

# Contribution for the Teaching of Natural Sciences: Mapuche and school Knowledge<sup>I</sup>

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## Abstract

Within the context of Mapuche families and communities, this paper focuses on the relationship between knowledge and educational methods in teaching the natural sciences. It aims to identify educational methods that have been forged and re-forged in connection with the social, cultural, political, economic and spiritual development experienced by Mapuche communities. Our educational research methodology is based on a qualitative approach in order to unveil the subjective and inter-subjective dimensions that characterize the subjects' educational knowledge in their life context. Our fieldwork has been carried out from a sample of interviews conducted with Mapuche wise men (*sabios*) living in the Araucanía. The results of the study are divided in four categories: 1) Relationship towards the natural environment; 2) Knowledge regarding living beings; 3) Küyen cycle (phases of the Moon); and finally, 4) Healthy lifestyle. The collected data have allowed us to link different contents (conceptual, practical and attitudinal) underlying the Mapuche educational methods to underline their rationalities with reference to core knowledge. Thus, we want to make a case for an epistemological basis substantiating the teaching of natural sciences in relation to Mapuche knowledge. This will allow us to contextualize natural science teaching within the framework of an intercultural educational approach. By doing so, we aim to establish an intellectual dialogue in a context of interethnic and intercultural relationships.

## Keywords

Mapuche knowledge – Relationships to knowledge – Natural sciences – Intercultural educational approach.

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# **Contribución para la enseñanza de las ciencias naturales: saber mapuche y escolar<sup>I</sup>**

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## **Resumen**

*El artículo tiene por objeto la relación con el saber, asociada a los métodos educativos para la enseñanza sobre la naturaleza en el contexto de familias y comunidades mapuches. El objetivo es aportar en la identificación de métodos educativos que han sido construidos y reconstruidos en relación con el desarrollo social, cultural, político, económico y espiritual, experimentado por las comunidades mapuches. La metodología empleada es la investigación educativa, con un enfoque cualitativo, para favorecer procesos investigativos que buscan develar las dimensiones subjetivas e intersubjetivas del conocimiento educativo que poseen los sujetos en su contexto de vida. El trabajo de campo se ha desarrollado con una muestra de sabios mapuches de La Araucanía. Los resultados del estudio se organizan en cuatro categorías: 1) Relación con el medio natural; 2) Conocimiento de seres vivos; 3) Ciclo del küyen (fases lunares); y 4) Vida saludable. Los datos permiten vincular los contenidos conceptuales, procedimentales y actitudinales que subyacen en los métodos educativos propiamente mapuche, para revelar sus racionalidades, presentes en la relación con el saber. Se aporta una base epistemológica que fundamenta la implementación de una educación sobre la enseñanza de las ciencias naturales articulada con el conocimiento mapuche. Esto permitirá contextualizar el sector de aprendizaje Ciencias Naturales, basado en un enfoque educativo intercultural, para avanzar en la configuración de un diálogo de saberes en contextos de relaciones interétnicas e interculturales.*

## **Palabras clave**

*Conocimiento mapuche – Relación con el saber – Ciencias naturales – Enfoque educativo intercultural.*

**I-** El artículo es resultado de la estadía de especialización en Québec, Universidad Laval, proyecto UCT0804 MECESUP; comunica los resultados del proyecto FONDECYT REGULAR N° 1110677 y 1110489.

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## Introduction

The Mapuche educational methods used in family education have been forged and re-forged with regard to Mapuche social, cultural, political, economic and spiritual development. The relationship to knowledge is unveiled, from an inherent rationality perspective, between a traditional knowledge and the methods used to teach children and young people. The passing down of traditional knowledge has kept present the social, spiritual and natural knowledge embodied in the *kimches*' social memory. As wise men and experts, the *kimches* provide guidance relying on the family and school education (QUILAQUEO, 2012). In this context, we have proposed the hypothesis that current Mapuche education is put in practice taking into account a double educational rationality, which allows its subsistence and adaptation in training children and young people for occupations such as *machi* (female healer), *logko* (chieftain), *werken* (messenger), *gürekafe* (weavers), among others, in both rural and urban contexts.

Historically and from a family education perspective, there have been disagreements between the school system and Mapuche families because such a system is based on *euro-centric views* and also on predominant Spanish usage. Nevertheless, the rationality embedded in Mapuche knowledge is developed in a relationship to knowledge. The central element of that knowledge, which is both objective and subjective, is a social memory resulting from adaptation processes experienced by the family education and expressed by the *kimches* (QUILAQUEO; QUINTRIQUEO, 2010). Consequently, it is assumed that within the communities, there are proper methods that evolve and whose aims are to train people and build their sociocultural identity from a relationship between school and family knowledge. A concrete example of such a relationship is embodied in the Mapuche students' cultural dialogue at school regarding

the school educational practices, and is expressed in the collaboration between Mapuche wise men and teachers. This process allows the school community to proceed with an articulation between cultural and school knowledge and then to contextualize education through an intercultural educational approach (QUINTRIQUEO; TORRES; GUTIÉRREZ; SÁEZ, 2011).

The aim of the present paper is to link the conceptual, procedural and attitudinal contents underlying the proper Mapuche educational methods to underline their rationalities with reference to a core knowledge. Thus, we want to make a case for an epistemological basis substantiating the implementation of an intercultural education approach within a Mapuche context, namely as part of the natural sciences courses.

## Frame of reference

Within a family context, it is worth noting that the Mapuche educational knowledge includes an epistemological basis that considers the *kimches*' and parents' as holders of educational and cultural knowledge. At the same time, such knowledge underlies a rationality that has allowed the Mapuche to subsist with its own cultural identity, whether from an individual, family or community perspective (QUILAQUEO; QUINTRIQUEO; CATRIQUIR; LLANQUINAO, 2004). Within a family education context, young people are taught cultural knowledge associated with myths, legends, oral and ancestral narratives, and also regarding their territorial background (QUINTRIQUEO; MUÑOZ, 2012). Those who cultivate such knowledge are considered *kimches*. They are familiar with the families' social and cultural aspects as well as with the different territorial local groups. Their body of knowledge is called *kuifake zugu* or "social memory" (LATCHAM, 1924; HOUSSE, 1939; NOGGLER, 1972; QUILAQUEO, 2007). From this point of view, the Mapuche educational methods are analysed taking into consideration

the existing relationship between the knowledge (CHARLOT, 1997; BEILLEROT, 1998; QUILAQUEO, 2007) and the double rationality that parents and *kimches* currently teach (QUILAQUEO; QUINTRIQUEO, 2010).

In the area of research, the notion of a relationship towards knowledge offers advantages when identifying the different Mapuche educational methods (QUILAQUEO; 2005). From that perspective, it becomes necessary to take into account the diversity of native knowledge, and how the native peoples value it as a set of principles and sociocultural practices to understand and solve different problems (OLIVÉ; 2009). That is why those principles and practices often acquire an epistemological status. On the basis of a sociocultural perspective, it is understood that each people has its principles, values and ways of living because any local knowledge is acquired in contact with a given reality and is used in specific situations (CASTELLANO; HINESTROZA, 2009). Within the context of native, peasant and popular cultures, a day-to-day knowledge thus allows its members to navigate in their environment and to know what to do and how to do it according to their era and particular circumstances (OSES, 2009; QUINTRIQUEO; TORRES, 2012). Another feature of a local knowledge is its practicality, not in an utilitarian way, but rather as an experience allowing discernment of what action is more appropriate and wiser in certain contextual situations (SCHMELKES, 2006). The native knowledge is transparent. It does not hide itself, but rather is openly transmitted since it is systematic and dynamic. Its capacity to sort out problems is always appropriate to a particular sociocultural context conferring it meaning (OSES, 2009). The local knowledge is logical and has a coherence of its own, even though this logic is more closely related to the values and rules of each sociocultural typology-unlike values and rules that could be considered universal (CASTELLANO; HINESTROZA, 2009).

According to Falavigina and Arcanio (2011), “know” as a verb refers in the first place to a concrete action. In the second place, its use as a noun – “knowledge” – refers to a plural reality and underlies the knowledge that we acquire or aim to acquire. Both authors underline the difference between what is conceived as an object of a specific knowledge and the very fact of knowing as an action. It follows that the relationship established with the knowledge is a notion rather than a concept. For Beillerot (1998), that notion of a relationship with the knowledge is an approximation to a reality that can be used to describe and designate. On the other hand, a concept is built from notions, operates as an interpretation tool and allows a series of verifications to validate or invalidate its accuracy: it is a vague notion whose vicinities and conditions are uncertain (FALAVIGINA; ARCANIO, 2011). This notion can be defined as a subject’s personal inclination towards a form of action involving his knowledge and also his set of relationships through his personal experiences and positioning prior to his opportunities to know. For Falavigina and Arcanio (2011), the relationship with the knowledge involves the history of the subject as well as his defence mechanisms. The latter mobilize his expectations, his outlook on life, his bonds with people, his self-image and the image he shows for others. In this way, the relationship with the knowledge is a practice referring to an individual relationship. That is to say, it is a representation expressing itself in a subject’s conscious or unconscious experience towards the object of knowledge, with all its affective, imaginary and spiritual aspects, particularly in the case of a native community (MOSCONI, 1998; GASCHÉ 2001).

The notion of a relationship to knowledge refers to what can’t be examined outside the subjective realm, thereby recognizing the subject’s importance and his context in the social construction of knowledge. It is a notion requiring an effort to connect and articulate the way we address singular and sociocultural

aspects related to people's subjectivities, as well as the permanent tensions between the subject and the institutions where he evolves (FALAVIGINA; ARCANIO, 2011). In this way, the object "knowledge" is what the subject uses to establish links with what was already present in the social realm as a pre-determined knowledge, acceptable for a family or a community, through its socio-historical formation (CASTORIADIS, 2003).

In the schooling process, the relationship with the knowledge is conceived within the framework of institutions and their corresponding programs. This is where a personal link with the knowledge can emerge from a plurality of institutional influences. In such a process, people have to face different defined and institutionalized objects of knowledge through the kind of relationships they have established with the institutions (BERTHELOT, 1982; BRIAND; CHAPOULIE, 1993; FALAVIGINA; ARCANIO, 2011). For this reason, we can define "institution" as a system of social practices made up by human groups in which exists, as a social construction, a knowledge emerging at a specific moment, through actions with determined purposes, and using specific means (OLIVÉ, 2009). According to Chevallard (1997), social practices are epistemic practices developing and transmitting themselves (and also being applied) when a subject establishes a relationship with a form of knowledge and interacts with one or more institutions. In the Mapuche context, the school is therefore a social and institutional space where students are trained by relating themselves with different sociocultural practices, Mapuche or not, either objectively or subjectively (QUINTRIQUEO, 2010). Viewed in this manner, the relationship with the knowledge – even though it is singular and built in consonance with each individual's history – falls within a family, social, institutional and historical dynamic. It is then an ever-changing process throughout life from what we know or do not know, and also regarding how we position ourselves in relation

with such a knowledge and the fact of knowing or not, allowing us to acquire new knowledge (HATCHUEL, 1999).

In that perspective, the construction of knowledge within a school context cannot be thought of without taking into consideration the cultural and academic capital acquired by the subjects throughout their lives, but namely at three stages: 1) In a stage of "integration", where the student learns a set of sociocultural values and information; 2) In an "objectified" stage, where he learns about and gets to know different sociocultural practices allowing him to relate to objects of knowledge; and 3) In an institutionalized stage, where he acquires a "seal" assuming a form of relationship with the socially and culturally constructed knowledge defining his way of behaving with respect to others, with this stage being evaluated according to rules and values characterizing each practice (BRIAND; CHAPOULIE, 1993; MUTUALE, 2009; OLIVÉ, 2009). So, these three stages of relationship with the knowledge gives us the possibility to reflect on the construction of different relationships with the knowledge, but also in the case of different school and family trajectories, either from an objective or a subjective standpoint.

Within a native context, the intercultural educational approach springs as a pedagogical proposal for which the individual's subjectivity is not considered as an obstacle or as an attack on scientific standards, but rather as a source of knowledge insofar as the social actors' active role in building their own reality is recognized (QUINTRIQUEO; TORRES, 2012; QUINTRIQUEO; GUTIÉRREZ; CONTRERAS, 2012). What is valued here is the subjective and inter-subjective dimensions present in the Mapuche educational knowledge. We are then dealing with an intellectual content allowing a dialogue in the construction of a scientific knowledge arising from a common wisdom in whose weft are hidden the meaning of the social actors' deeds on a day-to-day basis (MUTUALE, 2009). From that perspective, it is vital to consider the

Mapuche educational knowledge from its proper rationality. Nowadays, the concept of rationality within a Mapuche educational context can be related to the notion of constructed knowledge and the social use given to it. In this regard, both the school education and the Mapuche education play a vital role because they enable the Mapuche subject to have access to different rationality codes in a context of a determined sociocultural diversity. In that sense, Habermas considers rational

(...) the individual who interprets his needs in the light of his rules and values learned into his culture; but mostly when he is able to adopt a reflective posture with regard to those rules and values. (HABERMAS, 1987, p. 27).

On the other hand, Giroux (2004) holds that the civic or citizens' education rationality revitalizes itself through the creation of a more decent and just society, that is to say a form of liberation from the burden of its own intellectual and ideological history. That means "(...) developing a new rationality and a new problematic to examine the existing relationship between school and the society" (GIROUX, 2004, p. 216). In the Araucanía, such a new rationality would permit to understand the Mapuche family education and the school education according to their own context, then analysing the complex relationships between the knowledge and the dominant power, and considering such a task posing an epistemological challenge to any intercultural dialogue.

From an epistemological point of view, the knowledge, beliefs, expectations and orientations defining the Mapuche education rationality determine and are determined by the demands and social, educational, economical and political practices raised today. For Gasché (2001, p. 14), such a phenomenon reveals a double rationality present in the native communities' social activities "where a universal logic and a vernacular rationality, related to some beliefs,

coexist". Furthermore, Gasché (2008), noting a syntactic cultural model, emphasizes the existence of a hidden rationality in the beliefs. Such rationality would explain the performance of certain mythical acts and speeches. In the Mapuche case, mythical acts and speeches would also be linked to universal beliefs and ideas that are configured in sociocultural practices. This refers to day-to-day practical activities, either formal or informal, that are related to different symbolic aspects: *günechen*, a Superior Being and universal knowledge of a biological, physical, geographic and territorial nature associated to the concepts of *tuwün*, a kinship territorial system based on the female line; *küpan*, a kinship system based on the male line; and *az mapu*, the characteristics of the physical environment. From the *kimches*' speech, the inherent problem related to educational knowledge rationality and the principles guiding children's and youths' education has allowed them to develop their culture and a kind of relationship towards the families' and communities' natural environment, but also with respect to their social, cultural and spiritual dimensions (QUILAQUEO; QUINTRIQUEO, 2010).

## Methodology

The methodology of the present study is based on a qualitative educational research approach (FLICK, 2004; DENZIN; LINCOLN, 2011). Such an approach makes it possible to explore the knowledge built in the Mapuche families' life contexts, where different social, cultural, symbolic and spiritual elements – considered essential in the training of children and young people – are interwoven (QUILAQUEO; SAN MARTÍN, 2008; QUILAQUEO; QUINTRIQUEO, 2010). In this regard, the paper proposes a research approach positioning first and foremost the subject and its own context due to the necessity to understand and interpret frames of reference characteristic of the Mapuche way of life or the native way of life in general (OLIVÉ, 2009).

The research was carried out in the Araucanía. Situated in the centre-south of the country, it is Chile's Ninth Region. According to the 2012 National Census, 1,714,677 people living in Chile declare themselves belonging to a native group, accounting for 11.11% of the total national population (15,429,759 inhabitants). Of the total of people declaring themselves natives, 84.11% (1,442,214 inhabitants) are part of the Mapuche people. It therefore represents the country's largest native population (*Instituto Nacional de Estadística*, 2013). Moreover, some historical facts regarding the Araucanía allow us to understand that the Mapuche people's development goes back to ancestral times. In this regard, Dillehay makes the following observation concerning Chile's Centre-South region:

(...) during the long Archaic or Pre-Ceramic period, since about 7000 before Christ until about 400-500 after Christ, and during the Formative period or at the beginning of the Ceramic period until about 1000-1300 after Christ, there were small and scattered human settlements, suggesting the presence of mixed economies, relatively egalitarian, made of hunters and gatherers, recent horticulturist tribes and perhaps small agricultural chiefdoms (...) (2002, p. 174).

In other words, the above archaeological evidence highlights thousand years of land use and transformation by the Mapuche people. As examples, one can note the Pitrén (400-1.100 d.C.) and El Vergel (1.000-1.500 d.C.) complexes. According to the report published by the *Comisión de Trabajo Autónomo Mapuche* (COTAM, 2003) it is possible, from the 16<sup>th</sup> century onwards, to identify a Mapuche territory delimited within the actual Chilean borders. This territory stretched itself between the river Limarí in the north and Chiloé's main island in the south, and from the Andes mountain range to the Pacific ocean. In Argentina it stretched between the rivers IV and Diamante in the north and the river Limay in

the south, with its eastern limit being the river Salado in the vicinity of Buenos Aires and the Andes mountain range in the west.

Considering the aforementioned reality, the fieldwork was carried out in territories historically inhabited by Mapuche groups, more specifically in three areas belonging to the Araucanía: *Nagche* (those who live in lowlands), *Wenteche* (those who live in flat plains) and *Lafkenche* (those who live along the Pacific ocean coast). In order to facilitate the access to each area, key agents were involved (namely students writing their dissertation or graduates from the programme of Intercultural Primary Education offered at the *Universidad Católica de Temuco*). Each agent made possible the access to the following municipalities and sectors in the region: 1) Padre Las Casas (sector Xüf-Xüf) and Nueva Imperial (sector Rulo), both municipalities located in the *Wenteche* area; 2) Lumaco (sectors Pantano and Quetrahue), a municipality located in the *Nagche* area; and 3) Saavedra (sectors Ranco, Daullico, Naupe, Dollinco and Collico), a municipality located in the *Lafkenche* area.

The total sample used during the fieldwork is made of 32 *kimches*, the proportion of men and women being equal. The *kimches'* age is heterogeneous and fluctuates between 45 and 85 years old. With regard to their occupations within their families and communities, the following responses were provided: 15 mentioned agriculture, 12 are housewives, 3, as *lonkos*, hold a form of traditional authority, and 2 are weavers.

The data collection tool was the semi-structured interview. It was carried out in Spanish and applied to each participating *kimche* in the framework of that research (CORBETTA, 2003) to identify the educational methods related to the contents based on the Mapuche cultural knowledge. The following steps were then taken to conduct each interview: 1) Carrying out a first meeting with each *kimche* with the assistance of graduates from the programme of Intercultural Primary Education

who have written up their dissertation thesis in the framework of FONDECYT<sup>1</sup> projects and who usually come from such communities; 2) Establishing a date for the interview, considering the person's interest; 3) Presenting the interviewer at each *kimche's* place of residence; 4) Introducing, reviewing and signing the informed consent; 5) Seeking permission to record the conversation; and 6) Carrying out the interview. Each conversation lasted between 40 and 60 minutes; a questionnaire, with guiding questions on the research topic, was then used. Once the interviews were completed, a transcript of each testimony was completed.

The data analysis was conducted by taking into account elements belonging to the grounded theory approach. This is a methodological proposal allowing rigorous and systematic analysis of empirical data, and with the aim to construct new theoretical bodies of knowledge (substantive theory). In this way, we opted for an open coding approach to carry out a first conceptual sorting of the Mapuche wise men's or *kimches'* testimonies and then proceed to the identification of a set of emerging categories as well as their characteristics. These were subsequently eliminated by means of different strategies: axial coding, theoretical sampling, a constant comparative method and what is called "theoretical saturation" (STRAUSS; CORBIN, 2002; TRINIDAD; CARRERO; SORIANO, 2006; FLICK, 2004). That process was based on a qualitative data analysis software, Atlas.ti 5.0, that made it possible to organize and to more easily process the research data. The codification process considered two different steps: the first one underlying a form of data immersion to make the text "talk", and therefore unveil what is implicit in the *kimches'* testimonies; the second one based on comparing categories, empirical content saturation, and the *kimches'* testimonies triangulation by geographical areas. This process was carried out in order to identify

and distinguish each *kimche's* interview. With regard to the transcript and presentation, one nomenclature system was used by the means of a symbol ("K" for *Kimche*), an interview number and an acronym corresponding to the interviewee's place of belonging. It was defined as follows: "X" corresponding to Xüf-Xüf, "R" to Rulo, "S" to Saavedra and "L" to Lumaco. In this respect, each testimony is presented in the text in the following way: (K24R [69:69]), adding between brackets the number given to the hermeneutic unit (HU) created to analyse the data.

## Findings

### Classification categories of the Mapuche educational methods

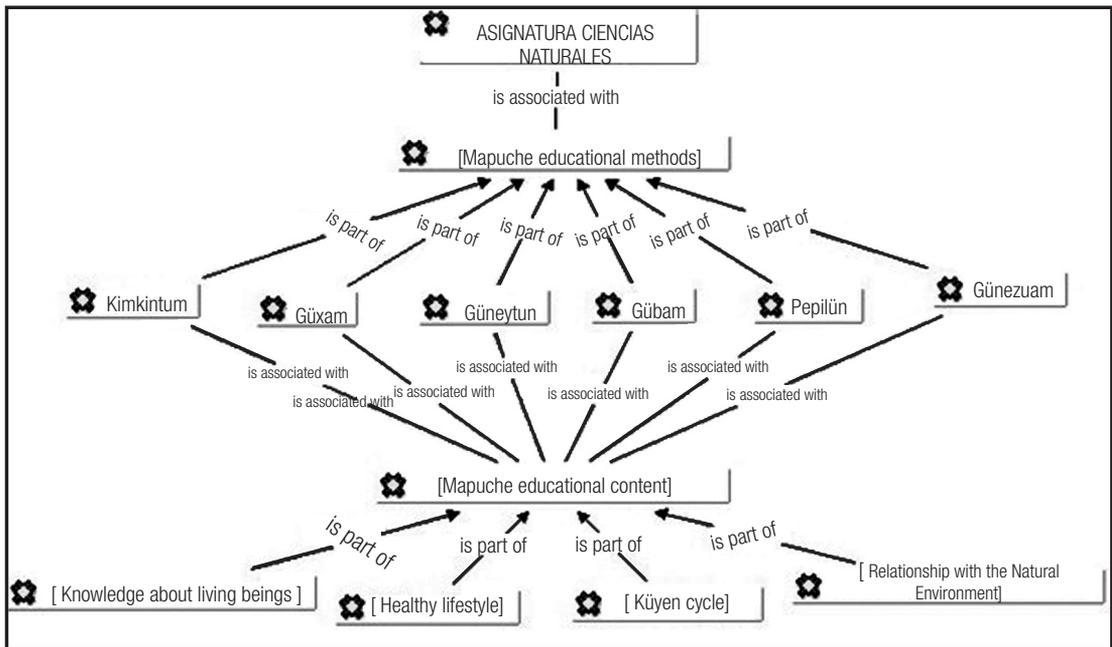
The classification of the Mapuche educational methods was organized and inspired from a core framework defined by the program of Natural Sciences (see the conceptual network No.1). This network aims to clarify the Mapuche educational methods and knowledge concerning the natural environment that could be articulated with the teaching and learning of the content appearing in the following didactic areas: Life Sciences, Earth Sciences and the Universe (CHILE, 2012). In this way, the coding process allowed us to identify one broad category ("Mapuche educational methods") linked to practices, within a family education context, aimed at training people. In this regard, some methods are worth pointing out and show an empirical content saturation: 1) *kimkintun* (related to the "learning by doing" principle); *güxam* (oral practise); *güneytun* (learning by practising); *gübam* (a type of oral lessons or advice); *pepilün* (learning to put into practice and to master a knowledge); and *günezuam* (learning to be self-reflective with respect to a form of knowledge). Each of these methods can be associated to another broad category ("Mapuche educational contents"), encouraging the learning and teaching of the following conceptual framework emerging

<sup>1</sup>- Projects funded by the *Fondo de Desarrollo Científico y Tecnológico* (FONDECYT): "Classification of the Mapuche Educational Methods" and "Mapuche and School Knowledge Epistemology: An Analysis from the Intercultural Pedagogy..."

from the *kimches*' testimonies: 1) Relation With The Natural Environment, which is associated to different processes of complementarity, harmony and respect towards elements of the environment and supernatural forces, with the aim to guide man's relationship with the natural environment; 2) Knowledge About Living Beings, which is associated to the learning process about animals and plants. It is desired, for instance, that children and

young people understand the different aspects related to animal care and herding and also the different plant uses in a family context; 3) *Küyen* Cycle, or moon phases, which is associated to the observation of the *küyen* phases and their relationships to the most appropriate period to sow and to plant and 4) A Healthy Lifestyle, which is associated to Mapuche diet patterns as well as an idea of prevention and personal self care.

**Conceptual Network 1** - Subject: Natural Sciences in relation with Mapuche educational methods



Source: Prepared with the support of the software Atlas.ti

**Relationship with the natural environment**

The respect for nature appears to be an essential aspect of the training given to children and young people. Its aim is to develop an attitude based on a balance and harmony in matters of relationship towards the natural environment. Such a concern is identified in 21.4% of a total of 173 frequencies. It is learned by the means of the *gübam* method and represents a knowledge on which rests a way of life and also ensures

that the individual feels part of the natural environment. In this regard, people have to be aware of the existence of key sociocultural codes in their day-to-day interaction with the natural environment. It has been highlighted that nature, from a Mapuche standpoint, has to be respected “because it is one of the most important things, being what children are firstly taught, whether they are boys or girls” (K13X [22:22]). In the *kimches*' language, the concept of *ekun* is perceived as a form of respect towards the natural environment

[...] to learn how to behave, to prevent accidents and to avoid attitudes damaging the relationship with supernatural forces such as the *gen* or spiritual force protecting the natural environment. (KL3 [41:41]).

Therefore, the respect towards nature encompasses the entire framework of relationships established with the Earth, including animals, plants and water. At the core of the relationship established with the natural environment, we thus find values and practices shaping the contents of the children's and young people's family education.

Within a family education context, asking permission to enter the wilderness is mentioned in 8.1% of interviews. It is associated to the people's relationship with the natural environment and is rooted in the respect towards the different natural elements. In this way, people raised in a Mapuche context learn to establish bounds with the natural environment by means of methods such as the *günezuam*. In this regard, a *kimche* points out:

[...] a child must be taught the value of a plant. For example, if I send a child to remove a cinnamon leaf, I must tell him to ask the plant the permission to do so because it has a *gen* [...]. (K18S [92:92])

In other words, spirituality unfolds as Mapuche knowledge whose aim is to teach respect to the natural environment. For that purpose, the *kimkintun* appears to be a key aspect in the teaching of that knowledge logic because it makes possible a learning process on the basis of a concrete educational action. A female *kimche* points out for instance:

We would go outside with our grandparents so they could teach us the trees and their names, and also what they are for. They would also let us know how and where we could go or not. Or that it was necessary to ask permission. (K21R [23:23]).

Thus, collecting plants or working outdoors in the countryside represents learning experiences for children and young people in order to interact with elements of the natural environment such as water, hills and the *gen*. As a form of reciprocal action of respect in the man's relationship with the natural environment, the foundation of the Mapuche rationality is then based on the *ekuwün*.

The respect towards the supernatural forces is mentioned in 9.2% of interviews. It is linked to the need of instilling in people a balanced and harmonious attitude in order to interact with the supernatural beings living in the natural environment. Within families, that is how methods such as the *güxam* are used to shape a set of *günechen* and *gen* representations. They enable to balance out people's good living, preventing all sorts of risks in the relationship with the natural environment. A female *kimche* from *Xüf-Xüf* recounts what follows:

[...] years ago we had to show respect ... because, when we went to a *menoko* (...), they would tell us there was something, that we had to be careful and to be really respectful, because there was a *gen* protecting the *menoko*. (K11X [16:16]).

From that perspective, it is no wonder why the people responsible for raising, within the families, children and young people, teach them how to behave well in the natural environment, to be careful in their actions, in order to respect those *life-giver spiritual entities*. For instance, the *günechen* is the one in charge of taking care of a wetland area – *menoko* –, a hill or the ocean. According to the Mapuche knowledge, the respect due to the spiritual forces allows the people to establish collective security measures with the aim of avoiding accidents or diseases in places considered risky for children and youths.

### Knowledge about living beings

Animal herding, referring to a set of knowledge applied to family subsistence cattle

raising, appears in 13.3% of the interviews. Herding is based on the value of the domestic animals as they are considered necessary creatures for family life. The teaching of that content is carried out by methods such as the *kimkintun* to encourage practical and contextual learning in the family education. In this respect, a female *kimche* mentions: "...when my granddaughter was younger I used to tell her she would become a midwife. One day there was a ewe that could not give birth. She then rolled up her sleeves and pulled out the lamb unable to be born. That is why those things are important" (K19S [92:92]). Under such a framework, children and young people are exposed to an *in situ* training; they actively participate in animal herding in order to learn and understand their feeding habits, how they breed, how to look after them when they get sick, and also the products they can provide. Learning about the natural vegetation and knowing how to use different plants appears in 12.7% of the interviews. That is to say, methods such as the *pepilün* and the *güxam* are used to develop a form of learning to use, master and distinguish different types of trees, plants and shrubs, as well as their characteristics and usefulness on a day-to-day basis. A female *kimche* elaborates:

[...] people must teach children to take care of the plants and also what purpose they serve; they must learn what are the medicinal plants, their names, the best time to harvest them and how to use them. (K13X [100:100])

The knowledge regarding animals herding is mentioned in 9.2% of interviews and is associated, in the context of domestic farming, to a respectful and caring contact. Just as the husbandry of animals, children and youth can learn by methods like the *kimkintun*. In other words, a person can learn by concrete activities the different functions related to herding, such as: 1) Knowing how to feed animals; 2) Knowing how to assist with deliveries and

being familiar with the reproduction cycles; and 3) Preparing remedies in the case of sickness. What comes before is related to the *gübam*, a series of advice given to maintain a responsible attitude in matters of animals herding. In this regard, a female *kimche* points out: "Before, our elders would give advice to take care of sheep; they would teach us how to take care of animals; that is why we would be pulled out of school because we had to herd the sheep..." (K10X [39:39]). Children and young people are therefore prepared by the senior adults to appropriately care for the animals, since such an activity is considered a fundamental pillar of the family economy.

### *Küyen Cycle*

Knowing the right moment to sow is mentioned in 8.1% of interviews. Such knowledge is linked with the *küyen* phases (the Moon phases) to achieve the sowing of cereals and planting a vegetable garden. Within a family education context, learning those tasks is carried out through methods like the *güneytun*, and is associated with exercises observing the Moon phases. In one *kimche*'s testimony the following aspect is emphasized:

[...] to find out when to sow, I look at the Moon and make sure it is full. For example the people would start sowing in April but now they seem to do it in May [...]. (K11X [88:88])

Observing then represents a key element in the definition of the right time to sow, two phases being identified: the waning Moon and the full Moon. "The value of both phases results from the fact that the plants benefit from better growth (K4L [98:98]). On the contrary, it is not recommended to sow or to plant on a new Moon because it restricts the plants growth. In this sense, children and young people need to learn how to identify the appropriate moon phases in order to sow or to plant crops (K17S [91:91]).

Observing the *küyen* phases is mentioned in 8.1% of interviews. It plays a key role in the identification of the periods associated with the Moon's path and phases and its relationship with different social, cultural, biological and productive processes. Within the families, methods like the *güneytun* and the *güxam* are used so that children and young people learn to distinguish the different Moon phases. A *kimche* is of the opinion that: "Children should learn more about the Moon. In the past, our grandparents would talk about the *we küyen* (new Moon) and now children do not know when is the *we küyen* o waning Moon... The elder people would look at the Moon and they knew when it was possible to pursue a farming activity" (K24R [74:74]). Consequently, the person in charge of teaching must apply and articulate the *güxam* and *güneytun* methods so her pupils can succeed in understanding the changes and events taking place in the natural environment.

### A healthy lifestyle

The Mapuche nutrition habits are mentioned in 9.8% of interviews. They are associated with a healthy lifestyle on the basis of the food produced by the natural environment. Mapuche people strongly believe that the food can help care for people's health. In a family education context, the *güxam* represents a method to teach and to remind children and young people the value of the Mapuche food. In this regard, a *kimche* recalls the following: "my parents would always talk to us; they grew up eating well (...) because at home there were *tükün korü* (a form of soup or stew), *mülxün* (a form of wheat dough)...all those things were natural and children would grow up healthy..." (K26R [22:22]). A Mapuche family's diet was based on products such as the *mürke* (toasted flour), *napor* (yuyo), *pisku* (cereal soup), *mülxün* (wheat dough), *wülo wülo* (new *coligue*) and *tikün* (*locro*) (K6X [12:12]). People would feed themselves with *napor*, an ancient food that is no longer used. "But in former days children

would eat it. Around noon they would get home to eat *napor* and *pisku*. In the morning they would eat toasted flour before going outside to take care of the animals, the sheep and the cows..." (K6X [12:12]). In the *kimches'* testimonies, it is mentioned that past eating habits would encourage the conservation of the children's and young people's health. Such a situation has changed in the present times due to a diet based on products that have brought problems such as diabetes and ulcers among children, teenagers, adults and elder people.

### Discussion and conclusions

In the framework of that research, it appears that the *kimches* are aware of the key sociocultural codes and practices forming the basis of the Mapuche knowledge that guide the relationship between people and the natural environment. In that sense, these codes and practices can be considered as a complex set of knowledge linking the people together with the *learning* and *knowing* process about the meanings given to knowledge products (CHARLOT; BAUTIER; ROCHEX, 1992). Learning in a context of family education refers to the people's experience, to their families' and communities' history with regard to their relationship with the natural environment, their expectations, their backgrounds, their outlooks on life, their relationships with the others, the way they see themselves and the others (CHARLOT, 2007). In the specific case of a knowledge underlying a form of respect towards the natural environment, it also encompasses the people's relationships with a body of knowledge: for example, observing the Moon phases in connection with cultivation and different sociocultural practices including a set of meaningful knowledge for the families and communities. Therefore, the main bodies of knowledge are related to sociocultural practices that allow the construction of values, concepts and ways of doing things, and taking into account the family knowledge associated to

the geography, the territory and some spiritual forces. Those bodies of knowledge shape the contents and the essential educational purposes in order to construct, within a family education context, a sociocultural identity.

Within a family education context, the educational methods are constituted by sociocultural practices guiding the development of practical and contextual learning experiences. What is at stake is to succeed in building concepts that allow them to interpret their reality. Let us look, for example, at the herding of animals. Children and young people experience learning processes associated with bodies of knowledge regarding feeding habits, breeding, delivery, care and products that benefit the family life. Furthermore, and with regard to the knowledge about the natural environment, the educational methods are related to the ability to identify names of plants and animals and to codify elements, events and facts shaping the physical, territorial and geographical space as well as its corresponding ecosystems. We also find the same logic with regard to the periods of cultivation and harvest, for instance, producing medicine for the treatment of local diseases affecting either people or animals, and making an adequate use of the resources given by the natural environment. Consequently, the teaching and learning methods are continuously connected to the empirical observation of different elements (objective, subjective, inter-subjective and spiritual) belonging to the reality as bodies of knowledge associated with sociocultural practices (OLIVÉ, 2009; OSES, 2009; QUILAQUEO; FERNÁNDEZ; QUINTRIQUEO, 2010; FALAVIGINA; ARCANIO, 2011). This can be observed, for instance, in the collecting of plants for different purposes—diet, medicinal, ceremonial and spiritual, either at a family level or a community level. All those practices end up shaping the relationship with the knowledge.

What has just been explained encourages the development of the following aspects in the children's and young people's education:

1) from a conceptual standpoint, they are taught the plants names, how to generate classification criteria according to the origin, use and shape of the plants; 2) from a value-based standpoint, they are taught to respect the natural environment in the process of obtaining and establishing bounds with the spiritual forces protecting the plants and with other elements of the natural environment; and 3) from a practical standpoint, they are taught how to use the plants, mainly their medicinal, food and ceremonial applications. All this methodological teaching processes of various content (conceptual, value-based and practical) is embedded in the respect for the *günechen* and the *gen*. As spiritual forces, they define one key basis of the Mapuche rationality: that is to respect and to be respected in the relationship of use, production and protection established with the natural environment. Thus, the different aspects included in the children's and young people's family education are clearly related to a bedrock knowledge, shaping their attitude and maintaining a balanced and harmonious relationship with the supernatural entities living in the natural environment.

According to Beillerot (1998), one can distinguish, in the relationship with the knowledge, the imitator from the transgressor, and the desire to learn from the desire to know. They are therefore two modalities of establishing bounds with the knowledge figure since the imitator wishes to learn while the transgressor is more interested to know. The apprentice, for example, is a conformist figure in its ways of acquiring bodies of knowledge; for him the knowledge is a determined, closed and already constructed object. On the other hand, being a transgressor underlies the fact of learning apart from—or against—the norms. For such a person, knowing above all is an inquiry.

For the Mapuche knowledge, learning is associated with the following educational methods: 1) *Inatuzugu*, whose meaning is to study, to search and to explore within a knowledge already existing to achieve an understanding

of the processes, phenomena, facts, events, and also to interpret the reality from a proper rationality; 2) *Nampülkan*, which encompasses the rationalization and representation of the idea of travelling in the territory, but is also a way of interpreting the social and individual memory to learn and understand the reality as a product of someone's own experience and resulting from the confrontation with other realities; 3) *Mümülkan*, which is a method to understand processes of knowledge construction with regard to a specific object (natural, artistic and technological), to organize the knowledge itself and to train people; and 4) *Zapilüwün*, a method whose logic is to learn and understand the development of things and people as a cultivation process including interests, contents and purposes. In the Mapuche case, we noted that the methods involving learning based on imitation are the *inatuzugun* and the *zapilüwün*. In other words, they are methods where the apprentice, desirable to learn, relates himself with determined bodies of knowledge. On the other hand, the *nampülkan* and *mümülkan* methods consider the apprentice as a transgressor. In this way, the apprentice breaks away from the mainstream to resort to his own individual and social experience and to interpret the reality in contrast with other realities, which is a way to organize and give meaning.

With the above perspective, we understand that grasping the meaning of the sociocultural relationships is closely tied to the relationship with the knowledge. Therefore, it is worth emphasizing that understanding the relationship with the knowledge in a school education and a Mapuche context (or a native context in general) does not require starting with the definition of a concept. Rather, it starts with the students' questioning, in summary from their own knowledge. Why is it so? Because it is possible to assimilate knowledge when, in the first place, the subjects have questions bringing them closer to their day-to-day realities (FREIRE, 2002). According to Freire, starting with a definition implies that the majority of the students do not understand anything and

that they will not understand anything either. Any definition must be introduced at the end, when the students have already understood. In some opportunities, it is not even the ultimate purpose of the teaching process, due to the necessity to leave open a certain margin to question or challenge the knowledge. That said, it is relevant to offer some sort of answers, but contextualized according to what the students know, according to their experience and sociocultural practices (FREIRE, 2002). One growing problem at school today is to find students who cannot make sense of the learning process and find it disagreeable (MUTUALE, 2009). This finding requires reconsidering the reference frameworks in the school education and assuming the challenge of going beyond the contents centred in an epistemic basis limited to exclusive aspects belonging to the Eurocentric Western knowledge. In chart No.1, different parameters of Western modern science are presented comparatively. As it is explained, essentialism and a positivist perspective dominate the Western modern science. Nevertheless, one has to admit that there are several approaches among the Western knowledge grouped in epistemic constructivism. This certainly needs to be discussed in relation with the knowledge underlying the Mapuche educational methods.

The above chart displays two situations: first, the existing epistemological distance between the school knowledge and the Mapuche educational knowledge; and second, the necessity to propose an epistemological rupture with the Western sciences' dominant knowledge which is synthesized and included in the program of natural sciences. As a consequence, it becomes necessary to define a framework of action including both epistemic matrices in a school context to progress towards a trans-disciplinary form. At stake here is to encourage the inclusion of educational methods shaped by rationalities that do not belong to hegemonic positions and that articulate environmental knowledge. This process will allow to progressively overcome the

**Comparative Chart 1:** parameters of the Western Modern Science vs. Mapuche Educational Methods and Knowledge.

Modern Western science	Knowledge At the core of the Mapuche educational methods
Western Science focuses on achieving the construction of objective and universal knowledge. Diversity is seen as something problematic that needs to be overcome.	The Mapuche knowledge is constructed at a subjective and inter-subjective level where different realities are articulated: personal experiences, knowledge about the past, local life context, spirituality. The diversity is essential for the development of nature and people.
Proceeds to a classification of nature by creating hierarchical categories (living and lifeless beings).	People are taught that there are different elements shaping nature; those elements are connected to forces that can be concrete, spiritual and supernatural.
The subjects are in a position where they control nature, resorting to its intervention or exploitation by means of technology (for instance, the emergence of a form of techno-nature based on biology and evolutionary ecology).	The aim is not to train people in opposition to nature but rather to develop a relationship based on the respect towards the rivers, the hills, the animals, the plants and the forests. Instead of teaching how to control nature, one learns to understand its periods of cooling, growth, blossoming and abundance.
Within a free market capitalist logic, it subordinates nature to different relations of production, exploitation and accumulation of wealth.	People are taught that nature can be used in a balanced way; it is vital to respect the Earth's cyclical periods of rest.
Establishes philosophical, epistemic and methodological differences between what is constructed and naturally existing, between the observer and what is observed.	The subjects are connected to nature and can be either the observer or the observed. (For instance: by working in the nature, in an open space, as a <i>menoko</i> , someone can be observed by a <i>gen</i> ).

Source: Chart inspired by the works of ESCOBAR (2010) and OLÓRTEGUI (2007).

epistemological disregard affecting the native educational knowledge in the school context and to move towards a more symmetrical intercultural dialogue (TUBINO, 2011).

In conclusion, this paper has allowed us to unveil traditional Mapuche cultural practices that are at the same time educational methods. These methods are composed of epistemic content allowing improvement of the school learning in natural sciences by all students, whether or not they are Mapuche. Therefore, it is proposed to promote an intercultural education that would include sociocultural knowledge, that is to say a set of principles and practices used by families and communities, and likely to confer an epistemological status to the Mapuche educational knowledge within the school context. Such a framework will enable making sense of the sociocultural relationships linked to the knowledge in the context of day-to-day activities within the families, in the

natural environment, or at school. Finally, it is worth remembering that the educational research in a Mapuche context allows us to go forward in the construction of a pluralistic and contextual epistemology. The latter helps to understand and explain the different possibilities of validity and legitimacy of the native knowledge in relation with different social processes: construction, transmission, social appropriation and application. This could represent the training basis for students and people at different educational levels: preschool, primary, secondary and higher education. At the same time, it could represent a valuable contribution by means of educational content based, in a school context, on the Mapuche educational rationality, which in turn could improve intercultural educational intervention processes on the basis of social partnership networks among families, schools and communities.

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