

Curricularization Of University Extension In The Public Management Technology Program: Environmental Education, Ocean Literacy, And Water Sustainability In The Territories Of Tocantins

Marcela Pinheiro Da Fonseca¹; Gianine Soares Borghetti¹;
Patrícia Miranda Ribeiro¹; Alyne Crystina Alves Magalhães¹;
Givaldo Batista Medeiros¹; Gleyce Paixão Pinto¹; Paula Cristiane Rodrigues¹;
Hosana Da Silva De Melo¹; Myriam Marta Soares De Mello¹;
Rodrigo José Lima Almeida¹; Andreia Brandão De Melo Lopes Rêgo¹;
Doriane Raga Nunes Nunes Bilac²; Daniel Ferreira Da Silva³; Carlos José Dos Santos⁴;
Ana Claudia Da Silva⁵; Pietro Lopes Rêgo⁶
(Universidade Estadual Do Tocantins (UNITINS), Tocantins, Brazil.)
(Universidade Federal Do Tocantins (UFT), Palmas, TO, Brazil.)
(Instituto Federal Do Tocantins (IFTO), Campus Araguatins, Araguatins, TO, Brazil.)
(Universidade Estadual De Goiás (UEG), Uruaçu, Goiás, Brazil.)
(Centro Universitário De Viçosa (UNIVIÇOSA), Viçosa, MG, Brazil.)
(Instituto Federal Do Tocantins (IFTO), Campus Dianópolis, Dianópolis, TO, Brazil.)

Abstract :

This article analyzes an experience of curricularized university extension developed in the Technology in Public Management program, within the scope of the Integrative Project I (class of 2025/I), focusing on environmental education, the appreciation of water as a common good, and the dissemination of ocean literacy in territories of the state of Tocantins, Brazil. The extension action took place between August and October 2025, involving two educational hubs and articulating territorial diagnosis, participatory planning, and community-based interventions. Methodologically, this is a qualitative and descriptive experience report grounded in critical and dialogical principles of university extension. The results indicate positive impacts on students' education, the strengthening of university-community relations, and increased environmental awareness among different social groups. The study highlights curricularized extension as a powerful pedagogical strategy for integrating teaching, research, and extension while fostering social commitment and sustainable territorial development.

Keywords: University extension; Curricularization; Environmental education; Water sustainability; Public management.

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I. Introduction

The intensification of climate change and its socio-environmental impacts have become one of the main contemporary challenges for national states, educational institutions, and civil society [1]. Phenomena such as prolonged droughts, water scarcity, degradation of hydrographic basins, and the increase in extreme events directly affect the quality of life of populations and highlight the need for integrated strategies for the sustainable management of territories and natural resources [2]. In this scenario, water assumes centrality as a common good essential to life, public health, and social development, requiring educational actions and public policies oriented by sustainability and socio-environmental justice.

Given this context, the public university occupies a strategic role by articulating the production of scientific knowledge, critical professional training, and social commitment to the territories in which it is inserted. As Freire [3] highlights, higher education cannot be restricted to the transmission of content; it must promote formative processes based on dialogue, the problematization of reality, and social transformation.

University extension, as a constitutive dimension of the university, enables this approximation between academic and popular knowledge, strengthening the socially referenced performance of the institution [4].

The curricularization of extension, provided for in the National Guidelines for Higher Education and systematized by the National Policy for University Extension [5], represents a significant advance by proposing the inseparable integration of teaching, research, and extension in undergraduate curricula. By incorporating extension actions as a mandatory component of academic training, this policy seeks to overcome punctual, assistance-based, or disconnected practices from the formative process, promoting pedagogical experiences that dialogue with concrete social demands [6].

In the field of Public Management, the curricularization of extension proves to be especially relevant, since the training of public managers requires a practical understanding of the complexity of public policies, environmental management, social participation, and territorial development [7]. The extension experience allows students to articulate theory and practice, developing skills related to planning, decision-making, conflict mediation, and ethical and responsible action in the territories [8].

In this sense, critical environmental education is a transversal axis of extension actions, by stimulating reflection on the modes of use of natural resources, the society-nature relationship, and the impacts of climate change on a local and global scale. Authors such as Jacobi [9] and Loureiro [10] argue that environmental education should promote the formation of critical subjects, capable of understanding the structural causes of environmental problems and acting collectively in the construction of sustainable alternatives.

The ocean literacy approach expands this perspective by recognizing the interdependence between oceans, rivers, hydrographic basins, and human societies. According to UNESCO [11], understanding this interconnection is fundamental to facing contemporary environmental challenges, even in non-coastal territories, such as the state of Tocantins, where the preservation of rivers, springs, and watercourses is essential for regional water sustainability.

Given this panorama, this article aims to analyze the experience of curricularization of extension developed in the Public Management Technology course, through educational actions aimed at the appreciation of water, ocean literacy, and water sustainability, carried out in communities in the municipalities of Miranorte and Paraná, in the state of Tocantins. By systematizing this experience, we seek to contribute to the debate on university extension as a formative and socially committed strategy, as well as to the strengthening of pedagogical practices oriented towards sustainable territorial development [12].

II. Theoretical Framework

Contemporary university extension is understood as an educational, cultural, and scientific process that promotes transformative interaction between university and society, guided by the dialogue of knowledge and the confrontation of social and territorial inequalities. According to the Forum of Pro-Rectors of Extension of Brazilian Public Universities [5], extension must be inseparable from teaching and research, constituting a structural axis of academic training and the social commitment of the public university.

The curricularization of extension, in this context, represents a milestone in the educational policies of Brazilian higher education, by mandatorily incorporating extension actions into undergraduate curricula. This guideline seeks to overcome punctual, assistance-based, or disconnected practices from academic training, promoting pedagogical experiences that start from the real demands of society and return to it in the form of applied knowledge, social intervention, and transformation of reality [13].

In the field of Public Management, university extension assumes a strategic role, since the training of public managers requires a concrete understanding of territories, public policies, and processes of social participation. According to De Oliveira et al [14], environmental public management demands professionals capable of articulating planning, governance, sustainability, and social justice, which presupposes a training that goes beyond technical mastery, incorporating practical and socially contextualized experiences.

Environmental education, in turn, constitutes a fundamental transversal axis for the performance of public management and for extension actions. Authors such as Jacobi [9] argue that environmental education contributes to the formation of citizenship by stimulating social participation, the sense of collective responsibility, and the critical understanding of socio-environmental problems. In this perspective, environmental education is not limited to the transmission of information but promotes formative processes aimed at changing values, attitudes, and social practices [15].

Loureiro [10] reinforces this approach by proposing critical environmental education, guided by the problematization of relations between society and nature and by the confrontation of the structural causes of environmental degradation. This conception dialogues directly with the principles of critical university extension, by valuing dialogue, the collective construction of knowledge, and social transformation as central objectives of educational practices.

The appreciation of water as a common good and the promotion of water sustainability are part of this debate, by highlighting the need for integrated public policies and permanent educational actions. The public

management of water requires articulation between different levels of government, community participation, and educational processes capable of sensitizing the population to the rational use of water resources [15].

The notion of ocean literacy, as defined by UNESCO [11], expands this understanding by recognizing the interdependence between oceans, rivers, hydrographic basins, and human societies. Even in non-coastal territories, such as Tocantins, ocean literacy contributes to a systemic view of water cycles, strengthening environmental education and public management practices oriented towards territorial sustainability.

Thus, the articulation between public management, environmental education, and university extension is configured as a fundamental theoretical framework for the analysis of the actions developed in this study, evidencing the potential of the curricularization of extension as a formative and socially committed strategy aligned with contemporary socio-environmental challenges [16].

III. Methodology

The present study is characterized as an experience report, of a qualitative and descriptive nature, based on the systematization of extension actions developed within the scope of the Integrating Project I of the Public Management Technology course. The experience report constitutes a methodological strategy widely used in research in the fields of education and university extension, as it enables the reflexive analysis of contextualized pedagogical and social practices, valuing the processes, meanings, and learning constructed throughout the intervention [17, 18].

The qualitative approach proved suitable for the study's objective, as it allowed for an understanding of the meanings attributed by participants to environmental education and university extension actions, as well as the formative and social impacts resulting from these practices. According to Minayo [17], qualitative research seeks to grasp social reality in its complexity, considering values, perceptions, relationships, and contexts—essential elements for analyzing extension experiences in specific territories.

Activities were developed between August 7 and October 30, 2025, directly involving 52 students, 12 faculty members, 6 administrative technicians, and 71 participants from the external community, totaling 361 people directly impacted. This quantitative figure evidences the social reach of the extension actions and reinforces the role of the public university as an agent of social transformation in the territories where it operates [19].

From a methodological standpoint, the extension actions were organized into three main stages: (i) diagnosis of the local reality, (ii) participatory planning of interventions, and (iii) execution and evaluation of activities. The initial diagnosis aimed to identify specific socio-environmental demands of the territories, considering aspects related to water use, climate change, and the preservation of natural resources, in line with the perspective of territorial and participatory public management [2].

The participatory planning of actions involved students, faculty, tutors, and community representatives, guided by the dialogue of knowledge and the collective construction of intervention proposals. This stage dialogues with the Freirean conception of education as a dialogical and emancipatory practice, in which educators and learners jointly construct knowledge based on lived reality [3].

The execution of activities comprised different intervention strategies, such as educational lectures, awareness campaigns, leafleting, and community mobilization (mutirões), developed in two face-to-face hubs: Miranorte and Paranã, in the state of Tocantins. These strategies were chosen for their potential for community reach, environmental sensitization, and promotion of social participation—central elements of critical environmental education and university extension [9, 10].

The evaluation of actions occurred in a processual and formative manner, considering the participation of those involved, observed changes in perception, and the socio-environmental impacts identified throughout the interventions. This evaluative perspective is aligned with the principles of critical university extension, which understands evaluation as an integral part of the educational and transformative process [8].

IV. Results And Discussion

The extension actions were developed in two face-to-face hubs located in the municipalities of Miranorte and Paranã, both situated in the interior of the state of Tocantins and at a considerable distance from the capital, Palmas, which reinforces the social relevance of university action in these territories. The geographical distance from the state's main urban center implies additional challenges related to access to public policies, specialized educational services, and permanent environmental education initiatives, making extension actions strategic for strengthening local development [6].

The municipality of Miranorte, located in the central region of Tocantins, presents typical characteristics of small towns, with an economy strongly linked to agribusiness and a significant dependence on municipal and state public policies. Educational indicators, such as the IDEB (Basic Education Development Index), and socioeconomic ones, such as the HDI (Human Development Index), reflect structural challenges common to interior municipalities, especially regarding the quality of basic education, school retention, and the

expansion of formative opportunities. In this context, the university's presence through extension contributes to qualifying educational processes, strengthening citizenship, and promoting environmental education as a transversal public policy.

At the Miranorte hub, four extension actions were developed, highlighting awareness activities on the conscious use of water, proper cleaning of water tanks, the impacts of wildfires on public health and the environment, as well as air quality. The actions involved home visits, lectures in state schools, and educational activities with the APAE (Association of Parents and Friends of the Exceptional), enabling dialogue with different audiences and the adaptation of pedagogical strategies to local specificities. These interventions sought to respond to concrete demands of the territory, especially those related to collective health, the use of water resources, and predominant agricultural practices.

The municipality of Paraná, located in the southeast of Tocantins and also distant from the capital, Palmas, has a strong cultural identity associated with rivers, waterfalls, and natural landscapes, in addition to a tourism potential still in the process of consolidation. Like Miranorte, Paraná faces challenges related to educational indicators (IDEB) and human development (HDI), especially concerning environmental education, solid waste management, and the preservation of natural resources. Extension work in this context helps to expand access to information, strengthen environmental awareness, and stimulate community protagonism.

At the Paraná hub, seven extension actions were carried out, addressing the preservation of waterfalls, rivers, and springs; the dissemination of ocean literacy in non-coastal territories; the reduction of solid waste on the banks of the Palma River; environmental education in municipal schools; and the promotion of selective waste collection and recycling. Noteworthy was the community mobilization (mutirão) carried out with children and local residents, focused on identifying, separating, and correctly disposing of recyclable materials, especially plastic packaging, strengthening sustainable practices and socio-environmental co-responsibility.

In general, the actions developed in both hubs evidence the importance of university extension as a strategy for the interiorization of the public university, contributing to the reduction of regional inequalities, the strengthening of educational indicators, and the advancement of local human development. By articulating environmental education, public management, and social participation, the interventions reaffirm the university's role as an agent of social transformation in municipalities far from large urban centers.

The actions developed throughout the environmental education and social awareness projects generated significant results in the communities served, promoting learning processes, social engagement, and perceptible changes in behavior. These findings corroborate the conception of university extension as a formative, dialogical, and socially referenced practice, in which academic knowledge is built in interaction with the concrete demands of society [20].

Regarding awareness of water use, the participating communities received practical guidance focused on conscious consumption and the adoption of sustainable habits in daily life, such as reducing waste and maintaining domestic supply systems [21]. An expanded understanding was observed regarding the importance of periodic cleaning of water tanks for public health—an aspect directly related to preventing waterborne diseases and promoting quality of life. These results dialogue with Jacobi [9], showing that environmental education, when articulated with local reality, contributes to building citizenship and changing social practices through critical reflection on the use and management of natural resources.

The strengthening of the relationship between the university and the community constituted one of the central results of the extension actions. The activities favored a closer approximation between students, faculty, and residents, allowing students to experience, in practice, the principles of public management, participatory territorial planning, and environmental governance [22]. This approximation reaffirms university extension as a space for the dialogue of knowledge and the co-production of knowledge, as defended by Freire [3], understanding education as a practice of freedom and an instrument of social transformation. Furthermore, such interaction contributes to the formation of public managers who are more sensitive to territorial realities and local socio-environmental demands.

In the axis of wildfire sensitization, 11th-grade students and APAE participants expanded their understanding of the environmental, social, and health impacts resulting from this phenomenon, especially in regions marked by prolonged dry periods. Active participation in discussions and the questions raised indicated a critical appropriation of the theme, reinforcing the role of critical environmental education in training subjects capable of acting as knowledge multipliers in their family and community contexts [12]. Such a perspective is fundamental for tackling complex socio-environmental problems that require articulated actions between education, public policies, and social participation.

Regarding ocean literacy and the valuation of local rivers, the population of Paraná showed high receptivity to educational actions, understanding the relevance of water preservation even in territories far from the coast. This understanding broadens the systemic perception of water resources and is aligned with the ocean literacy approach proposed by UNESCO [11], which highlights the interconnection between oceans, rivers,

watersheds, and human societies. By recognizing this interdependence, the actions contributed to strengthening collective responsibility for the conservation of inland waters.

Also noteworthy is the reduction of solid waste on the banks of the Palma River, observed after educational work carried out with campers. Compared to previous years, a significant decrease in inadequate waste disposal was verified, a result attributed to the combination of educational actions, direct dialogue with participants, and articulation with local public authorities. This finding reinforces the importance of integrated environmental education and public management strategies for promoting territorial sustainability, as pointed out by Ribeiro et al [7] when discussing the need for public policies articulated with social participation for effective environmental management.

In the scope of education for the preservation of springs and streams, the lecture held at the Municipal School Professora Floracy expanded the environmental awareness of 4th-grade students, promoting engagement, curiosity, and active participation. Teachers and tutors showed interest in themes related to soil degradation, wildfires, and the importance of institutional partnerships for environmental restoration, highlighting the school's potential as a strategic space for socio-environmental training and the consolidation of sustainable practices in the territory [9].

Awareness of water scarcity also emerged as a relevant result, as students and staff understood the impacts of reduced water availability on society and the environment. Participants were encouraged to adopt more responsible consumption practices in both school and domestic environments, strengthening attitudes of socio-environmental co-responsibility. This result dialogues with the water sustainability perspective defended by Bursztyn and Bursztyn [2], emphasizing the need for articulation between public policies, environmental education, and social participation.

The actions aimed at preserving waterfalls, rivers, and springs in Paraná, developed with 5th-grade students, demonstrated high pedagogical efficacy. The use of visual resources, such as photos and videos, facilitated learning, strengthened the sense of belonging and environmental responsibility, and sparked interest in sustainable tourism as a strategy for valuing the municipality's natural resources. Such results are in line with the principles of critical environmental education, which advocates active and contextualized methodologies as means for forming ecological and socially committed subjects [4].

In general, these results reinforce the potential of the curricularization of extension as a formative strategy capable of articulating theory and practice, promoting meaningful learning, and expanding the social commitment of the public university, in line with literature that defends university extension as a structural axis of academic training and professional practice committed to sustainable development [6].

Among the main difficulties faced during the development of extension actions, the short timeframe for planning and organizing activities, limitations in physical and technological infrastructure in the territories served, instability of internet connection—especially in interior municipalities—and budgetary restrictions for producing and printing didactic and informative materials stand out. These challenges are recurring in university extension initiatives developed in contexts marked by regional inequalities and less access to public and technological resources.

The reduced time for executing activities required a high level of organization, rapid decision-making, and adaptability to the emerging demands of the communities from both students and faculty. This condition, although limiting, also functioned as a formative element, bringing students closer to the real conditions of working in public management, where short deadlines and resource scarcity are frequent situations [15].

Infrastructure limitations and internet instability primarily impacted the use of digital resources and communication between hubs, requiring the adoption of alternative strategies, such as using simplified printed materials, face-to-face dialogical activities, and participatory methodologies based on orality. These challenges highlight the need for public policies aimed at digital inclusion and strengthening educational infrastructure in municipalities far from large urban centers.

Budgetary restrictions, in turn, demanded creativity and co-responsibility from those involved, stimulating the reuse of materials, the production of low-cost educational content, and the establishment of local partnerships with schools, community associations, and public bodies. This dynamic reinforces the conception of university extension as a socially referenced practice, built through dialogue with reality and the valuation of local knowledge [5, 23].

Despite the identified limits, the challenges were partially overcome through adaptive strategies, the critical and creative use of available resources, and the collective engagement of students, faculty, and the community. In this sense, the difficulties not only highlighted the structural fragilities of the territories but also enhanced formative, collaborative, and reflexive processes, reaffirming university extension as a space for meaningful learning and social commitment.

V. Considerations

The analyzed experience demonstrates that the curricularization of extension in the Public Management Technology course constitutes an effective pedagogical strategy to promote critical environmental education, community engagement, and sustainable territorial development, especially in municipalities in the interior of the state of Tocantins. By articulating theory and practice, the extension integrated into the curriculum enabled students to experience concrete challenges of public management, environmental governance, and social participation, broadening their understanding of the role of the State and society in promoting sustainability.

The actions developed evidence the transformative potential of university extension when conceived as a structural dimension of academic training, in line with the principles defended by the Forum of Pro-Rectors of Extension of Brazilian Public Universities [5]. In this sense, extension ceases to occupy a peripheral place in the curriculum and begins to constitute a privileged space for the production of socially referenced knowledge, strengthening the civic, ethical, and professional training of students.

From the point of view of public management, the experience contributed to the development of competencies related to participatory planning, institutional communication, conflict mediation, and the formulation of educational strategies in contexts of resource scarcity—recurring characteristics of public administration in territories marked by regional inequalities. Such learning dialogues with the literature that advocates for the training of public managers committed to socio-environmental justice and sustainable development [7].

In the field of environmental education, the actions reaffirmed the importance of critical, contextualized, and dialogical approaches, capable of promoting changes in perception and behavior regarding water use, the preservation of natural resources, and collective responsibility. Critical environmental education must contribute to the formation of subjects conscious of their historical and political role in transforming socio-environmental reality, a perspective evidenced in the results achieved with the served communities [10].

Furthermore, the extension work strengthened the university–community relationship, expanding access to scientific knowledge, valuing local knowledge, and contributing to the reduction of asymmetries between large urban centers and interior municipalities. This approximation reaffirms the Freirean conception of education as a practice of freedom, based on dialogue and the collective construction of knowledge [3].

In view of the above, the expansion and institutionalization of similar initiatives in higher education are recommended, so as to consolidate the curricularization of extension as a permanent academic policy. It is also suggested to deepen evaluative studies that investigate the medium and long-term effects of these actions on the professional training of students, the strengthening of local public policies, and the promotion of sustainable territorial development. Such investigations can contribute to the improvement of extension practices and to the strengthening of the social role of the Brazilian public university [12].

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