanities of the Federal University of Amazonas (UFAM) - Vale do Rio Madeira Campus and approved by the Ethics Committee in Research with Human Beings (CEP) of UFAM, under the CAAE registry 79982217.2.0000.5020.

Acquiring knowledge about plants in the teaching of Natural Sciences for riverine students

In the research process of the subjects who participated in this study, it was found that the Nature Sciences classes focused only on reading the textbook, with illustrations of vegetables in different ecosystems, without a contextualization on the Amazon Region.

We believe that the book is an important means of communication, but it should not be the teacher's only resource,

and it is essential to look for new proposals to teach, since the teacher has autonomy and training to search and enrich the teaching contents. For Moura, Silva and Ales (2014), the biological illustrations presented by the textbooks are true allies in the teaching and learning processes of students, however, what is observed in many books are illustrations that are far from the context of the students, such as pine or araucaria, and other plants that do not represent the life of the students in the Amazonian region.

Another important issue to be presented at this first moment refers to the training of the teacher who taught the discipline of Natural Sciences at school, whose teacher training was in Physical Education and not in the area of Sciences.

The used methodology in the subject of Natural Sciences and the training of teachers are challenges that are part of the reality of many schools in the countryside. It should be noted that teachers who work displaced from their training area generate difficulties in the teaching and learning processes, since they do not have theoretical, methodological and practical skills in the area in which they work. In this context, Freire (1996) draws attention to the need for professional competence. Therefore, teachers must take their training seriously and attempt to meet the demands and coordinate the activities of their class.

Teachers are subjects that face difficulties in the teaching process, often limited to their functions. Teaching in different areas of their education disqualifies their role, since the teacher does not have mastery of the area in which they work. Consequently, in most cases it ends up making learning simply bookish and decontextualized.

One of the proposals for teaching, presented as part of this work, is through knowledge connections, where curricular integration is highlighted in all stages of teaching. We understand that the book, as a didactic resource, needs to be more open to the concerns of the students' own lives, where culture and social aspects are highlighted, aspects that lead us to coincide with the thought of Morin (2000) when he says that there is a triadic relationship between individuals/society/species, that is to say, "Culture and society guarantee the fulfillment of individuals, and it is the interactions between individuals that allow the perpetuation of culture and the self-organization of society" (Morin, 2000, p. 54).

To understand students' conceptions of plants in the teaching of Natural Sciences, we start from the following questions: What are vegetables? What is

the importance of vegetables? What are vegetables for? Faced with these questions, the students, at the beginning, were more reserved, but little by little answers were emerging that contributed positively to the proposal to debate about vegetables according to the knowledge and realities lived by the inhabitants residing on the banks of the Madeira River, thus avoiding a merely passive and repetitive class. For Luckesi (2008, p. 131), "school knowledge can only become meaningful and existential knowledge in the lives of citizens if it is incorporated through understanding, exercise and creative use.

The knowledge of the riverside students of the Municipal School of São Miguel about plants was highlighted in several points of the investigation. A unique moment of the research was when the students mentioned medicinal plants as a cure for diseases. According to some statements:

> *"At home we use plants when we are sick" (*Chicory*).*
>
> *"Plants serve us as medicine" (*Jambú*).*
>
> *"Teacher, plants are also good to eat" (Rue).*
>
> *"They are medicines and are used for many diseases" (Mast).*
>
> *"Plants are used to make tea to cure diseases" (Lemon).*
>
> *"My grandmother makes tea when we are sick" (Holy Herb).*
>
> *"They also heal many diseases; they even heal bumps and wounds" (Aloe Vera).*
>
> *"My family makes tea, herbal remedies and they are good with illnesses" (Açaí).*
>
> *"I think they cure diseases, tummy aches, they are good for the flu" (Lemongrass).*

In the students' speeches, there are elements that lead us to the knowledge derived from the tradition about plants, especially the knowledge about medicinal plants. Given the participation of the students on the proposed topic, it was possible to see the enthusiasm of the part of the students about the proposed content, which required the need to start from what the students knew from their experiences on the topic, an aspect noted in the Curricular Guidelines for the teaching of Natural Sciences, by reinforcing that the contextualization of the contents with the students' knowledge awakens personal, social and cultural meanings.

Endorsing the above, Freire (1994) reinforces the need to start from cultural contexts in school education. For the author, this “imposes on liberating action, which is also historical, in a context that requires that there must be a relationship of correspondence not only with the 'generative themes', but also with the

perception that men are having from them" (p. 54).

The articulation of traditional/popular knowledge in countryside schools is fundamental and necessary, since the knowledge of the students is worked on and approaches scientific knowledge. Thus, it will be possible to have a comprehensive education, valuing the knowledge of the students.

In this context, Morin (2000) highlights that the need to teach in the human condition is one of the knowledge for future education. It is fundamental, in teaching, that human beings can "recognize common humanity and at the same time recognize the cultural diversity inherent in everything human" (p. 47), where all knowledge needs to contextualize and value their own knowledge in order to become relevant for mankind.

Practical and field classes: building ways of teaching

In our next step, the use of non-school educational spaces was prioritized, such as the outdoors of the school and nearby courtyards, considering that they are strategies that can enable satisfactory learning for students. According to Krasilchik (2011), working outside of the school area allows collecting data and information about notes made in class, which also allows students to get in touch with the communities in which they live, in addition to increasing the interaction between teacher and student.

Education in the countryside has a true natural laboratory, especially in regions which are rich in biodiversity and cultural heterogeneity, such as the riverside schools of the Amazonian region. Students can explore their environments, their peculiarities and articulate with the scientific knowledge presented in the classroom. Often, the lack of resources in schools is pointed out as a prerequisite for the absence of practical classes, however, natural ecosystems can serve as support for practical classes, so the theoretical contents are presented in a contextualized way in practical classes (Krasilchik, 2011; Silva & Cavassan, 2006).

The first practical activity that was carried out was the collection of botanical material from around the school to make the stickers, which is a sort of practical field class. In the perspective of Silva and Cavassan (2006), practical field classes enable the development of skills in students, allowing attention to the diversity existing in the nature that surrounds them, which contributes to the observation and articulation with Scientific Education.

For the use of the tracing technique (Figure II), small sheets available in the external environment of the school were used, with the presence of limbus and protruding ribs to apply the technique.

Figure II - Student Artwork Decal.

Source: Melo, 2018.

As indicated in the previous figures, we highlight the importance given to the student when carrying out this practical activity, fulfilling some objectives of the practical classes proposed by Hofstein and Lunetta (1982), since these activities arouse the interest of students, involving them in the scientific field, in a research that allows understanding basic concepts and developing specific content competencies.

From the perspective of Moura and Silva (2015), the proposal to teach Science contents through scientific illustration, in our case, the sticker allowed students to learn from the materials available in their daily lives and, above all, the production of teaching materials with illustrations and their own meaning, considering that these vegetables have meaning in the students' lives.

For this reason, it is emphasized that the students' approach to the reality of their daily lives allows them to awaken their curiosity to expand their knowledge, guide the teaching and learning processes and strengthen the idea that we do not always need sophisticated resources and materials to develop activities that allow us to contribute to the school education of children and young people in the countryside.

The vegetal content has been frequently approached in teaching through

the close connection with human beings since the dawn of civilization. They are living beings that are part of the daily life of students, part of traditional/popular knowledge and are abundant. For Alves Silva (2016), it is an approach that can be a tool to achieve teaching focused on contextualization and dynamism, where the student has a direct contact with the object of study.

In general, the practical classes work in the teaching of science with paths that are being built for Scientific Education, because when interconnected with the subject contents and mediated in a contextualized and interdisciplinary way, they enable the formation of critical and reflective citizens.

Riverside students and medicinal tea

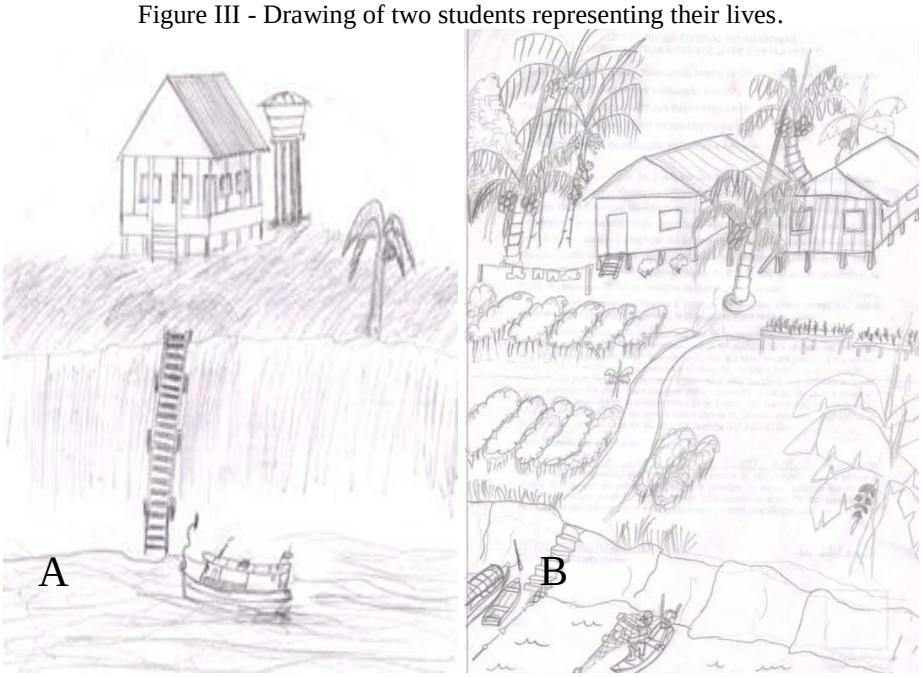
School transportation is an element that is part of the life of the riverside students, being one of the challenges of the Countryside Education for the students of the field research school. At the São Miguel School, students face a long journey every day to get there, in addition to the lack of transportation on some school days, which implies the lack of classes at school, considering that most students need this conveyance.

Upon arriving at the school, the students are welcomed with the "Medicinal Tea", where we had food to connect the proposal of teaching from the life knowledge. The students brought various medicinal plants from their homes to continue their activities with the interconnection of scientific and school knowledge.

The articulation of traditional/popular and school knowledge is essential and necessary for a quality scientific education, since formal education often excludes the knowledge of students because it is considered insufficient in the process. However, lived knowledge, which is transmitted from generation to generation, must be part of the school context, not only to contribute to learning, but also to value this intangible heritage and prevent it from being lost. For Gaspar (2002), school and non-school education must be mutual, due to the fact that traditional, popular and school knowledge stimulate dialogue for a quality Scientific Education.

Continuing with the discussion of the research data, the students drew pictures that represented their lives as riverbank residents, as shown in Figure III.

Figure III - Drawing of two students representing their lives.



Source: Melo, 2018.

The above drawings of two students from the research field school represented the importance given to the nature of the environment in which they live. Figure A represents the São Miguel School, in summer, where the Madeira River can be observed as the school boat approaches. When observing the details of this figure, the grass around the school and the coconut tree located next to it stand out, describing the vegetables as indispensable components in their riverside life. In figure B, the student presents his home and, in this image, there is a rich diversity of vegetation, the means of transportation for this student and his family, and the fishing net that represents one of the residents' sources of life.

With these two images, we describe the importance that students give to the representation of their lives, where the school is a synonym for a great representation where plants are not just a backdrop. It is at the height of the need to break down barriers of isolation and value the knowledge that each student has in their background traditional knowledge. According to Morin (2000), one of the knowledge for the education of the future passes through the need to teach the earthly identity, being essential to learn to be on the planet, "to learn to live, to share, to communicate, to take communion; it is what is learned only through unique cultures" (Morin, 2000, p. 76).

When thinking of activities for students in countryside schools, it is necessary to think of strategies that dialogue with the reality of countryside subjects. Thus, illustration activities that

represent the lives of students are highly representative memories of the place and life, and it is necessary for educators to provide articulations of the knowledge experienced in teaching.

Conclusion

The first challenge of the research was to perceive the lack of integration of the contents on plants in the discipline of Natural Sciences at the São Miguel Countryside School, considering that these relevant contents were not treated in the studied series. We do not want to blame here only the teacher who taught the discipline in the school, but to alert the municipal school system about the seriousness with which countryside education should be treated in the riverside communities.

In the research, it was found that the riverside students have knowledge about plants and that, by sharing the activities, they made possible the articulation of knowledge and a multidimensional look. The instruments used in the research were essential to understand how important is a contextualized teaching, where the subjects are not in disjunctions with knowledge, where students understand the concepts and the applicability of the knowledge that is taught and experimented.

It is essential to consider the need for the school to mediate this knowledge to avoid future losses, in addition to providing students with learning of scientific content based on their experience and knowledge in a contextualized way. In addition, the Amazon Region has a large medical collection and a rich cultural complex that is part of the life of the riparians and, therefore, cannot be disconnected or taken out of school.

Research with students from the field school in the teaching of Natural Sciences allowed a dialogue on the knowledge about plants, considering that there is an intimate relationship between human beings and plant species, in addition to considering biodiversity, therefore that it is imperative that new research be sensitive to the articulation of traditional/popular knowledge with Scientific Education.

The most important thing in this research process was to understand the relevant space of traditional knowledge in the constitution of the life of students, which requires that the school and teachers work in a multidimensional perspective, with the reconnection of knowledge as possibilities for Education Scientific

Integration should be based on aspects of the students' culture and their everyday lives. Thus, it will be possible to build an education that leads to citizenship

training, providing the learning of the meaning of the science that surrounds them, of the knowledge they need and that are present in schools. For this, it is necessary that the competent bodies and education professionals see the students and countryside schools as a priority, overcoming the barriers of isolation and transforming education and the future of children and youth.

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Article Information

Received on April 29th, 2020
Accepted on October 10th, 2020
Published on June, 30th, 2021

Author Contributions: The author were responsible for the designing, delineating, analyzing and interpreting the data, production of the manuscript, critical revision of the content and approval of the final version published.

Conflict of Interest: None reported.

Article Peer Review

Double review.

Funding

No funding.

How to cite this article

APA
Melo, P. R. H., Batista, E. R. M., & Camargo, T. T. S. (2021). Rural Education and Science Teaching: Experiences in a riverside school in the Southwest Amazonas. *Rev. Bras. Educ. Camp.*, *6*, e9760. http://dx.doi.org/10.20873/uft.rbec.e9760

ABNT
MELO, P. R. H.; BATISTA, E. R. M.; CAMARGO, T. S. Rural Education and Science Teaching: Experiences in a riverside school in the Southwest Amazonas. **Rev. Bras. Educ. Camp.**, Tocantinópolis, v. 6, e9760, 2021. http://dx.doi.org/10.20873/uft.rbec.e9760