Mathematical Comprehension Of Cultural Expertise In Crafting Wayúu Mochila

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ABSTRACT

This research highlights the connections between culturally adept Wayúu women and the mathematical understanding intertwined in crafting their traditional Wayúu mochilas within their cultural milieu. Employing an ethnomathematical framework in tandem with qualitative methodologies encompassing ethnographic techniques, we used triangulated analytical frameworks established through semi-structured interviews. The study seeks to demonstrate the capacity to transmit ancestral and mathematical knowledge to younger generations, with the fundamental objective of upholding cultural heritage.

Keywords: mochilas, Wayúu, mathematical knowledge, ancestral knowledge.

INTRODUCTION

Education must equip students with the intellectual and social tools necessary for continuous learning throughout their lives. Delors' (1996) report for UNESCO stresses the importance of transmitting theoretical and technical knowledge adapted to the information and communication age.

¨Education in the twenty-first century presents itself as a global challenge in search of progress and improved educational dynamics. Emphasis is placed on the importance of organized collaboration to achieve educational goals; it is a human process that must be attuned to society" (pg. 95).

This relevance of connecting Education with the sociocultural context focuses on the implementation of emergent mathematical practices in multicultural classrooms, specifically in the context of indigenous Education, using Ethnomathematics as an approach. Ethnomathematics is the arts and techniques of understanding, explaining, and dealing with the social, cultural, and natural environment.

Mathematical practices must integrate local culture, as in the Wayúu community's case, where mathematics is related to the elaboration of Wayúu artisanal mochilas. These Wayúu artisanal mochilas are more than just products; they are cultural expressions that transmit ancestral knowledge and traditions in which women play a crucial role.

However, traditional Education often fails to consider cultural practices and local knowledge, which can lead to learning difficulties, especially in mathematics.

The need for an education adapted to the demands of the 21st century, with a focus on self-management of learning and the integration of cultural practices in teaching mathematics, specifically through Ethnomathematics in the case of the elaboration of Wayúu artisanal mochilas. It focuses on the importance of creating a contextualized educational environment that fosters meaningful and relevant learning.

This paper describes the implicit and explicit school mathematical practices that emerge when constructing the Wayúu artisanal mochilas, the characterization of the process, and the documentation of the same with Sabesoras -A wise woman- who teaches seventh-grade students of an ethno-educational institution.

BACKGROUND

Aroca (2008) focuses on teaching geometry to the Ika indigenous community. Through the elaboration of Arhuacas Wayúu artisanal mochilas, elements of geometric thought

are explored from three perspectives: the development of geometric-symbolic thought when creating the Wayúu artisanal mochilas, the ethnomathematical analysis of the figures woven into the Wayúu artisanal mochilas, and the reflection on the educational contributions of the Ethnomathematics in teaching. On the other hand, López (2015) presents a monograph on the elaboration of Arhuaca Wayúu artisanal mochilas, highlighting the importance of women weavers and the symbology in the process. The study focuses on Education and the promotion of ancestral knowledge. The work of Ávila (2014) shows how the teachers at indigenous schools in Mexico conceive and apply Ethnomathematics in their classes. Also address teacher training from the perspective of Ethnomathematics. Analyzing the relationship between the beliefs and practices of teachers in the classroom and training approaches are proposed.

THEORETICAL FRAMEWORK

Ethnomathematics involves a broad etymological conceptualization that makes it of great importance due to the three semantic components that conform to it, such as the prefix ethno, the mathematical root and teeth, the mathematical root, and the suffix tico. D'Ambrosio (1990) defines the term Ethnomathematics as follows: The prefix [=etno] is an extensive term that refers to the sociocultural culture. Therefore, it includes language jargon, codes of conduct, myths, and symbols. The derivation of [=math]. That is but tends to mean, explain, teach, know, understand, and perform activities such as coding, measuring, classifying, inferring, and modeling, classifying, inferring, and modeling. The suffix tics is derived from [=techné] and has the same root as technique. It has the same root as a technique

D'Ambrosio (1997) argues that Ethnomathematics tends to be mathematics practiced in the diversity of culture practiced in a diversity of cultures and ethnic groups.

Vithal and Skovsmose (1997) refer to mathematics as proceeding from its history, cultural roots, and the cultural roots implicit in the teaching and daily practice of ethnic groups. The teacher who develops Ethnomathematics must have a broad mastery of the subject and various areas of

mathematics, in the subject and in diverse areas that complement the excellent performance of their work to achieve significant learning in the student. It is essential to point out that in the educational context, depending on its application by the teacher, Ethnomathematics can be considered a strategy, a method, or a theory that carries out activities in response to the cultural needs of the social group. For this reason, Ethnomathematics has relationships to different forms of projects, such as classroom projects, such as classroom projects research, among others, in which the methodology and strategies are according to the social and cultural characteristics of the population.

For Bishop (1999), the teaching of mathematics through the implementation of projects allows for the participation of the learner, of projects allows the participation of the learner, in which generates the development of competencies of counting, measuring, locating, designing, playing, and explaining, being useful in their daily lives. Therefore, the application of Ethnomathematics in the students allows teaching individually and collectively, enhancing logical-mathematical thinking through interpreting and explaining events. Therefore, Ethnomathematics is framed in the social and cultural dimension to respond to situations that are presented to the inhabitants of the ethnic groups in their daily life, giving great importance to coexistence, being necessary to train the student in aspects related to cooperation, teamwork, integration, which allows improving their skills in the area of mathematics by creating a bridge of connection with the culture.

Based on the above, Ethnomathematics, from the sociocultural approach to mathematics education, is linked to a research field, which has taken much strength in various national and international This approach offers a broad vision in the processes of teaching and learning mathematics, where mathematical elements can be evidenced in everyday practices to transform them and contextualize them in the daily life contextualize them in the student's daily life. In the same vein, the expert and scholar of mathematical sciences.

D'Ambrosio (1997) defines Ethnomathematics as mathematics practices among identifiable cultural groups, such as national tribal societies, labor groups, children of a specific age range, and children of a particular age group. Groups, children of a specific age range, and professional classes, among others, consider classifying, ordering, inferring, and modeling capacities. Therefore, Villavicencio (2001) interprets the term created by D'Ambrosio that Ethnomathematics tends to be the set of knowledge produced or assimilated by a sociocultural group. Assimilated by an autochthonous sociocultural group: counting, measuring, organizing space and time, designing, estimating, and inferring, in force in their context.

It is vital that for the author, Ethnomathematics for a specific ethnic group are variant and dynamic and are similar from one generation to the next, although it is inevitable that they differ in some aspect due to the recreative function of the next generation. Therefore, we contextualize the above within Bishop's proposal of enculturating mathematics, where the emphasis rests on developing the formal level of enculturation; this intentionality is possible as one encounters real-life mathematical activities.

Although it does not directly allude to Ethnomathematics, it proposes six universal mathematical activities: counting, counting, counting, counting, and mathematical activities. Universal mathematical activities: counting, measuring, locating, designing, playing, and explaining.

The Wayúu artisanal mochilas.

In the indigenous regions of the Wayúu culture, handicrafts play a fundamental role in their cosmovision since many or most inhabitants of the indigenous sector identify with the Wayúu artisanal mochilas that, according to Aristizabal et al. (2016), "is a traditional element or accessory and that in its expression according to the Wayúu culture calls it Susu which means that which walks with one, since it responds to the needs of carrying and transporting objects.

The Wayúu artisanal mochilas elaboration is one of the most significant economic undertakings within the Wayúu nation. Constructing these mochilas is rooted in a cultural practice that emerges through a ritual of confinement during the

stage of Wayúu female puberty, known as Majajüt. In this phase of adolescence, a designated guardian from the maternal lineage, such as the maternal aunt, grandmother, or mother, imparts this knowledge to the girl as she reaches maturity. This expertise, which embodies their experiences and aspirations, becomes ingrained in the collective consciousness of the Wayúu women.

As per Artesanías of Colombia (2003), weaving holds immense symbolic value for the Wayúu, signifying discernment, inventiveness, and intellect. Being proficient in weaving equates to being knowledgeable as a woman. Within Wayúu culture, the skill of weaving commands respect even among men. Refer to Figure 1 for a visual representation of the components of the Wayúu artisanal mochilas.

Figure 1. The parts of the Wayúu artisanal mochilas.

Source: Photograph by Licelis Rojas Vanegas. Own adaptation.

The Weaving Walekerü

Weaving as a creative inspiration responds to the Wayúu's emotions and spiritual reasons. It is essential to mention that, through weaving, they can express ideas and feelings that generate a mythical message and establish a relationship with their ethnicity.

Weaving as a creative inspiration responds to the Wayúu's emotions and spiritual reasons. It is essential to mention that, through weaving, they can express ideas and feelings that generate a mythical message. Likewise, it is a way of establishing a relationship with their ethnicity. According to Vásquez (2011), weaving contemplates a peaceful life, makes it joyful and ritualistic, and, at the same time, it involves explanations as alternative solutions to existence and the mysteries and inexplicable myths that it presents. According to the cultures, the cults of the deities explain the presence of the fabric as a principle of life. In the Wayúu nation, there is a myth called the Walekerü, better known as the weaver spider, for the Wayúu woman it is an essential symbol of the cosmovision since it is a symbol of the Wayúu woman's cosmovision since it is a symbol of the Wayúu woman since the Walekerü is a symbol of the Wayúu woman's cosmovision. The Wayúu artisanal mochilas find their origin in connection with this creature. Figure 2 illustrates the symbolism embedded in the stamping on the Wayúu artisanal mochilas.

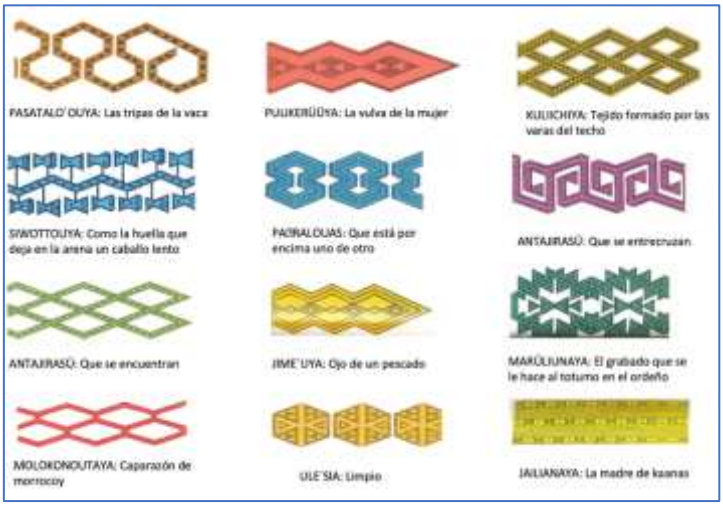

Figure 2. The symbology of the Wayúu artisanal mochilas stamping.

Images sourced from the website (http://www.artesaniasdecolombia.com.co/)

The Wayúu artisanal mochilas Base

The art of weaving this handcrafted accessory begins with the base of the Wayúu artisanal mochilas. We weave its base

in a spiral shape, gradually forming a circle that establishes the size of the mochilas. The base allows for one or multiple colors and can feature designs distinct from those found on the body. This process initiates from the center, where stitches initiate slight movements to shape a small circle. As the circle expands, the stitches create a spiral pattern that aligns with the required diameter and circumference.

The artisan initiates this process by executing the movements mentioned above or stitches. While constructing the bottom or base of the Wayúu artisanal mochilas, they decide whether to employ a double or simple weave. After completion, one evaluates its dimensions by observing, making manual assessments, employing ropes, counting turns, or using measurement units such as meters. By integrating these measurement units, we can determine the size of the Wayúu artisanal mochilas in terms of area and perimeter. Please refer to Figure 3 below for a visual representation of the spiral Wayúu artisanal mochilas base.

Figure 3 The graphical representation of the base of the spiral Wayúu artisanal mochilas.
Source: Own elaboration

METHOD

We approached this work from a qualitative research perspective, which, as Sandín (2003) states, focuses on gaining an in-depth understanding of educational phenomena, the transformation of practices and socio-educational scenarios to decision-making, and the discovery and development of an organized body of knowledge" That within this context, it seeks to generate changes and transformations in the individual and to be more aware,

reasonable and capable of facing their realities. The studied subjects, wise women who teach seventh-grade students of an ethnic-educational institution how to build Wayúu artisanal mochilas, engage in this participatory dynamic. This interaction enables the researcher to establish an intersubjective relationship with the social phenomenon under study. Consequently, the investigative approach differs significantly from quantitative research's objectivist and linear perspectives.

The ethnographic method employed in this study prioritizes immersing oneself in or gaining insight into an ethnic group. Within this context, the concepts of the studied realities take on distinct significance as the group's specific rules, norms, values, ways of life, and sensations come into play. Consequently, these groups require comprehensive observation and study, as each element is interconnected with the rest, deriving its meaning from these relationships.

It is crucial to highlight that the ethnographic method rests on the belief that the traditions, practices, values, and norms within which individuals of an ethnic, cultural, or situational group operate possess a coherent and rational structure. This structure might only sometimes be explicitly articulated, but it becomes evident through various facets of their lives.

RESULTS AND DISCUSSION

The researchers establish contact with the two wise women who initiated the construction of the Wayúu artisanal mochilas. Through an ethnographic observation process, they facilitate a dialogue and conduct a semi-structured interview, as illustrated in Figure 4. Each question highlights the day-to-day process of crafting the Wayúu artisanal mochilas. The roles are designated as follows: the researcher (I) and the wise woman (S), as depicted below:

Researcher (I): How long does completing a Wayúu artisanal mochila take?

Wise Woman (S): Weaving an entire Wayúu artisanal mochila takes two days, as other tasks are around the house.

Researcher (I): What mathematical expertise is necessary for crafting the Wayúu artisanal mochilas?

S: You have to know how to count; the measures we use are the hands to extend it, which gives us the measure of the base or the measure of the arms for the height of the Wayúu artisanal mochilas, for the gauze, also the measure of the arms, for the design you only have to count the stitches with the mix of the threads to give shape with the colors that give life to our expressions.

Figure 4. Each of the questions allows us to put in evidence the day to day of the construction of the Wayúu artisanal mochilas.
Source: Own elaboration

I: How would the Wayúu artisanal mochilas construction facilitate the connection between the teaching of mathematics and the school?

S: Mathematics articulates the everyday life of human beings. Regularly, individuals actively involve themselves in activities closely intertwined with mathematics. As they wake up, rise from bed, and check the time, they inherently engage in a mathematical activity by forming a schematic and operational representation of how they will allocate their time throughout the upcoming hours. When someone visits a store, they are also performing a mathematical activity. Moreover, when individuals find themselves in a natural setting, they observe and interact with mathematical aspects without necessarily recognizing them.

I: How is mathematics used to respond to the cultural needs of the social group of the students you teach?

S: Mathematics as an exact science, one of the excellent strategies that he uses, let us say, to help clear up a particular cultural and scientific enigma is research, as the first strategy,

the development of that daily life leads him to have mathematics as a vital tool and straightforward, many Questions, as second strategies the divulgation that is to say to publish so it is through the orality, through the different means. For example, social networks and magazines are great tools for spreading ideas.

Analysis Categories

Table 1 shows the results of the categories and subcategories identified in the ethnographic process.

Categories	**Subcategories**	**Element Identification**
Mathematical logician	count, measure	Geometry of symbology
Spatial Development	motor ability to knit	anthropomorphic measure
ancient knowledge	practice, ritual	orality

CONCLUSIONS

This study emphasizes the experiences of cultural experts who, through interviews and the triangulation of information during the construction process of the Wayuu artisanal mochilas, illustrate specific mathematical practices reflecting the routine activities of human beings. These practices connect to mathematics and align with daily life. From the Wayúu perspective, specific processes are deemed necessary in their daily activities, incorporating concepts described by Bishop (1986), including counting and spatial measurement. These mathematical elements, essential for life, find application in creating handicrafts.

Characterizing the process of mathematical practices that emerged at the time of the elaboration of the Wayúu artisanal mochilas, we can say that through these processes sought to transmit knowledge, problem-solving, linking it to situations of daily life, things that they practice daily because that allows the student to associate quickly and find what is interesting, that is, not to look at mathematics as something mandatory, but rather something that will be applied, when making the Wayúu artisanal mochilas, which allows

strengthening the practice sociocultural and identity of the region.

About documenting the link between mathematical practices in the process of making the Wayúu artisanal mochilas, the cultural context of the Wayúu is broad and complex, allowing the inclusion of beliefs, customs, arts, and knowledge where the practice of mathematics plays a preponderant and binding role in its elaboration through the inculturation of mathematics, it involves elements or characteristics such as counting, measuring, designing and explaining, which allows the representation of geometric figures, through the fabric in which to express their feelings and emotions through craftsmanship. For the tradition to be maintained, the teacher must implement didactic strategies that provide the ability to link mathematics with the student's school context and with other areas of knowledge and thus develop skills that facilitate the analysis and reflection of emerging mathematical practices.

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