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Medicinal plants and their importance for the conservation of biocultural knowledge in primary school students of the Paniquita Indigenous Community (Rivera, Huila, Colombia)

[Plantas medicinales y su importancia para la conservación del conocimiento biocultural en estudiantes de primaria de la Comunidad Indígena Paniquita (Rivera, Huila, Colombia)]

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Abstract: Ethnobotany approached through ethnoeducation allows for the preservation of the cultural heritage of indigenous communities. In this way, the ethnobotanical knowledge of primary school students from the Paniquita Indigenous Community was recognized, regarding the cultural knowledge of medicinal plants and their significance in the conservation of the biocultural heritage. This research had a qualitative, ethnographic approach. The sample consisted of ten students who were part of a focus group, ethnobotanical walks, and participatory workshops with drawings since they stimulate students' creative and dynamic thinking and strengthen interculturality. Twenty-one plants were reported, which are used to relieve sore throats, headaches, and stomach aches, as well as to treat diarrhea and fever, to prevent flu, and as a purgative. All the medicinal plants mentioned grow in the community and are either cultivated or wild, which also shows the students' knowledge of their territory. These findings reflect the importance of ethno-education and ethnobotany at school and how historical reconstruction processes are generated from these settings, where indigenous ancestral knowledge is made visible.

Keywords: Ethnobotany; Intercultural education; Ethnomedicine; Medicinal use; Traditional knowledge

Resumen: La etnobotánica abordada desde la etnoeducación permite mantener el legado cultural de los pueblos originarios. De esta manera, se reconoció el conocimiento etnobotánico de los estudiantes de primaria de la Comunidad Indígena Paniquita, sobre el conocimiento cultural de las plantas medicinales y su importancia para la conservación del patrimonio biocultural. La investigación tuvo un enfoque cualitativo y etnográfico. La muestra estuvo conformada por diez estudiantes que formaron parte de un grupo focal, caminatas etnobotánicas y talleres participativos con dibujos, ya que estimulan el pensamiento creativo y dinámico de los estudiantes y fortalecen la interculturalidad. Se reportaron 21 plantas que se utilizan para aliviar dolores de garganta, cabeza y estómago, así como para tratar la diarrea y la fiebre, para prevenir la gripe y como purgante. Todas las plantas medicinales mencionadas crecen en la comunidad y son cultivadas o silvestres, lo que también demuestra el conocimiento que los estudiantes tienen de su territorio. Estos hallazgos reflejan la importancia de la etnoeducación y la etnobotánica en la escuela y cómo se generan procesos de reconstrucción histórica desde estos escenarios, donde se visibiliza el conocimiento ancestral indígena.

Palabras clave: Etnobotánica; Educación intercultural; Etnomedicina; Uso medicinal; Conocimiento tradicional.

INTRODUCTION

One of the most complex challenges faced by the modern school is the articulation of cultural knowledge with conventional school curricula (Arenas & del Cairo, 2009), where the pedagogical component must break the paradigms established throughout history (Bernate, 2021). Likewise, adjustments to the assessment methods and tools in the educational practices must be developed in compliance with sociocultural factors, which strengthen children's capacities and types of intelligence (Peña-Rodríguez, 2018). Based on the idea mentioned above, it is necessary to articulate educational policies so as to respond to the difficulties that arise from inequalities and social or cultural differences of a historical nature, which are not alien to schools (Beatriz-Melo, 2019). According to the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2009), it is important to investigate the relationship between cultural diversity and biological diversity due to their close ties. Therefore, it is relevant to include interculturality in school environments since this poses a scenario of exchange between Western science and other forms of knowledge. At the same time, it promotes an intercultural dialogue that allows the integration of diverse worldviews in order to eradicate the imaginary that the only valid knowledge is Western scientific knowledge (Uribe-Pérez, 2020).

The intercultural approach constitutes a step towards the construction of plurality and democracy, especially in diverse and multicultural societies such as those in Latin America, in which countries such as Brazil and Chile have shown a more significant number of studies on interculturality. However, the number of publications is still low for other Latin American countries (Paredes & Carcausto, 2022). Thus, conducting studies with an intercultural approach will allow to continue incorporating the cultural heritage of the communities at school (Essomba, 2006). Therefore, contextualized teaching practices must be developed at school, focusing on the dialogue and interlocution between local and foreign knowledges (Uribe-Pérez, 2020). During these dialogues, traditional knowledge should be associated with particular features or characteristics that may or may not be presented synchronously (Olivé, 2009). Furthermore, the interaction of knowledge allows valuing diversity and building and deconstructing some constructs based on different worldviews and the polysemy of meanings (Uribe-Pérez, 2020).

In this sense, rural education should adopt a

position that integrates its knowledges, worldviews, culture and the daily life experiences of its inhabitants, as well as the relationship with other ways of learning, doing and teaching (Arias-Gaviria, 2021). Teaching practices should not focus exclusively on school content since they should recognize local knowledge related to agricultural work, the sense of rootedness, environmental sustainability, and shared history (Arias, 2017). Thus, research should start from the social expectations and then move to the classrooms so as to identify local knowledge and practices in the educational processes that promote interculturality at school (Galván, 2020).

It has been demonstrated that parents are the most important in the transmission of plant knowledge in the early stages of life, as a family tradition (Eyssartier *et al.*, 2008; Soldati *et al.*, 2015), but extrafamilial learning becomes increasingly relevant throughout the cultural life history, for example, when children and adolescents go to school (Lozada *et al.*, 2006; Ladio & Molares, 2013). In this way, the transmission of knowledge is understood as a cultural educational process that is based on active content in various realms of socialization, including family and school (Husain-Talero, 2021).

Research in different educational institutions highlights the importance of incorporating local plant knowledge into school activities (Acosta *et al.*, 2015; Guarnizo-Losada *et al.*, 2022; Calderón *et al.*, 2023). Furthermore, the connection between children and the natural world progresses over time through various natural routines (Giusti *et al.*, 2018; Hand *et al.*, 2020), making necessary to understand the meaning and connection of children with nature and its association with different activities based on their natural environment (Barthel *et al.*, 2018). Hence, the intercultural approach ensures the integration of ethnobotanical practices, fostering in students a more comprehensive knowledge about plants and establishing connections between educational and practical components (Yangin, 2019).

However, there is evidence of a disarticulation between the teaching of science and the traditional knowledge of students, which would make it impossible to bring the learner from the classroom towards constant interaction with the context in which they live (Posos & Yaqueno 2021; Guarnizo-Losada *et al.*, 2022). For this reason, educational institutions should be interested in promoting the richness that interculturality offers in terms of social, cultural and professional development (Vidal *et al.*, 2021). An example of this

is how the knowledge and practice of using medicinal plants are deeply rooted in culture, but with a disconnect between the school and traditional cultures (Cheng & Monroe, 2012). It is not known how children acquire this knowledge and practices or how they are passed down from generation to generation (Nankaya *et al.*, 2019). Furthermore, knowledge about plants should not be mere pieces of information; on the contrary, it should be understood in terms of its richness and complexity, as something continuous that carries experiences from the past to the present (Wyndham, 2010).

Finally, ethnobotanical studies in indigenous school environments are still scarce and even more so in Colombia and the Huila region, where it is necessary to continue recognizing the knowledge built by students from indigenous communities in relation to the knowledge they possess about plants from the cultural and educational standpoint (Guarnizo-Losada *et al.*, 2022). Thus, the present research sought to recognize the knowledge that primary school students from the Mayor community in the Dujos Tamaz town and Páez Del Caguán, Paniquita Indigenous Community have about the cultural knowledge of medicinal plants and their importance for the conservation of the cultural heritage at school. It is important to highlight that the Paniquita Indigenous Community has been a victim of the armed conflict for years, being displaced from their ancestral territory, and enduring multiple challenges, including death (Mondragón-Duarte *et al.*, 2019), which, in turn, has led to a fragmentation of ancestral knowledge and the migration of community members to the peripheral areas of the community. It also highlights the fact that, for the Paniquita Indigenous Community, the territory is sacred; it is the natural setting where the life of the community takes place, and it is there, rather than at school, that children share with other members of their community and acquire knowledge.

MATERIAL AND METHODS

Study area

The present research was developed in the Mayor community in the Dujos Tamaz and Páez Del Caguán, Paniquita Indigenous Community, whose members arrived on November 7, 1989 (Figure No. 1). This community was displaced from Isla del Río Magdalena (Trapichito, Neiva) to the municipality of Rivera (Huila) with approximately 284 families. Nevertheless, over the years, migrations have been generated to La Ulloa (in the Municipality of Rivera) and to El Caguán (in the Municipality of Neiva) (C.

Páez, personal communication).

The Mayor Community is located in the Cordillera Oriental (Eastern Ranges), on the hill called El Dinde (Rivera), north of El Caguan and south of La Ulloa. The area has a warm and humid climate, with altitudes between 500-1,000 m.a.s.l., an average annual temperature between 26-28°C, and an average annual rainfall between 2,000-3,000 mm (Alcaldía de Rivera, 2021), as well as tropical dry forest and pre-montane rainforest in the highest part of the area. The community has an area of 1,010 hectares that have been under a recovery process developed by the inhabitants (C. Páez, personal communication), which according to the Alcaldía de Rivera (2021), can reach 70% of this territory, being fundamental for the natural resources and environment protection.

Ethnobotanical data collection and analysis

The information presented here corresponds to the work developed with elementary school students from the *Centro Etnoeducativo de Paniquita*, which was founded on February 20, 1988, in the Isla del Río Magdalena. After the community's displacement, the school (Figure No. 1) had to reopen in the municipality of Rivera with the help of Eduardo Tovar, who is the only teacher at the school nowadays. The educational model corresponds to *Escuela Nueva* (Ministerio de Educación Nacional, 2010), based on active learning principles, generating opportunities for students to advance at their own pace, with an adaptable curriculum to the socio-cultural characteristics.

The present study involved ten students (six boys and four girls) out of the 12 learners enrolled at school. The participants were in different grades (from kindergarten to fifth grade), and their ages ranged from 5 to 13 years. The participants were selected based on their class attendance and willingness to participate in the project. Permission was obtained from the Authority of the Mayor community, parents, and the teacher in charge (Cano-Contreras *et al.*, 2016). It is essential to highlight that there is only one educational institution within the indigenous territory offers primary education; therefore, after graduating from primary school, the students must enroll in other institutions outside the indigenous territory.

This qualitative and ethnographic study sought to integrate students' knowledge about medicinal plants and their importance for cultural conservation at school. To conduct the study, a mapping workshop was developed (Avila, 2020)

about the culturally important places within the Paniquita Territory. This process was complemented with drawings since they stimulate students' creative and dynamic thinking and strengthen interculturality (Bejarano, 2021). Moreover, drawings enable students to express their emotions and how they see

the things surrounding them (Mosqueira *et al.*, 2021). Subsequently, students were asked to represent through drawings the medicinal plants they deemed relevant due to their uses and cultural importance within the indigenous community.



Figure No. 1
Location of the study area, highlighting the *Centro Etnoeducativo Paniquita*
[Paniquita Ethno-educational Center]

Likewise, to complement the previously generated representations, a focus group was developed (Geilfus, 2002) with the students. This group aimed to enhance the list of medicinal plants and their uses and determine the abundance or scarcity of these species in the territory. Furthermore, the origin of the plants was investigated whether they were wild (species that grow spontaneously in the territory) or cultivated (species that may be within areas employed by the community) (Rosero-Toro *et al.*, 2021). It is necessary to highlight that the methodology was framed on intercultural dialogues (Geilfus, 2002), in which the students transmitted their experiences and perception of the topic being studied. In all the activities developed, the students were the protagonists and played a central role in their learning process through different educational practices that allowed them to participate actively. Hence, we sought to get the students interested in the subject to consolidate their learning based on their

previous experiences and knowledge, making it meaningful.

Based on the above, the information collected was organized and systematized using the ATLAS.ti software so as to know students' perceptions regarding ethnomedical knowledge. On the other hand, specialized taxonomic keys were used for taxonomic identification. The International Plant Names Index (IPNI) and "Catálogo de plantas y líquenes de Colombia" (Catalogue of Plants and Lichens from Colombia) platforms were employed to confirm the current nomenclature of the scientific names. The wild species were collected and deposited in the Herbarium of Surcolombiana University, SURCO. Additionally, tours of the managed environments were carried out to corroborate the species represented through the students' drawings and mentioned in the focus group. The tour was accompanied by the traditional doctors from Paniquita, in order to confirm the identities of

the species.

RESULTS AND DISCUSSION

The students reported 21 plants of medicinal use, which correspond to 17 families, 20 genera and 21 botanical species (Table No. 1). The most representative family by genus and species was Asteraceae (3/3), followed by Myrtaceae (2/2) and Piperaceae (1/2), while 14 families were represented with only one genus and one species (Figure No. 2);

the only genus with two species was *Piper*, the rest presented only one species. The species mentioned, present three growth habits, being 9 trees, 7 herbs and 5 shrubs. In addition, it was found that six species (*Ageratum conyzoides* (L.) L., *Bidens pilosa* L., *Carica papaya* L., *Crescentia cujete* L., *Ocimum campechianum* Mill., *Piper aduncum* L., and *P. peltatum* L.) are categorized as species of Least Concern (Bernal et al., 2019).

Table No 1
Species of medicinal importance for the students of the Paniquita Indigenous Community

Common name	Scientific Name	Usage	Form of use	Plan abundance	Source	N° herbarium***
Albahaca (Basil)	<i>Ocimum campechianum</i> Mill.	Influenza; Healing wounds; COVID-19	Body baths; Infusion	Abundant in the territory	Wild	013943
Amapola (Poppy)	<i>Tagetes</i> sp.	Influenza; COVID-19	In infusion	Abundant in the territory	Cultivated	013940
Anón	<i>Annona squamosa</i> L.	Treating diabetes	In infusion	Scarce in the territory	Cultivated	-
Cadillo	<i>Bidens pilosa</i> L.	Diarrhea; Kidneys	Take the stain that comes out of the bark	Abundant in the territory	Wild	013944
Cilantro (Coriander)	<i>Coriandrum sativum</i> L.	Urine infection	Take as an infusion	Abundant in the territory	Cultivated	-
Coca (Coca)	<i>Erythroxylum coca</i> Lam.	Ritual stress	Dried leaves (rituals); Infusion	Abundant in the territory*	Cultivated	-
Cordoncillo	<i>Piper aduncum</i> L.	Kidneys	Macerated; poultice	Abundant in the territory*	Wild	013939
Eucalipto (Eucalyptus)	<i>Eucalyptus</i> sp.	For cough; Influenza; Cold	Drink water from the bark and infuse the leaves; For the bath, boil the leaves	Scarce in the territory**	Cultivated	-
Gramma	<i>Paspalum</i> sp.	Urinary tract infection	In infusion	Abundant in the territory	Wild	013948

Guayaba (Guava)	<i>Psidium guajava</i> L.	Diarrhea	Juice	Abundant in the territory**	Cultivated	013946
Hierba de chivo (557oa tweed)	<i>Ageratum conyzoides</i> (L.) L.	For hair; Cough; Stomach pain; Diarrhea;	Macerate, take the extract with little boiled water, the whole plant is used	Abundant in the territory	Wild	013942
Hierba mora	<i>Solanum nigrum</i> L.	Stomach pain; Healing wounds	Macerated/take extract with boiled water	Abundant in the territory	Wild	013935
Hoja de rayo	<i>Piper peltatum</i> L.	Headache; Influenza; Menstrual cramps	Poultices on the head, or according to the place of pain; take in infusion with lemon juice	Abundant in the territory*	Wild	013941
Moringa	<i>Moringa oleifera</i> Lam.	Influenza; COVID-19	Take an infusion and make baths with the leaves	Scarce in the territory**	Cultivated	-
Naranja (Orange)	<i>Citrus x sinensis</i> (L.) Osbec	Influenza; Purge	Extract or juice	Abundant in the territory**	Cultivated	-
Papaya	<i>Carica papaya</i> L.	Constipation	Juice; pulp	Abundant in the territory**	Cultivated	-
Pelá	<i>Vachellia farnesiana</i> (L.) Wight & Arn.	Influenza; COVID-19	The bark is taken in infusion	Abundant in the territory	Wild	013928
Sábila (Aloe)	<i>Aloe vera</i> (L.) Burm f.	Influenza; Gastritis; Burns; Hair; Cough	Shake; poultice	Abundant in the territory**	Cultivated	-
Mango	<i>Mangifera indica</i> L.	Digestion	Juice; eat the fruit/ Fresh preference	Abundant in the territory**	Cultivated	-
Totumo	<i>Crescentia cujete</i> L.	Cough; Sore throat; Headache	Take in emulsion, boil the contents of	Scarce in the territory	Wild	-

			the totumo and make syrup			
Violeta (Violet)	<i>Viola odorata</i> L.	Menstrual cramps	Take as an infusion	Scarce in the territory*:**	Wild	013933

* Preference for fresh spaces
 ** It is located near the houses
 ***Entry code to the SURCO herbarium

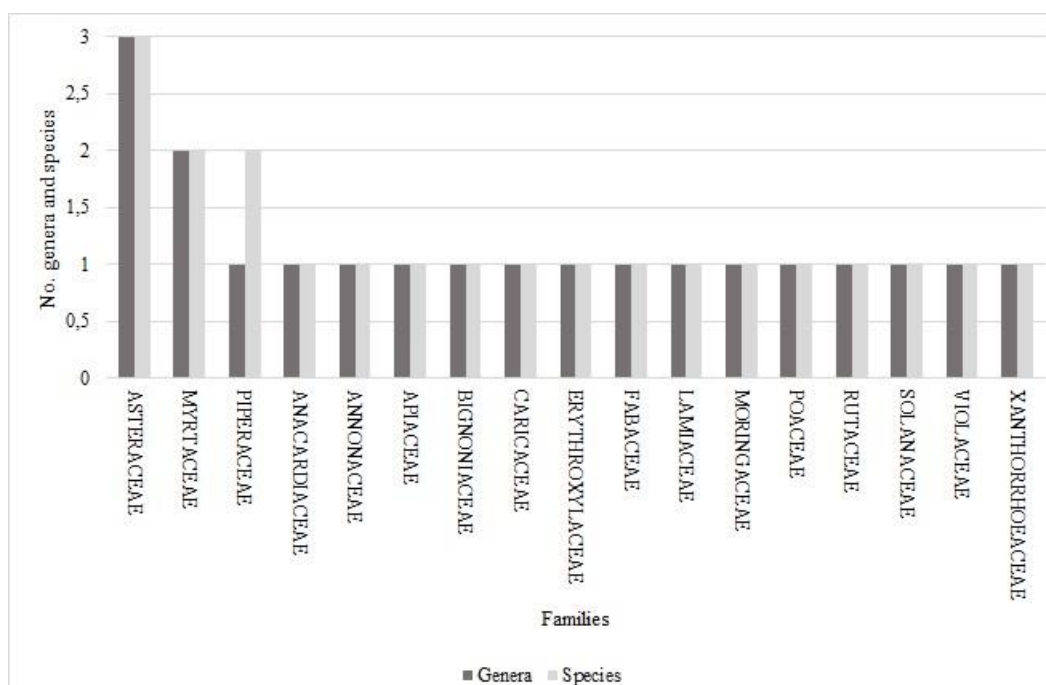


Figure No. 2
 Richness of genera and species of medicinal plants reported by the students of the Paniquita Indigenous Community

Among the uses described, it was found that these plants are employed to relieve headaches, sore throats and stomach aches, remove diarrhea and fever, as well as to prevent the flu and as a purgative (see Table No. 1). The above corresponds to the ailments with the highest frequency of treatment in the child population (Husain-Talero, 2021), coinciding with the fact that medicinal plants are the main source of primary health care in communities (Albuquerque et al., 2015), which may explain the knowledge that students have about the use of these plants. Likewise, it is worth highlighting that the following medicinal species: cadillo (*Bidens Pilosa* L.), cordoncillo (*Piper aduncum* L.), sábila (*Aloe vera* (L.). Burm f.), guayaba (*Psidium guajava* L.)

and naranja (*Citrus x sinensis* (L.) Osbec), were also reported by Guarnizo-Losada et al. (2022), who conducted a study with indigenous students from Cohetando, Paez, Cauca.

In addition, the plants mentioned have multiple uses (Table No. 1), which corresponds to that cited by Rosero-Toro et al. (2021), who described the cultural importance of plants to the diversity of uses. Thus, it was found that of the 21 medicinal plants mentioned, 10 share uses with other categories, five for the fruit category: anón (*Annona squamosa* L.), guayaba, papaya (*Carica papaya* L.), naranja, and mango (*Mangifera indica* L.); two for ritual use: amapola (*Tagetes* sp) and coca (*Erythroxylum coca* Lam.); cilantro (*Coriandrum*

sativum L.) for seasoning; totumo (*Crescentia cujete* L.), which is used for home decoration and to make "cocas" that function as cups; and finally, amapola as a plant used to feed bees. This diversity of uses is related to the importance given by the communities for human survival (Toledo et al., 2009), and to people's perceptions about the availability of the resource in their territory and the culture of each community (Pfeiffer & Butz, 2005).

Through their drawings (Figure No. 3), students also highlighted food plants because of their fruit potential, shade plants for providing freshness to the house and crops, and those plants that could provide food to birds and bees. Considering the above stated, some examples of the students' representations are highlighted: in Figure No. 3A the

representation of the student K. Ninco (Personal communication), who states that "the sapote is sweet, tasty to eat and gives great shade, besides, it serves as food for birds"; in Figure No. 3B, the drawing of a moringa (*Moringa oleifera* Lam.) plant elaborated by student J. Rodríguez (Personal communication) who stated that "moringa is good for removing sore throats, it has helped us a lot, it has cured everyone in the house"; in Figure No. 3C and 3D), naranja and guayaba trees are represented, by students J. Poveda and M. Ninco (Personal communication), who commented that "they are delicious fruits, my mom uses them a lot in juices, and they are beneficial to cure us, the orange we take a lot for the flu and the guava when we have diarrhea".

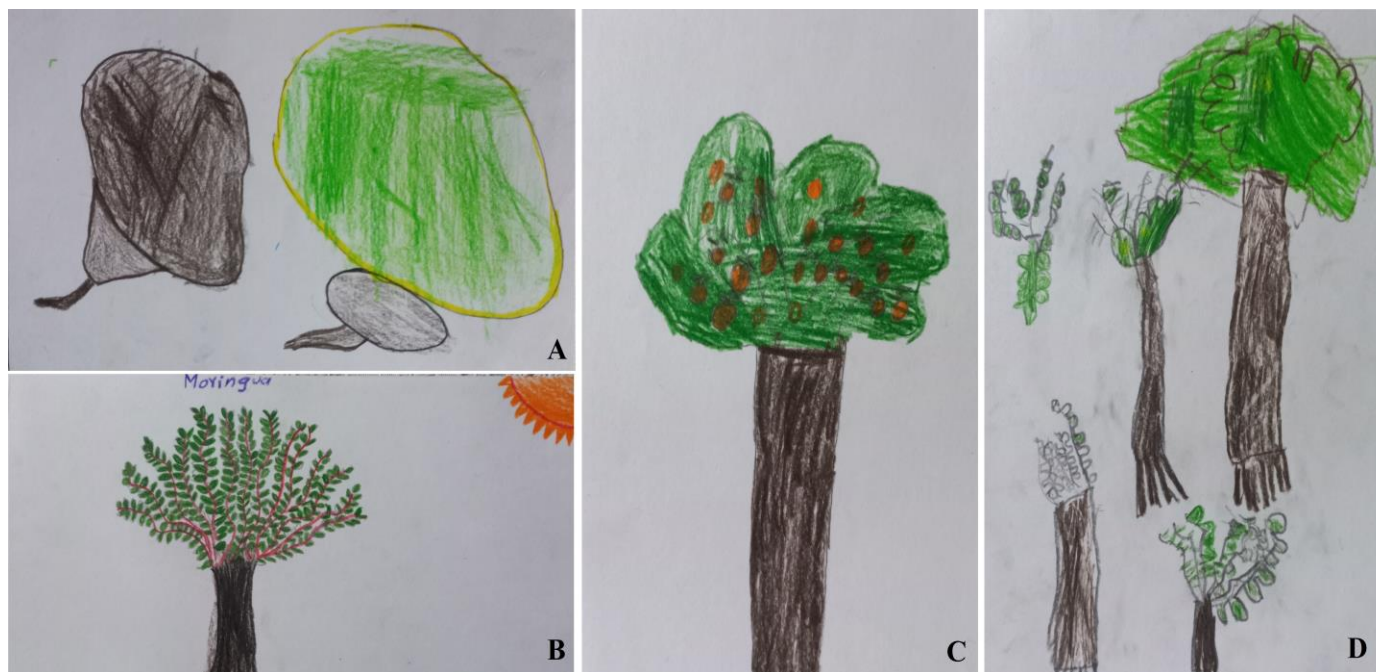


Figure No. 3

Drawings of some of the plants preferred by students. A. Sapote fruit; B. Moringa plant (*Moringa oleifera* Lam.); C. Orange tree (*Citrus x sinensis* (L.) Osbec); D. Orange and guava tree (*Psidium guajava* L.)

Considering the aforementioned idea, it is important to emphasize that it is necessary to generate connections between the traditional knowledge and curricular contents from the school educational processes (Guarnizo-Losada et al., 2022). These processes should be adapted to each particular social group, encouraging the learner to continue recognizing their territory and culture (Bernate, 2021) and generating in the academic community a look

towards cultural appreciation based on inclusive practices and learning environments with social responsibility (Vidal et al., 2021). In this way, nature and culture are recognized from heterogeneous dynamics that are fundamental for preserving traditional knowledge (Cabarcas et al., 2018).

Thus, all of the students stated that they did not know several of the uses of the plants, although they had seen them being used at home. Additionally,

when they began to generate drawings of the plants (Figure No. 3), they started to question how they had learned to use them and where they could find them. For instance, one of the students mentioned that after leaving school, she would collect plants and upon reaching home, she would inquire her parents about their knowledge and potential uses. Therefore, during the meetings, engaging in dialogue with the students became crucial to comprehend the cultural value of plants and how the school should facilitate and influence ethnobotanical learning, especially for students from an indigenous community. The dialogue should also involve parents, traditional doctors, and the institution's teachers to ensure that ethno-medical and cultural learning is prioritized within the curriculum design.

In this curriculum development process, it is important to prioritize the relationships and

connections with nature (Canale & Ladio, 2020), as this influences how students enjoy, empathize with, and give meaning to their territory (Cheng & Monroe, 2012). Therefore, through this research experience, it was possible to recognize how students represent their natural surroundings, where nature is the central axis in representing their home, surrounded by mountains and rivers, vibrant colors symbolizing the biodiverse territory (Figure No. 4). Furthermore, the emotions generated during the activity were significant for the students; it led them to narrate how, during their journey from home to school, they could appreciate the saman trees (*Samanea saman* (Jacq.) Merr.), which provide ample shade, and freely play around them. They also highlighted how water traverses their entire sanctuary, underscoring the importance of protecting the forest to ensure this resource year-round.



Figure No. 4

Cartographic representation of the important and sacred places of their culture and Paniquita Territory, made by the participating students

On the other hand, the students stated that the plants are boiled (33%), infused (33%), turned into syrup (29%), or herbal baths (5%). Similar results were reported by Mendoza *et al.* (2021), for the Pijao indigenous community, in which the adults of the community reported infusion (32%), decoction (24%), and aqueous extract (11%) as the primary forms of preparation. On the other hand, concerning the parts of the plant that are used the most, the results show that leaves (33%), followed by seeds and fruits (29%), bark and root (24%), and finally stems (14%) are mainly employed by the community members. These results coincided with previous research studies in which the main parts of the plant used for medicinal purposes are leaves, stems, fruits, roots, and bark (Estrada-Castillón *et al.*, 2012; Estrada-Castillón *et al.*, 2021). Furthermore, it is worth highlighting that the use of leaves has been widely documented (González-Ball *et al.*, 2022), given that they produce higher amounts of active substances such as alkaloids, essences, glycosides, and tannins (Singh & Dhariwal, 2018), which are easy to use and can be available in large quantities (Palheta *et al.*, 2017). These findings also agreed with the ones reported by Mendoza *et al.* (2021), who claimed that the most used parts of the plant in the Pijao indigenous community are leaves (46.7%) and fruits (13.2%).

It should be noted that all the plants mentioned are found in the territory and used fresh at the time of preparation. 52% of the species correspond to cultivated plants (e.g., coca, sábila, and moringa), while 48% correspond to wild species (e.g., albahaca, cordoncillo, and hoja de rayo: *Piper peltatum* L.). In addition, the students schematized and indicated that plants diversify in the territory (see Figure No. 4), stating that several of the species described were around their houses (including gardens and orchards) and in the forest. The above was also highlighted in the study conducted by Rosero-Toro *et al.* (2021), who mentioned that the communities diversify the areas of use, and the use of species can vary according to their origin (cultivated or wild). In addition, it has been reported that there is a significant increase in the number of uses of cultivated species compared to wild species (Guarnizo-Losada *et al.*, 2022).

With the above, the revaluation of the use of medicinal plants, which still remains relevant among students, has been achieved, contributing to the generation of collective awareness about the importance of cultural knowledge (Acosta *et al.*, 2015). This, in turn, promotes both the vertical and

horizontal transmission of traditional practices as part of local identity (Eyssartier *et al.*, 2008), which must be built and preserved across generations, with schools playing an important role in the sustainability of local cultural heritage (Nankaya *et al.*, 2019).

On the other hand, the participating students emphasized that they learned about medicinal plants at home when they saw how their family used them, being knowledge transmitted orally. Learning about plants is a process that begins at a young age and expands day by day, given that this knowledge is transmitted in the family unit and is associated with daily activities and imitation processes that begin at an early age (Simoni & Perea, 2016). However, there is evidence of a concern that traditional knowledge disappears when children enter school, have less time to learn about the traditional uses of plants, and on the contrary, concentrate on studying issues outside the culture (Van 't Klooster *et al.*, 2019).

Based on the above, it was found that there is significant parents' participation in school life; thus, traditional knowledge is related to practical aspects of the student body (Villar, 2010). Additionally, the students expressed that in the community, the "Mayores" (community leaders, elders; recognized for their broad ancestral and spiritual knowledge) are concerned about physical and spiritual health. The traditional doctors come when there is a physical or mental illness or when protection is needed in case of danger.

Greater knowledge about medicinal plants was found among students who are children from the "Mayores" of the community and from those who have a meaningful role within the indigenous community. In this sense, it is observed that from an early age, the students have begun to have leadership within the organizational structure of the community, highlighting that the Cabildo Mayor elects a "Cabildo Escolar" represented by the students, whom they assign roles such as principal and secondary governor, treasurer, secretary, "mayor", and bailiff. The aforementioned potentiates the traditional knowledge of the students, strengthening the culture in the school environment and mobilizing students from leadership and transformation of the spaces in the territory. In addition, the need to continue intergenerational dialogue initiatives to favor the transmission of traditional knowledge is highlighted (Ramet *et al.*, 2018).

Furthermore, the educator and the health, environment, education, and territory committee of the Paniquita indigenous reservation play a meaningful role because they accompany the school

processes to achieve linking the cultural practices of the indigenous community. This accompaniment has been encouraged, given the increase in school dropouts and the migration of community members to the city in recent years. Addressing ancestral traditions from school allows children to learn about their territory and culture by applying school content. Besides, learning about the world around them and their social and cultural environments is essential for biodiversity conservation (Wyndham, 2010).

The pedagogical strategies generated in the Paniquita educational community lead us to reflect upon the importance of ethno-education, framing the current difficulties experienced by the indigenous communities, where there is a constant struggle to defend their ethnic rights, their resources, and their

territory. Hence, from the school, a process of historical reconstruction has to be generated, given that the relationship human being - nature in children is progressive over time, and must be strengthened from experience (Giusti *et al.*, 2018). Therefore, the curricular contents should be oriented and directed in this socio-cultural line that makes visible the ancestral knowledge the community has historically preserved. In this way, education ceases to be understood as a tool that distances from the roots and imposes the norms and values of others to be redirected and framed on the indigenous community's own vision of the world and life, values, traditions, and cultural history (Castillo *et al.*, 2005).

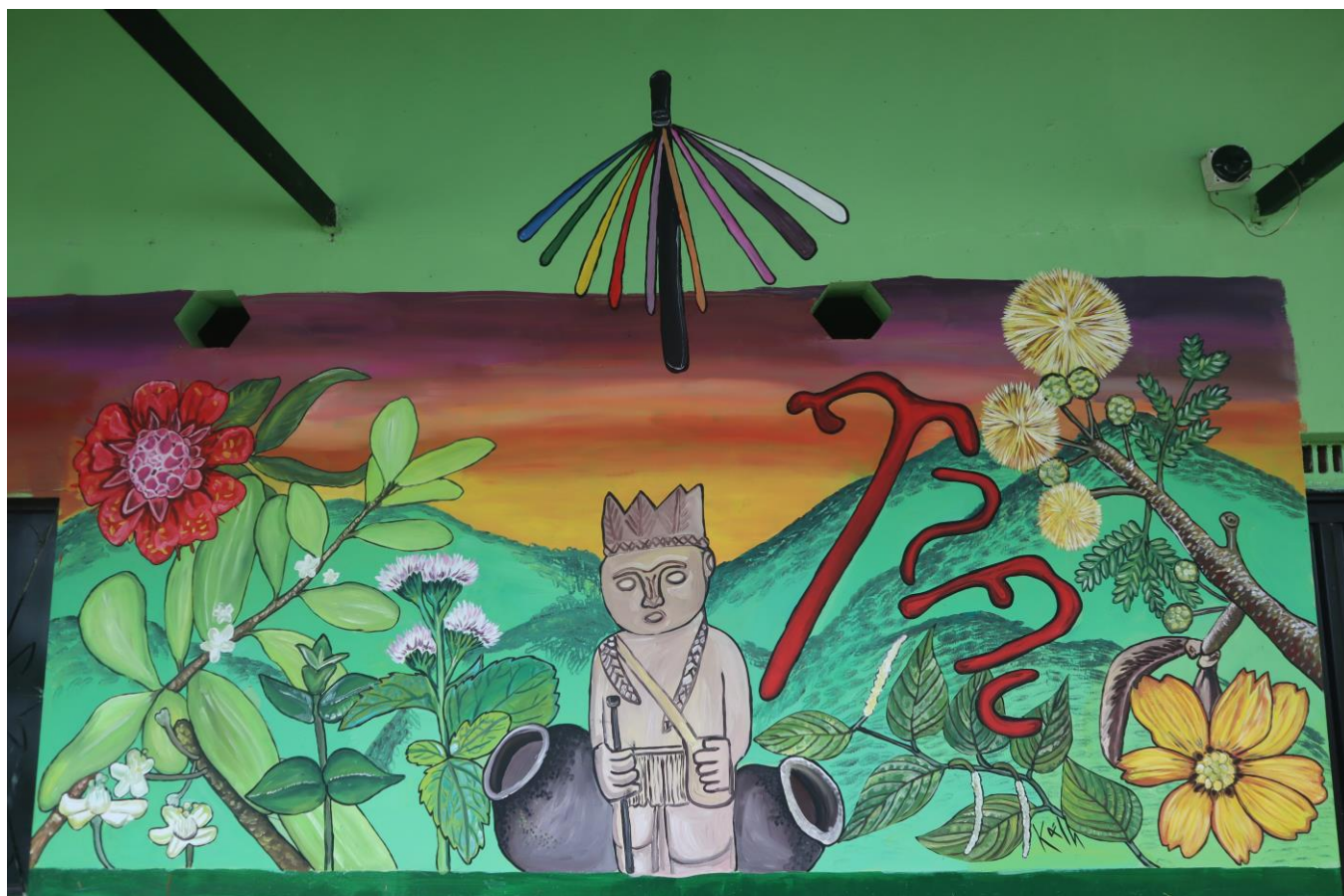


Figure No. 5

Representation of some culturally important plants recognized by students, parents, “Mayores” (elders) of the community and teachers. Mural created by Katherine Trujillo bachelor

From ethnobotany, strategies can be generated to continue transmitting cultural knowledge about plants and strengthening the

students' knowledge thereof based on the different cultural processes. An example of this is shown in Figure No. 5; some of the plants that were described

in the conversations between students, parents, the “Mayores” of the community, and teachers are represented through a mural (Figure No. 5). The species were pelá (*Vachellia farnesiana* (L.) Wight & Arn.), chipaca (*Cosmos sulphureus* Cav.), cordoncillo, hierba de chivo (*Ageratum conyzoides* (L.) L.), coca, roso cruz (*Brownea ariza* Benth.), alegría (*Stellaria* sp). These plants are important for their medicinal and spiritual value, as well as beekeeping, fodder, and firewood flora. The mural was the space to connect the names of the plants, their uses, and the dialogue between participants on the basis of their culture. Also, the mural's location is articulated with the meeting spaces of the indigenous community and is located between the Maloca site where food is cooked and the passage to the school and other essential areas of the community.

From the process of articulation between traditional knowledge and the curriculum, the students approached the observation of the environment, described characteristics of living beings and inert objects, and established similarities and differences between them. Moreover, the flora of the territory was identified and described. The preceding was framed in the competency standards for Natural Sciences for primary education established by the Colombian Ministry of Education (Ministerio de Educación Nacional, 2004).

To achieve the above, we worked with the students from practice, and it was possible to travel the territory from the water sources that supply the homes to the sacred sites. Also, it was possible to work in the orchards, the green areas where the students recognized the plants used in medical and spiritual treatments. In the observation process, they identified the relationships between organisms and the characteristics of the observed organisms. On the other hand, although the number of medicinal species reported by the students was only 21 (Table No. 1), this number may increase as spaces continue to be generated where ancestral knowledge and scientific knowledge are discussed. Additionally, this study serves as a basis for strengthening school ethnobotanical processes. It is crucial to continue the dialogues among family members, teachers, and traditional doctors to shape a curricular design where ancestral contents articulated with scientific contents are addressed. Furthermore, biological and cultural conservation efforts can be generated in schools so as to safeguard traditional knowledge and improve intergenerational dialogue about useful plants (Van't Klooster *et al.*, 2019).

In addition, in a country like Colombia, there

are still challenges in the design and implementation of educational systems for ethnic communities (Anderson & David, 2022). For example, institutional documents such as the PRAE (“Propuestas Ambientales y Educativas”; Environmental and Educational Proposals) and the PEI (“Proyecto Educativo Institucional”; Institutional Educational Project), although they have aspects that recognize plant diversity, show, in turn, a lack of knowledge about the traditional use of plants and the intercultural relationships that students may have. In addition, there is no evidence in the Area Plan of the process of articulation between school scientific knowledge and local knowledge held by the community, or which prevents these two types of knowledge from recognizing and harmonizing with each other (Posos & Yaqueno, 2021).

Finally, several challenges are expected in school environments that strengthen cultural identity and values throughout the student's education, even when they encounter themselves in other scenarios to continue their secondary or university studies. The school keeps the community's customs alive and mobilizes its culture to the curriculum so that cultural and scientific knowledge are valid and in an ongoing dialogue (Beatriz-Melo, 2019). Thus, the goal is to incorporate aspects of the students' culture and expand the knowledge fostered at school with the ancestral knowledge (Siqueira, 2012) so as to generate closer and more articulated relationships between indigenous cultural knowledge and Western knowledge (Guarnizo-Losada *et al.*, 2022).

CONCLUSIONS

The students of the Paniquita Indigenous Community have learned about 21 species of medicinal plants from a family learning process, through observation, experimentation, and knowledge of their territory, a number that is growing as the educational processes are linked to cultural experiences. In this sense, it is understood that the school is not a space for the construction of homogeneous knowledge; conversely, there is a diversity of knowledge, standpoints, and ways of learning, which means that the teacher and students can share knowledge leading to more meaningful learning.

The cultural tradition has been developed orally, which generates new challenges for teachers regarding how pedagogical and didactic strategies can be generated from the curriculum so that there is a connection between what is practiced at home and the contents suggested by the Ministry of Education. Moreover, within the national and local conservation

plans, cultural knowledge should have greater relevance by allowing the generation of participatory and appropriation guidelines that lead to the conservation and preservation of the ecosystem from a position of ethnobiological recognition of the territory. Besides, it is concluded that the students have been developing leadership practices and responsibility in transmitting cultural knowledge and the indigenous identity of the community. The roles within the Cabildo Escolar make it possible to generate a process of empowerment, linking this leadership with cultural knowledge, ultimately leading to intercultural strengthening.

Within the Paniquita indigenous territory there is only one educational centre that goes up to the fifth grade of primary school. Students have to migrate outside the territory in order to continue their secondary education. Several children even begin their schooling outside the territory. In this way, the importance of promoting the importance of the historical legacy of the Paniquita indigenous reservation and the cultural knowledge associated with plants in children from an early age can be concluded. The school becomes the space to build this knowledge together with the “Mayores” (elders), traditional doctors, parents and teachers. Ethno-educational construction is being developed in homes and is accompanied by the school. It is hoped that, in

the future, the consolidation of a curriculum designed to further strengthen the cultural, spiritual and environmental realities of the community will be completed, and that it will overcome the current shortcomings of a traditional curriculum.

Finally, the students recognize species of ethnomedical importance that are related to typical species of the dry ecosystem and also highlight the preference for cultivated species. However, it is important to continue studies that deepen the recognition of the number of wild species, as well as their importance for all the members of the Paniquita Indigenous Community.

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