

## Articles

# New curricular knowledge in professional education through environmental knowledge, on the banks of the Taquari river in Pantanal, Mato Grosso do Sul

Novos saberes curriculares na educação profissional por meio do saber ambiental, às margens do Taquari no Pantanal Sul-mato-grossense

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## Abstract

The integrated curriculum in High School at Federal Institutes has been identified as a major challenge for Professional and Technological Education (EPT), requiring teachers to develop activities that encompass scientific and other knowledge, in order to integrate school-community, in favor of the development of socioeconomic, cultural and environmental actions. In this study, we seek Environmental Knowledge as a foundation for curricular construction, taking the local reality in a unit of a Federal Institute in Mato Grosso do Sul (IFMS) as a basis for achieving curricular integration and comprehensive and human training. The use of the Culture Circle as a theoretical-methodological contribution to the development of an Integrative Activity allows the creation of interdisciplinary knowledge and other important knowledge for the school and the community, favoring the reflection-action-reflection of those involved, in defiance of socio-economic local environments.

**Keywords:** integrative activity; integrated high school; traditional knowledge; scientific knowledge; socio-environmental action.

## Resumo

O currículo integrado no Ensino Médio dos Institutos Federais tem sido apontado como um grande desafio da Educação Profissional e Tecnológica (EPT), exigindo dos professores, o desenvolvimento de atividades que contemplem os conhecimentos científicos e outros saberes, de forma a integrar escola-comunidade, em prol do desenvolvimento de ações de caráter socioeconômico, cultura e ambiental. Neste estudo, buscamos o Saber Ambiental como fundamento para a construção curricular, tomando a realidade local de uma unidade do IFMS como base para alcançar a integração curricular e uma formação integral e humana. A utilização do Círculo de Cultura como aporte teórico-metodológico para o desenvolvimento de uma Atividade Integradora permite compor saberes interdisciplinares e outros saberes importantes para a escola e a comunidade, favorecendo a reflexão-ação-reflexão dos envolvidos, diante dos desafios sócio-econômico-ambientais locais.

**Palavras-chave:** atividade integradora; ensino médio integrado; saber tradicional; saber científico; ação socioambiental.

## INTRODUCTION

The Integrated High School (Ensino Medio Integrado - EMI) offered by the Federal Institutes (IF) is based on the premise of overcoming the duality between specific (professional) training for manual labor and general training, through the integration, articulation and inseparability of

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the dimensions of work, science, culture and technology. It is a question of “constituting High School as a formative process that integrates the structuring dimensions of life, work, science and culture, opens up new life prospects for young people and contributes to overcoming inequalities between social classes” (Ciavatta, 2014, p. 198 *apud* Ciavatta; Ramos, 2012a, p. 306).

However, the materialization of the integrated curriculum in EMI has been a major challenge for teachers, managers and students in Professional and Technological Education (EPT). We have been able to see this challenge, especially in the teaching practice focused on the elaboration of Integrating Pedagogical Activities (Atividades Pedagógicas Integradoras - AI), which are related, according to Pasqualli, Silva and Silva, to “realization of interdisciplinary work, the rupture of hierarchies historically constructed between the areas of knowledge and the opening of those involved to collective work and to new pedagogical experiences” (Pasqualli; Silva; Silva, 2019, p. 105).

However, interdisciplinarity alone, understood as an integration between different disciplines, is not enough, since knowledge of a given reality requires other knowledge, especially focused on socioculture.

In this text, we present Environmental Knowledge as a proposal for new knowledge, which Hissa characterizes as broad and free, because

[...] the development of environmental knowledge emerges without the seal of disciplinary boundaries, free like the opening of the frontier, turned outwards, made up of a chaotic weave. There are no defined objects, but various possibilities for theoretically structuring objects that cross each other and become worlds made up of intersections that question the discipline: woven together, transversal, complex, transdisciplinary. There are no proprietary, monopolized methodologies: there is an anarchic multiplicity of alternatives for the integrated treatment of environmental issues (Hissa, 2008, p. 59).

Moraes et al. (2021), based on research into EMI, also points out this challenge, drawing attention to the lack of understanding of this teaching proposal, as well as the limitations of teachers' initial and continuing training, the difficulties of carrying out collective experiences, and the lack of studies and integrative pedagogical experiences.

With this in mind, we propose a reflection on environmental knowledge as curricular knowledge, capable of contributing to the definition of themes, principles, objectives and methodologies inherent in an interdisciplinary activity - a didactic-methodological possibility for curricular integration at the EMI of the Federal Institute of Mato Grosso do Sul (Instituto Federal do Mato Grosso do Sul - IFMS).

The text seeks to: a) contextualize the concept of an integrative curriculum; b) support

the notion of environmental knowledge; c) present an AI for the IFMS curriculum, with the development of the Culture Circle for the integration of interdisciplinary, technical and community knowledge, through interaction and participatory action by the subjects in the local socio-economic-environmental challenges.

## **ENVIRONMENTAL EDUCATION IN PROFESSIONAL AND TECHNOLOGICAL EDUCATION**

The National Environmental Education Policy (Política Nacional de Educação Ambiental - PNAE), Law No. 9.795 of 1999, states that Environmental Education (Educação Ambiental - EA) integrates all national education, with “processes through which individuals and the community build social values, knowledge, skills, attitudes and competencies aimed at the conservation of the environment, a good for the common use of the people, essential to a healthy quality of life and its sustainability” (Brasil, 1999, n.p.).

The 2012 National Curriculum Guidelines for Environmental Education (Diretrizes Curriculares Nacionais para a Educação Ambiental - DCNEA), present EA as an integrating theme of the curriculum for the integral and professional formation of the student. Zitzke e Calixto (2019) point out that

actions based on Environmental Education are protagonists of the individual's reflections on themselves and the society in which they are inserted. They can mediate integrative proposals, occupying the lines between knowledge, corroborating the construction of critical thinking in students, contributing to the development of participatory individuals in the teaching and learning process (Zitzke; Calixto, 2019, p. 309).

Reigota points out that in view of the contemporary themes that have been added to the initial debates, "new theoretical, political, ecological, social, cultural and pedagogical challenges" are being presented to environmental education (Reigota, 2010, p.539). And Jacobi adds that environmental education "increasingly takes on a transformative role, in which the co-responsibility of individuals becomes an essential objective for promoting a new type of development", thus becoming a "necessary condition for modifying a situation of growing socio-environmental degradation" (Jacobi, 2003, p. 193).

According to Reigota, EA does not disregard scientific knowledge, nor does it replace traditional disciplines,

allows **the pedagogical process to take place under different aspects, which complement each other**. In this way, there is room for moments in which **knowledge is transmitted** (this can be from the student to the teacher), knowledge is constructed (including between teachers from different disciplines) **and social representations are deconstructed**, especially those of the teachers themselves, based on the **interaction between science and everyday life; scientific knowledge, popular knowledge and social representations; political participation and citizen intervention**, completely discarding the predominant relationship that the teacher teaches and the student learns, and establishing a **dialogical process between different generations** (teachers and students), **discussing possibilities for joint actions** that can guarantee a healthy life for all, without forgetting the ecological legacy that we will leave to future generations. (Reigota, 1998, p. 34) (emphasis added)

This approach to education and, consequently, human formation is very close to Professional and Technological Education (EPT) through perception, understanding, reflection and critical action in the face of socio-environmental issues. This requires, as Paula and Henrique point out, a "historical-critical-political formation of the subject, emancipatory formation, which places the subject as the author of their own history, with a sense of justice that fights for their rights; integral formation that articulates science, technology, work and culture, which integrates teaching, research and extension" (Paula; Henrique, 2016, p. 85).

This proposal for education and human formation is prioritized in high school curricula in Brazil, and especially in high school integrated with vocational education, as described in the legal documents of national education.

## THE HIGH SCHOOL CURRICULUM IN BRAZIL

The purpose of High School is to further study; basic preparation for work and citizenship; and the ethical and human formation of the student, as defined in LDB 9394/96. To achieve these purposes, it comprises a curriculum made up of a Common National Curriculum Base (Base Nacional Comum curricular - BNCC) and a diversified part, linked to the "historical, economic, social, environmental and cultural context" (Brasil, 1996, s/p).

From this perspective, the curriculum has interculturality as its premise, because "it implies a clear and objective intention to promote dialogue and exchange between the different groups and individuals that constitute them, open and in a permanent movement of construction, resulting from the intense processes of cultural hybridization (Candau; Koff, 2006, p. 102).

Art. 35 §7 of this BDL states that "high school curricula should consider the integral formation of the student, [...] for their formation in physical, cognitive and socio- emotional aspects". And that "given the general education of the student, it may prepare him/her for the exercise of technical professions" (Brasil, 1996, s/p).

The 2018 National Curriculum Guidelines for Secondary Education (DCNEM) reinforce the principles to be met by High School (EM) in order to guarantee the integral, civic and professional education, of which we highlight: comprehensive student education; construction of the student's personal, civic and professional dimensions; environmental sustainability; articulation of knowledge with the historical, economic, social, scientific, environmental context, local culture and the world of work (Ministério da Educação, 2018, p.2).

It also points to what can be understood as integral education, with the "intentional development of the physical, cognitive and socio-emotional aspects of the student through significant educational processes that promote autonomy, citizen behavior and protagonism in the construction of their life project" (*idem*).

The diversification in the document aims to articulate knowledge with the local historical, economic, social, environmental and cultural context and the world of work, contextualizing the content to each situation, school, municipality, state, culture, values, articulating the dimensions of work, science, technology and culture.

In addition to the precursor principles for EPT Integrated High School (EMI), the MEC has proposed curricular integration between basic general education, as provided for in the BNCC, and formative itineraries, specific knowledge for academic or professional pursuit. This integration between general and specific, professional education makes it possible to break down the dualism between basic and professional education, enable further studies with entry into higher education and also professional training insertion into the world of work.

In this respect, regardless of the modality, the proposal for curricular integration is inherent to all education, in this specific case to High School. But what is curriculum integration? Lopes says that curricular integration is proposed according to the theoretical and social principles defended. In this way, he discusses how integration takes place based on curricular organization by competencies; reference subjects; or school subjects or disciplines.

In curricular organization based on **competences**, integration takes place in the context of the application of know-how. In curricular organization based on **reference disciplines**, the integrating principle is identified in the scientific field itself: concepts and principles of science that integrate different disciplines. In turn, in curricular organization based on **school subjects**, the integrating principles are sought in the educational goals that are being pursued (Lopes, 2008, p. 64).

However, despite these possibilities for organizing the teaching curriculum by units of study, competences and skills, modules, activities, practices and contextualized projects, or transversal or transdisciplinary themes, the disciplinary organization is still the most evident in education systems. Thus, the Diretrizes Curriculares Nacionais - DCN, for both EM and EPT include contextualization and interdisciplinarity or transdisciplinarity as a methodology to ensure the articulation of knowledge.

In order to fulfill this purpose, some educational strategies and learning environments are not necessary to provide methodological flexibility from the perspective of the student's comprehensive education. However, for the materialization of these integrative pedagogical practices, Frigotto *et al* point out some difficulties, such as:

(i) the imposing way in which it is presented; (ii) the conservative mentality of current pedagogical standards, as well as political positions that are averse to the discourse of integrated training and emancipatory education based on criticism of market society; (iii) conceptual ignorance; (iv) the lack of material conditions; (v) the lack of management and democratic participation in the institutions; (vi) the difficulty of involving temporary teachers, with precarious working relationships and commitment to the institutions (Frigotto et al., 2014, p.16).

Araújo and Frigotto point out that the implementation of integrated education requires reflection on the possibilities of pedagogical practices, curriculum selection and organization, depending on the curricular unit(s), profile and level of education of the students. In addition

to the specific purpose of the pedagogical work, as well as the commitment of the teacher and management to this perception of education. Thus,

it is a condition for the development of integrative pedagogical practices that the subjects of teaching, above all, and learning reveal a transformative human attitude, which materializes in their political commitment to the workers and the workers' society, not least because educational practices are not constituted in the school, nor do they have implications that are contained in it (Araújo; Frigotto, 2015, p. 64).

Sobrinho (2017, p 129) presents some actions that make curricular integration possible, such as: "the provision of complementary activities, Integrating Projects, the constitution of study and inclusion centers, research, extension, technical visits; in short, Integrated Professional Practices that consider the dimensions of science, technology, culture and work". Moura, on the other hand, suggests "field classes, project development, prototype construction, scientific initiation" as integrating activities, as long as they are defined collectively considering the local reality and characteristics and guided by the relationship between work and society, science, nature and culture (Moura, 2012, p. 14).

Machado (2006) proposes curricular integration through temporal approximations, content mergers, shared studies and research, joint promotion of seminars and events, implementation of project-based teaching methods and generating themes.

The "integration of local knowledge and practices with global social practices" is indicated by Araújo and Frigotto (2015, p.66) in and for integrative practice, with a view to promoting integrated training, autonomy and social emancipation. In order to implement integrated teaching, the principles of contextualization, interdisciplinarity and commitment to social transformation must be observed. The teacher plays a decisive role in establishing the appropriate pedagogical strategy, procedure or methodology for integrated teaching.

## THE INTEGRATIVE CURRICULUM: A FEATURE OF THE IFMS PROPOSAL

The Federal Institute of Mato Grosso do Sul (IFMS), in compliance with the legal provisions and the philosophical and theoretical-methodological precepts of the EPT, links the courses offered to the

an understanding of education as praxis, constituted in the field of discourse and socio-political action carried out within the scope of socio- historical-cultural relations, which aims to train critical-reflective, ethical citizens, endowed with technical-scientific competence and who are protagonists in the constitution of a society based on humanistic values" (IFMS, 2018, p.49).

With a view to the integral formation of the student, the pedagogical activities of the EPT, and especially of Integrated High School (EMI), are planned based on the tripod and the inseparability of teaching, research and extension, in order to provide students with "the construction of new knowledge to understand and transform reality" (IFMS, 2018, p. 58).

The integral education proposed by the institution involves the active participation of students and teachers in the process of constructing learning, through the interaction between education and social practice, between theory and practice and valuing the historicity of subjects and knowledge. It aims to "implement an interdisciplinary curriculum, in order to expand cooperation between areas and redesign new curricular practices, seeking not only omnilateral and integral training, but also in order to align school learning with the current demands of society" (IFMS, 2018, p. 53).

Among the possibilities for curricular integration, the IFMS proposes "participation in complementary activities, artistic-cultural, scientific-technological or sporting events, optional/ elective curricular units, teaching and extension projects, scientific initiation and professional practice activities". Participation in these activities enables experiences "in which the scientific, social, organizational, economic, political, cultural, environmental, aesthetic and ethical foundations that underpin integral, omnilateral education are expressed" (IFMS, 2019, p. 53).

Thus, this curricular proposal articulates general and specific training units and provides for the integration of theoretical and practical knowledge, “aiming to prepare citizens to act in the world of work, through the development of a scientific, critical and innovative spirit” (IFMS, 2018, p. 58).

The curricular structure of integrated high school courses is made up of curricular units: general training, as provided for in the National Curriculum Guidelines; technical training, necessary for the professional profile; and the diversified part, which relates the two cores and “comprises scientific, social, organizational, economic, political, cultural, environmental, aesthetic and ethical foundations that underpin integral, omnilateral training” (IFMS, 2019, p. 18). In order to make curricular integration effective, the IFMS Aquaculture Pedagogical Course Project (Projeto Pedagógico do Curso - PPC) “proposes diversified teaching methodologies, compatible with the student’s daily life, enabling questioning of the practices carried out”, which can be “dialogued lectures, practical classes in the laboratory, directed studies, group work, research, seminars, lectures and debates, technical visits, case studies, dramatizations, integrated panels, mock juries, and others deemed pertinent” (IFMS, 2019, p. 67).

The PPC emphasizes that the objectives of diversified methodologies are to “foster a global vision of the content studied, with a view to understanding reality and finding technological solutions to the problems studied”, as well as “understanding the multiple relationships that man establishes in society, his relationship with technology and the role it can play in production processes, environmental preservation and the transformation of society” (IFMS, 2019, p. 68).

However, the implementation of “an integrated curriculum goes beyond individual desires, as it resizes old discourses, breaks paradigms and conceptions rooted in the various (dis/in) formations” (Bresolin et al., 2016, p.37). This perspective “requires changes in the teacher’s attitude and this cannot be imposed, since it starts from a formative, conceptual or experiential change, stemming from their desire to carry out differentiated work” (Bresolin et al., 2016, p. 48).

In order to contribute to the continuing education and practice of teachers and the EMI, the Study Group in Professional Education for the Development and Application of Integrating Activities (Grupo de Estudos em Educação Profissional - GruPEPT) seeks to develop and apply Integrating Activities in the EMI courses at the IFMS Coxim *campus*. It is, therefore, an action by and for permanent teacher training and the integrated training of the institute’s students.

## **ENVIRONMENTAL KNOWLEDGE AND THE APPROACH OF AN INTEGRATING ACTIVITY FOCUSED ON LOCAL REALITY**

Environmental knowledge is defended by Enrique Leff (2000, 2006) with the aim of integrating inter- and transdisciplinary knowledge, with a socio-cultural focus, both to explain the complexity of socio-environmental systems and to problematize the fragmentation of disciplinary knowledge.

Taking the existing environmental crisis as a starting point, Leff proposes a new rationality, through “[...] it is a process of theoretical production and social transformations” that involves relations between institutions, practice and social movements, “affecting the forms of perception, access and enjoyment of natural resources, as well as the quality of life and development styles of populations” (Leff, 2006, p.240).

The [environmental] crisis has provoked questions about contemporary society’s ways of living, being and producing.

the environmental rationality constituted by a set of criteria necessary for the decision-making of social agents, to guide public policies, standardize production and consumption processes and legitimize the actions and behaviors of different actors and social groups to achieve certain definable ends and sustainable development objectives (Leff, 2006, p. 251).



Leff explains that the environment is a sociological category, and that the environmental problem has brought about the need for dialectical integration of inter- and transdisciplinary and cultural knowledge, which has led to the “emergence of new fields of knowledge” and the “interdisciplinary construction of knowledge”. This process transcends the environmental sciences and opens up to ethical and cultural values, including the recovery of traditional knowledge.

With this, environmental rationality is based on a new ethic, with principles based on democratic life, values and cultural identities that are capable of mobilizing and reorganizing society as a whole, in search of the transformation of power structures and effective sustainable development that promotes a new social meaning attributed to nature, understood as “existential meanings, cultural values and differentiated development styles” (Leff, 2000, p. 318). This ratifies the need to reintegrate knowledge about nature and society, taking into account the diversity of cultures and social identities, in order to appropriate environmental knowledge.

The environmental problem, therefore, is of a social nature and goes beyond disciplinary knowledge. It also provokes a transformation in the paradigms of theoretical and practical knowledge, the perspective of an environmental sociology, which integrates environmental knowledge and builds an environmental rationality, with values of ethnic- cultural diversity. In this sense, Environmental Knowledge revalues cultural identities, since it recognizes the identity of each people, as well as their cosmology and traditional knowledge, even as part of their culture.

For Leff (2000) environmental knowledge occurs through the practice of a “dialog of knowledges”, both between the knowledges of scientific disciplines and their research and work methodologies, and between these and “non-scientific”, “subjugated”, “traditional, popular and local” knowledges. This dialogue is necessary for the integration of knowledge from the natural and social sciences in order to understand environmental complexity, with the proposal of configuring the relationship between man and nature.

However, in the face of environmental complexity, for Leff “environmental interdisciplinarity establishes the transformation of established paradigms of knowledge in order to internalize environmental knowledge”, so it is more than the “sum and combination of the paradigms of knowledge that have constructed the disciplinary compartments of universities” (Leff, 2000, p. 318).

Considering these assumptions, in the context of the socio-environmental reality of the region covered by the IFMS/Coxim, the aspects of the reality present in the north of the state of Mato Grosso do Sul (MS), the region where the municipality of Coxim is located, are presented in environmental knowledge as curricular knowledge.

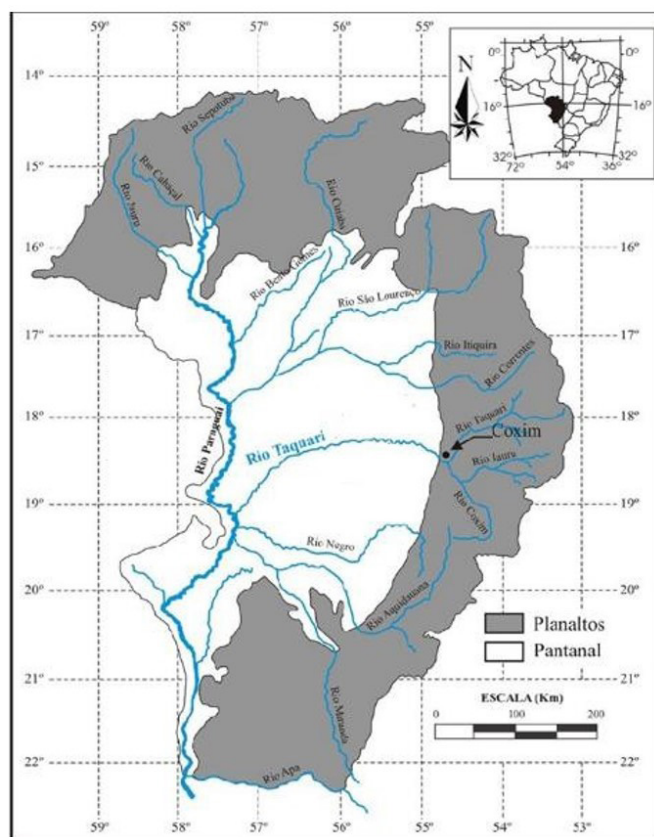
## LOCAL REALITY AND THE CONSTRUCTION OF ENVIRONMENTAL KNOWLEDGE

The Pantanal region in the north of the state of Mato Grosso do Sul, where Coxim city is located, is the context in which the Integrating Activity is to be presented. The local hydrographic condition (Figure 1) makes Coxim the “fish capital”.

The Taquari, Piquiri, Correntes, Jauru and Coxim rivers make up the city's hydrographic network and due to the diversity of fish species, fishing is an important local socio-economic activity, both because of the cultural tradition of fish consumption and because of fishing tourism and professional fishing. According to Catella et al. (2008, p.175), fishing in the Pantanal and throughout the Upper Paraguay river basin is carried out in the following ways, as shown in Table 1.

The city has the Colony of Professional Artisanal Fishermen Z-2 Rondon Pacheco, which was set up in 1967 to protect these workers in terms of fisheries inspection and legislation. Zanchett (2013, p. 15) points out that, at the time of his research, there were “367 men and 193 women regularly enrolled in the colony”, who work in a family economy. Thus, fishing is the main economic activity of approximately 8% of the population of Coxim.

The Taquari River, according to Vieira, Oliveira e Souza (2017), is characterized as a plateau and plain, along its 800-kilometre length, and since its source in the municipality of Alto Taquari (MT) it has suffered from railroads, plantations and urban areas in its surroundings. On the



**Figure 1.** Hydrography of Coxim city. Source: adapted from LEITE, 2021.

**Table 1.** Fishing modality X characterization (Catella et al., 2008, p. 175).

Fishing modality	Characterization
subsistence	"It is intended for self-consumption and fulfills an important social role in guaranteeing low-income riverside populations or those located in isolated regions access to a source of protein."
professional	<p>"is practiced in an artisanal way, as it is based on one fisherman</p> <p>This activity also includes catching live bait, which is sold to amateur fishermen, and catching ornamental fish. This activity also includes catching live bait, which is sold to amateur fishermen, and catching ornamental fish which, despite its high economic potential, is still not very significant in the two states."</p>
Amadora	"The fish is the attraction and not the product of fishing, as it is intended for personal consumption and cannot be sold. The product of this activity is fishing tourism, which includes services such as transportation, food and accommodation purchased by amateur fishermen."

Source: authorship, 2023.

border between Mato Grosso (MT) and Mato Grosso do Sul (MS), it has an unevenness of approximately 500 meters with high erosion power. In addition, due to the characteristics of the river and the geomorphology of the Alto Taquari Basin (Bacia do Alto Taquari - BAT), a large amount of sediment deposited in the river is displaced, in addition to that brought by its tributary, the Coxim River. This siltation dynamic runs for another 150 kilometers towards the Pantanal. This is in addition to the disorganized expansion of agricultural activity in the BAT. This combination of factors contributes to the acceleration of the silting up of the Taquari River, thus highlighting the decline of extractive fishing.

According to data from the 2018 Mato Grosso do Sul Fishing Control System (Sistema de Controle de Pesca de Mato Grosso do Sul - SCPESCA/MS), as shown in [Table 2](#), there was a



significant 55% drop in the amount of fish caught by professional and sport fishing in the BAT of MS between 2002 and 2018.

**Table 2.** Quantity and percentage of fish caught (tons) by professional (estimated catch) and sport fishing in BAT, in 2002 and 2018, SCPESCA/MS.

Year	Fishing (tons)				Total
	Professional	%	Sports	%	
2002	312	45,48	374	54,51	686
2018	100	32,15	211	67,85	311

Source: data from SCPESCA/MS - 25 – 2018. In: ALBUQUERQUE; CAMPOS; CATELLA, 2020

When we compare the data provided in the Research and Development Bulletins, from Brazilian Agricultural Research Corporation (Empresa Brasileira de Pesquisa Agropecuária - Embrapa) Pantanal's Mato Grosso do Sul Fishing Control System for the years 2002 and 2018, at the Coxim inspection site, as shown in Table 3, we can clearly see an 83% decrease in the amount of fish caught in 2002.

**Table 3.** Comparison of fish caught, marketed and caught in 2002 and 2018 at the Coxim inspection site.

Year	fish caught (kg)	fish sold (kg)	estimated catch (kg)
2002	31.229,0	36.272,1	36.307,1
2018	3.442,4	2.636,1	6.078,5
% drop	-89%	-93%	-83%

Source: data from SCPESCA/MS - 25 – 2018. In: ALBUQUERQUE; CAMPOS; CATELLA, 2020.

In view of the above, can fish production in alternative cultures make a socio-economic and environmental contribution to the fishermen and fisherwomen of the Z-2 Rondon Pacheco Professional Artisanal Fishermen's Colony?

### INTEGRATING ACTIVITY FOR THE EMI FROM IFMS/COXIM

Henrique e Nascimento (2015) help us understand what integrative activities or practices are, when they point out that “they are so called because they mobilize integration between subjects, knowledge and institutions. They can take place at different levels and involve a variety of elements, in order to provide the existence of a network of knowledge relationships”. With the aim of “meeting the principle of dialogicity between knowledges, their existence in school education contexts aims to promote a more complete and complex perception of reality and the problems that plague humanity” (Henrique e Nascimento, 2015, p. 68).

The Integrating Activity (IA) presented in this text aims to provide socio-economic and environmental contributions through the interaction between traditional knowledge (fishermen) and scientific knowledge (IFMS teachers and students) through the production of fish in alternative crops for the fishermen of the Z-2 Rondon Pacheco Professional Artisanal Fishermen's Colony, Coxim/MS.

To this end, Kovalski, Obara and Figueiredo (2011) consider the knowledge and information accumulated over time by a given community in relation to its practices, its values, its culture, in short, its experiences. This knowledge is neither permanent nor unshakeable, as it is generated, modified and reformulated by the community. For Faria, Almeida Vaz and Kruger (2023, p.

2), the AI is aimed at “training for work, with the participation of different areas of knowledge considering the professional reality of the future worker, encompassing the representations of work, aiming at the training of maieutic workers”. It is based on interdisciplinarity, the dialogue of knowledge and contextualization as principles of pedagogical action.

In order to carry out the AI, we adopted the assumptions of the Culture Circle, proposed by Paulo Freire as a teaching and learning strategy that provides opportunities for dialog and the sharing of experiences through the exercise of listening and speaking, in a dynamic of interactions that leads to reflection, pondering and the perception of the other.

According to Freire, “Culture Circles are precisely that: centers where the people discuss their problems, but also where concrete actions of collective interest are organized and planned” (Freire, 1978, p. 8) (*sic*). He goes on to say that “the important thing is to organize the population to discuss their reality with them in groups, always through practical actions. To analyze local conditions and find solutions to some of their problems” (Freire, 1978, p. 9). In this sense, the Culture Circle is a political-pedagogical activity, of cultural action, which implies the involvement of the population in action projects on their own reality. In this way, they are appropriate for thinking and acting in the face of the seriousness of the socio-environmental situation in Brazil.

Planning and organizing pedagogical stages are essential to ensure that the objectives of an AI are achieved. From this perspective, we are seeking to develop knowledge, values and attitudes to encompass the local reality, in search of environmental knowledge in the existing curricular proposals at the IFMS. The way forward is to develop this socio- environmental AI within the scope of the Integrated Technical Course in Aquaculture.

## INTEGRATED AQUACULTURE COURSE

The Integrated Technical Course in Aquaculture at the Coxim *campus* of the Federal Institute of Mato Grosso do Sul (IFMS) can contribute to alternative fish farming with a view to sustainable development and socio-economic-environmental benefits from the perspective of integrating scientific and traditional knowledge between the academic (students and teachers) and fishing populations of Coxim.

The aim of this course is to fully train the Aquaculture Technician to work in activities involving the rational use and exploitation of aquatic resources and monitoring the quality of water and ecosystems. With respect for environmental, social, technological and legal changes; responses to the demands of the world of work, products and production processes; and the possibility of verticalization of studies in Higher Education.

The Pantanal region, especially the Taquari River, has been suffering extreme environmental degradation, visibly observed in its silting up. This also has to do with a lack of knowledge about existing natural assets, which requires what Leff calls a “process of social reconstruction through an environmental transformation of knowledge” (Leff, 2004, p. 230).

Thus, the IFMS /Coxim Aquaculture Technician must be able to intervene in this reality, to work “on projects to implement systems for cultivating hydrobiological resources based on the management and quality of products and water, in accordance with local and regional realities” (IFMS, 2019, p.16). With this technical training, a cooperative and associative approach is expected, based on economic, technical and legal viability, which respects environmental protection standards and prevention, hygiene and safety at work, among other skills.

In compliance with the legal provisions, the curricular structure of the Technical Course in Aquaculture has the characteristics of integration between general and technical training; presentation in curricular units of general and specific knowledge of the professional area; development of research and reflection in the face of social and regional demands; valorization of research, extension and entrepreneurship for scientific- technological development; and observation of local productive, social and cultural arrangements.

The AI we are presenting looks at the curricular structure of the 5th period (PPC, IFMS, 2019) for the possibility of interdisciplinary actions, specifically between the following curricular units and their respective excerpts from the syllabus, as shown in [Table 4](#).

**Table 4.** Subjects X syllabus (excerpt).

Subjects	Menus (excerpt)
Biology IV	Ecology: basic concepts. Ecological relationships: harmonious and inharmonious. Ecological succession. Biogeochemical cycles. Pollution.
Alternative crops	Social, economic and environmental importance of species of aquatic organisms that can be used as a viable alternative to aquaculture and/or species considered to be emerging. Production of the main species of alternative and/or emerging aquatic organisms of economic interest.
History III	Environment and ecology.
Mathematics V	Plane Geometry. Area of circular regions. Spatial Geometry.
Fish farming I	Fish farming in public waters. Rearing fish in net pens. Details of the structures used in the net-tank system.

Source: IFMS (2019).

The aim of this Integrating Activity is to provide an opportunity, through interaction between the fishermen's traditional knowledge and scientific knowledge, by means of IFMS teachers and students, for the production of fish in alternative crops for those enrolled in the Z-2 Rondon Pacheco Professional Artisanal Fishermen's Colony, Coxim/MS, from a socio-economic-environmental perspective.

As a methodological procedure for teaching and researching AI, we organized the Culture Circle (CC):

1. Participatory planning of the AI: meeting of the participating teachers to select the content to be covered in the activity; intended objectives; didactic resources required; time needed for each teacher/subject;
2. Preparing for the field: research and preliminary reconnaissance visit to the Rondon Pacheco Fishermen's Colony in Coxim; definition of the subjects participating in the Culture Circle - students, teachers and fishermen from the Colony; definition of the Culture Circle itinerary; definition of the CC conductors: the cultural animator (who proposes the chosen subject, encourages debate and discussion, linking popular knowledge to scientific knowledge; the mediator, who ensures everyone's participation and interaction; and the CC rapporteur, who records the speeches, expressions, conflicts, interactions, whatever is relevant); and drawing up the field notebook;
3. Field research: Culture Circle for reflection and data collection;
4. Production on the field: systematization of all the information obtained for the collective production of knowledge;
5. Preparation and presentation of an alternative fish production project for fishermen, with reference to the extension project "Raising fish in raised geomembrane tanks" already developed by IFMS/Coxim in the cities of Miranda, Nova Andradina and Ponta Porã/MS.<sup>1</sup>

The descriptive case study is shown to be a qualitative research strategy, since it favors understanding the information found in the field and socio-economic-environmental relations in order to propose a transformative action. Lüdke and André (2018) state that "when we want to study something unique, which has a value in itself, we should choose the case study", because it develops "a natural situation", is rich in descriptive data", has an "open and flexible plan" and focuses on "reality in a complex and contextualized way" (Lüdke; André, 2018, p. 20).

The data collected during the AI with meetings of teachers and students; visits to the Fishermen's Colony; the Culture Circle; and the field notebooks of the students and researchers should be interpreted using the categorical content analysis proposed by Laurence Bardin.

The results of this AI are development of the Integrated Technical Course in Aquaculture at the IFMS Coxim from a perspective of integrating interdisciplinary knowledge; interaction between students, future technicians in Aquaculture, and teachers with fishermen, in the

<sup>1</sup> <https://www.youtube.com/watch?v=2tbSVrHRCMo>

sense of providing an opportunity to get to know the subjects, their knowledge and the socio-economic-environmental challenges facing the local community; school-community integration, in the proximity between popular and scientific knowledge; development of participatory and socio-economic-environmental actions according to the local reality, involving the academic community and the Z-2 Rondon Pacheco Colony of Coxim.

## FINAL CONSIDERATIONS

The final reflections of this study highlight the relevance and complexity of implementing an integrated curriculum in Professional and Technological Education (EPT), especially in the context of High School in the Federal Institutes. The research revealed that Environmental Knowledge, when used as a foundation for curriculum construction, can effectively contribute to the integration of popular and scientific knowledge, general and specific training and school and community knowledge, promoting an integral and human formation of students.

Environmental Knowledge has proved to be strategic as a process of producing a new rationality, where scientific, technical, cultural and socio-environmental knowledge are integrated in order to think and act in favor of a professional and integral education in IFMS high school. The adoption of the Culture Circle as a theoretical-methodological approach, as well as being a pedagogical policy proposal with great potential, proved to be effective for the development of Integrating Activities. This methodology allowed for the composition of interdisciplinary knowledge and the valorization of other relevant knowledge for the school and community context, favoring dialogue between students, teachers and the community, and promoting knowledge of a given local reality. The study suggests that curriculum integration, based on Environmental Knowledge and mediated by participatory methodologies such as the Culture Circle, can be a powerful strategy for achieving EPT objectives by connecting scientific knowledge with local experiences and needs. Therefore, the experience analyzed in this article can serve as a reference for other institutions seeking professional education that is not only technically competent, but also socially relevant and ecologically conscious.

In short, the research contributes to the debate on the integrated curriculum in EPT, pointing the way to an education that goes beyond the mere transmission of content, promoting the development of critical citizens who are committed to the realities and challenges of their communities. The implementation of Environmental Knowledge in the curriculum, through the Culture Circle, offers a promising way to train professionals capable of acting in a conscious and transformative way in their social and environmental realities.

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