

Role of intercultural education in the conservation and sustainable management of natural resources, with emphasis on food systems

Papel de la educación intercultural en la conservación y el manejo sostenible de los recursos naturales, con énfasis en los sistemas alimenticios

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Abstract

In Mexico, and other areas of Latin America, around to 80 % of the country's natural resources (NR) are in the territories, hands, and the minds, of indigenous communities. Most of the research regarding management of NR in indigenous areas, link their culture to the sustainable use of NR. Unfortunately, the culture, which includes sophisticated systems of learning and constructing knowledge, is not taught in conventional schools, much less at university level. In fact, research shows that indigenous people lose confidence in their traditional ways of constructing knowledge and have strong difficulties acquiring the new system taught in schools. Thus, indigenous knowledge that carries out centuries of experimentation is being lost. This paper discusses a model, called intercultural education in Mexico, for higher education. The working definition for intercultural education, coined at the Intercultural Maya University of Quintana Roo (UIMQRoo), is: intercultural education is a process that takes place in a safe environment in which different systems of learning and constructing knowledge coexist, creating new avenues to innovate systems of teaching-learning-and constructing knowledge, using the best



of indigenous and modern systems. Examples from agroecology and education, both academic programs at UIMQRoo, are presented and discussed to illustrate successful results of intercultural education. Access to education and food sovereignty, according to the cultural bases of indigenous people, are important not only from the human rights point of view but also for the social fabric and overall sustainability of a country, especially in a multicultural setting.

Keywords: intercultural education; natural resources conservation; sustainable management; UIMQRoo.

Resumen

En México, como en otras regiones latinoamericanas, cerca del 80 % de los recursos naturales del país se encuentran en los territorios, en las manos y en la mente de las comunidades indígenas. Gran parte de la investigación relacionada con el manejo de los recursos naturales en las áreas indígenas establece una relación entre su cultura y el uso sostenible de los recursos naturales. Desafortunadamente, la cultura, que incluye sofisticados sistemas de aprendizaje y de construcción de conocimiento, no se enseña en las escuelas convencionales, mucho menos en las universidades. De hecho, la investigación muestra que los pueblos indígenas pierden confianza en sus tradicionales modos de construir conocimiento y tienen grandes dificultades en apropiarse del nuevo sistema que se enseña en las escuelas. De esta manera, el conocimiento indígena, que conlleva siglos de experimentación, se está perdiendo. Este artículo discute un modelo, llamado educación intercultural en México, para educación superior. La definición de trabajo para la educación intercultural, acuñada en la Universidad Intercultural Maya de Quintana Roo (UIMQRoo), es: la educación intercultural es un proceso que tiene lugar en un ambiente sano, en el cual diferentes sistemas de aprendizaje y de construcción de conocimiento coexisten, creando nuevas vías para innovar sistemas de enseñanza-aprendizaje y construcción del conocimiento, mediante el uso de los mejores y modernos sistemas indígenas. Ejemplos desde la agroecología y la educación (ambos, programas académicos en la UIMQRoo) se presentan y se discuten para ilustrar resultados exitosos de la educación intercultural. El acceso a la educación y a la soberanía alimentaria, de acuerdo con las bases culturales de los pueblos indígenas, son importantes, no solo desde la perspectiva de los derechos humanos, sino también desde el punto de vista del tejido social y la sostenibilidad de un país, especialmente en un contexto multicultural.

Palabras clave: conservación de los recursos naturales; educación intercultural; manejo sostenible; UIMQRoo.



The role of local culture and knowledge in natural resources management and conservation has been acknowledged in several publications. For instance, the World Bank published in 2007 a research regarding water management in Mexican indigenous areas, demonstrating how important is it to learn from them and to adapt public policies according to their needs and cosmovision (Mejía, Sennhauser, and Wellenstein, 2007). FAO, on the other hand, sponsored research by Barragán Alvarado (2008), which analyzed the status of Latin America protected areas located in indigenous territories. The study confirmed the correlation between biodiversity and cultural diversity: over 400 indigenous communities, representing around 10% of the population in L.A., host almost 80% of the protected areas. This trend is also reported by Cisneros & McBreen (2010) in research supported by the International Union for the Conservation of Nature. A report prepared by a network of indigenous organizations and scientists from different continents, for COP 21, sustains that 20.1% of the captured carbon in the tropics takes place in indigenous territories; in Mesoamerica, the conservative figure is 49.3% (UNFCCC, 2015). The above information should not be a surprise; indigenous people have developed effective strategies for the administration of their natural resources (FMAM, 2008).

Biodiversity is also expressed in agroecosystems. Thrupp (2000) claims that food security is correlated to agrobiodiversity in sustainable food systems. González Jácome (2004, 2009, 2011) demonstrates that indigenous people developed highly sophisticated cultures, and traditional agriculture, which is biodiverse enough, proves it. In the literature, the expression Traditional Ecological Knowledge (TEK) has been used to refer to the body of knowledge, beliefs, traditions, practices, organization, peasant and local communities in interaction with their biophysical environment (Toledo, 2000; Berkes, 2004). Gómez-Baggethun, Corbera, and Reyes-García (2013) have demonstrated the importance of TEK in developing effective strategies to face challenges from global environmental change.

Based on the premise that traditional ecological knowledge plays a significant role in the conservation of natural resources and biodiversity, this contribution claims that TEK is the result of a highly sophisticated system of learning and constructing knowledge (LCK) developed by indigenous communities over centuries. Not understanding those processes, both TEK and LCK, could result, not only in a loss of biodiversity and knowledge for its management but also in the loss of the culture itself. The design and management of highly productive and



biodiverse traditional agroecosystems is an expression of a highly sophisticated system of learning and constructing knowledge that is passed on efficiently from generations to generations, and requires high levels of analysis and synthesis like modern science does.

Education is at the heart of the issues discussed above, and the connection is usually not visible. Thus, several important questions regarding the education that indigenous people are exposed to are raised: How do indigenous people create knowledge? What is the learning process? Does the official school system value and incorporate indigenous ways of learning? If not, what are the alternatives?

These questions will be addressed in this contribution. First, a description of findings of indigenous ways of learning is presented. Then, a description of the intercultural model developed in Quintana Roo, Mexico, is discussed as a viable alternative, including institutional settings and pedagogies.

Indigenous Ways of Learning

Research on indigenous ways of learning has been growing over the last two decades. Not only is there no a unique way of learning for all indigenous groups, but it is dynamic in time and space. However, some aspects of the learning system seem to be present in many indigenous societies. For instance, there are observational skills, incorporation in adult and community activities at a young age, hands-on experience rather than theory, and the creation of a safe environment for children and adults—in which mistakes are tolerated because they are part of the learning process. All these aspects are present in the Mazahua people (central Mexico) (Paradise, 1985, 1994; Paradise and De Haan, 2009, Paradise et al. 2014). Studying the Mayas in Yucatan, and other indigenous groups, Gaskins (1999, 2003) and Gaskins and Paradise (2010) report the same aspects aforementioned. According to Rogoff, Najafi, and Mejía-Arauz (2014), the Guatemalan Maya also have the same elements in their learning system. Those basic principles still are present in indigenous people living in urban settings (Alcalá et al., 2014). According to Price, Kallam, and Love (2009), Native American people in the United States, as well as indigenous people in Peru according to Bolin (2006), also have the same aspects in their learning process.

Based on a large body of literature on indigenous ways of learning, Rogoff (2014) presents a model, which identifies seven facets of the learning process in native cultures. It is called Learning by Observing and Pitching-In (LOPI). The



organization of the facets is only to understand the process; this does not necessarily happen in that order to all communities and all indigenous people.

- Facet 1. LOPI's central feature is the inclusion of children in the endeavors of their families and communities.
- Facet 2. Children's motivation derives from their interest to contribute as valued members of their families and communities, together with other people who are trying to accomplish an activity, who may guide or support children's contributions.
- Facet 3. The social organization of groups involves collaborative engagement as people coordinate fluidly with each other, with anyone taking the initiative as they see a way to contribute.
- Facet 4. The goal of learning is transforming participation to contribute, which includes learning to collaborate with consideration and responsibility, as well as gaining information and skills.
- Facet 5. Learning involves wide, keen attention, and contribution to the endeavor, with guidance from community expectations and, sometimes, also from other people.
- Facet 6. Communication is based on participants' shared, mutual endeavors, and includes nonverbal conversation, as well as verbal means of coordination, in addition to narratives and dramatization.
- Facet 7. Assessment includes the appraisal of how a learner is supported in efforts to contribute, as well as how the learner is progressing in helping, to aid learners' contributions during the endeavor. Feedback to the learner is available from the outcome of their efforts and whether it was accepted as part of the endeavor or corrected or discarded.

Conventional, "Western" Way of Learning

Understanding the indigenous ways of learning, through LOPI, Rogoff (2014) explored and compared it to the system used in most government schools, calling it Assembly-Line Instruction (ALI). ALI is also presented in seven facets:

- Facet 1. The organization of learning is a bureaucratically controlled instruction in a segregated setting.



- Facet 2. The motivation of the learner is to get extrinsic rewards or to avoid threats. The expert's motive is to instruct and sort learners.
- Facet 3. The social organization of endeavors is unilateral. The expert controls learner's pace, attention, and motivation. The expert "transmits" information, divides labor. There is practically no collaboration in the endeavor. The learner does as told.
- Facet 4. The goal of learning appears to be the transmission and receipt of isolated information and skills. The goal is the certificate, which is a prerequisite for inclusion in society.
- Facet 5. Learning is accomplished by means of receiving lessons, exercises, and tests out of context of productive activities.
- Facet 6. The communication is based on a limited range of formats, often explanations out of context. Quiz questions are also used.
- Facet 7. The objective of assessments is to sort and test learners. It gives the impression that it is separate from authentic learning. Feedback comes from extrinsic rewards or threats and ranking.

Based on the description of LOPI and ALI, it is possible to say that both systems are very different, like in opposite directions. This observation does not imply that one system is better than the other, but rather to show the differences that may explain why indigenous people still resist to attend school or to complete their education, as described by Rogoff (2011) and Everton (2016).

In either case, education plays an important role when it comes to natural resources management and conservation. It is through the western schooling that, for instance, Ecology—since the German scientist Ernst Haeckel coined the term in 1866—and Conservation Biology—since Wilcox and Soulé (1980) introduced it in 1978—have provided significant tools in concepts and methods to advance the conservation of natural resources in the world.

There is no need to compare which system is better. Different authors have been calling for a combination of the best of the western system with the indigenous ways of thinking and constructing knowledge (e.g., Berkes, Folke & Gadgil, 1994; Mazzochi, 2006).



The Intercultural Model of Education

Since 2004, a model of intercultural education (IE) has been developed, mainly, but not only, at the university level of education in Mexico. The Intercultural Maya University of Quintana Roo (UIMQRoo), the case discussed in this paper, began academic activities in August 2007. IE is now present in 11 states throughout Mexico, located in areas where there is a high indigenous population (Fig. 1).

The intercultural model at UIMQRoo allowed the interaction of some elements of indigenous and non-indigenous pedagogies combined within the institutional setting. The intercultural model developed in Quintana Roo created *a safe environment in which different systems of learning and constructing knowledge (e.g., scientific and local) coexist, significantly increasing the opportunities for synergies to create new knowledge* (Rosado-May, 2013a, 2013b). The combination of indigenous and non-indigenous pedagogies accounts for high student retention rates, above 80%, the highest graduation rate in the country, 100%, and over 90% of employability of alumni, among other impressive indicators of the success of this system.

UIMQRoo is a public university and has to follow federal and state regulations, which not necessarily are designed for intercultural universities. Over 90% of UIMQRoo's students are of Maya origin; meaning that their ways of learning are different from the western system. Thus, the challenge was the implementation of both institutional settings and innovations in pedagogy that met the requirement of the government and, at the same time, creates better opportunities for indigenous students. The following is a brief description of what I considered some of the most important elements of the system. For more information, see Rosado-May (2012, 2013, 2013a, 2013b, 2015, 2016), Rosado-May & Cuevas Albarrán (2015), Rosado-May & Osorio Vázquez (2014).

Institutional settings. The organization of UIMQRoo and the bylaws were well articulated, complying with the government and providing conditions for indigenous students to develop their potential. The structure was as horizontal as possible, as it is in indigenous communities. The basic unit was the department where, in a participatory, open, and transparent manner, important academic and administrative decisions were made. Each department offered a list of courses from which students of different programs could benefit. This basic unit is different than other organizations in which a school or a division offers courses only



to their students. Besides the governing board, UIMQRoo had a Social Council, where representatives of the Maya communities, and of non-Maya people, discussed and proposed directions that the university had to attend. The idea was to have a system in which UIMQRoo would be as close as possible to the needs of the Maya communities and to avoid building an ivory tower.

The University offered eight undergrad programs: Agroecology, Alternative Tourism, Language and Culture, Community Health, Municipal Governance; Arts, Information and Communication Technology, Business. It also offered one master program: Intercultural Education. All programs were designed to interact with each other under the working definition of intercultural education; thus, conditions were created for achieving economic growth and sustainable development in the region. Our students, therefore, had to work harder than students from other schools because they not only had to learn the same competencies and skills that students from other schools, but at the same time they had to tap into, and deeper, their own language, culture and system of constructing knowledge. It was a lot of work for them, but at the same time, it meant a competitive advantage in the labor market.

Every academic program was designed thinking about the context in which the alumni would be incorporated into labor. Our alumni had working opportunities in their own communities, creating jobs through projects funded by non-government organizations, or elsewhere. In any case, our alumni had four possible areas for work: working in public offices or with a private firm or creating their own, or working with a NOG or creating one, and working in academia. The skills and knowledge that each of these four areas of work demand are different. Thus, a single curriculum for all students of the same program will not fulfill the needs of real life. UIMQRoo offered training and information about what are the expectations of each of those four possible areas of work. Based on that, a flexible curriculum was designed so that students could choose courses according to their needs, regardless the major.

The students needed guidance in order to walk through their four years at UIMQRoo. The usual tutoring system did not work. Instead, based on the system designed by the Mayas to ensure the correct transmission and construction of knowledge, called *iknal*, the conventional tutoring system had major changes. One of the most important innovation in the *iknal* system was the incorporation of the *nool iknal* (elders tutoring students). Each student had to choose an elder



from his/her community who agreed to follow up the performance and behavior of the student in his/her community, like how well he/she knows traditions and the local language, how well he/she respects elders and other members of the community, how eager he/she is to learn and pass on knowledge to new generations, and so forth. The *nool iknal* has the power to intervene in the decision of passing or failing a student by the university. If the student is not performing well, academically speaking, but has a very good behavior in his/her community, the *nool iknal* speaks in his favor, and he/she gets another opportunity to pass. Fig. 2 is a representation of the *iknal* system implemented at UIMQRoo.

Another important component of the institutional setting was the system for recruiting and maintaining personnel, both in administration and faculty. All personnel participated in a contested, open, and in some cases international, process. The evaluation committee was made up not only by well-known, high academic and ethical standards, faculty from UIMQRoo, and other institutions but also by highly respected people from the community, as well as students. The process became very transparent, and often community representatives, usually without formal schooling, or students made the most difficult questions to the participants. A similar committee evaluated the performance of both administration and faculty in order to keep their positions. The system worked very well.

Examples of innovation in pedagogy. By tapping into their own culture and system of constructing knowledge, our students learn quickly how to perform well in teamwork, with individual responsibility, a very valuable skill in today's labor market.

Our students had to take an admission test, called EXANI II in Mexico. Almost all university students in Mexico take it. As expected, the academic performance of most of our students in the EXANI II, under the western thinking of education, was poor. UIMQRoo designed another entrance test, one that detected the motivation to earn a university degree. This was the main criteria for admittance, and it worked because the system had other components. For instance, during a year all students had to take a mandatory workshop on human development and motivation, how to overcome difficult situations and how to re-embrace the greatness of their culture, their way of learning and constructing knowledge (LCK). They re-learned that the main motivation of knowledge was to construct knowledge valuable to their communities; they re-learned that the feeling of belonging, of having a strong identity with their community, was to give back knowledge trough



actions and through sharing that knowledge with the new generations. They also re-built a new social fabric to attend many of their personal and academic needs.

Indigenous students, as described by the authors consulted in the section of indigenous ways of learning, rely mostly on hands-on activities to learn. This is known in the west as induction. In most schools, the training of the teachers/professors, as well as their approach to teaching, is the opposite: it is deduction approach. UIMQRoo faculty was trained to identify the preferred way of learning and constructing knowledge by the students, and based on that, we organized the groups. A rule of thumb, based on at least five years of observations, was that students, who scored below 1100 units in the EXANI, would prefer induction; those scoring above 1100 units would lean towards deduction. Students were grouped initially based on this information, at least for a year, faculty worked with them to make them aware of the different ways of learning, so that team working with students and with faculty became more flexible and opened new spaces for creativity.

Not only did the students have access to *iknal* and to a learning system that took into account their ways of learning and constructing knowledge, but in some programs and courses, they also had a local wise, intellectual man or woman, from the community, working as faculty, shoulder to shoulder with faculty, with a university postgraduate degree. The students had the privilege to learn from the western point of view and the local perspective; no one was more important than the other, even using the local language so that the communication was more effective.

The students, with the help of *iknal*, have been equipped to fulfill the expectation of the working definition of intercultural education developed at UIMQRoo. Each of them is the recipient of different ways of constructing knowledge; each of them has begun the process of constructing new knowledge, intercultural knowledge. Intercultural thinking and results are not utopias. The science of Agroecology is the result of an intercultural process (Rosado-May, 2015). Therefore, there is hope for the future in conserving natural resources, biodiversity, and sustainable food systems.

Closing Thoughts

The experience at UIMQRoo is only one of many that exist in our world. There are other experiences at an institutional level and many more at a micro level, at the level of each professor doing his/her best in finding ways to recognize,



support, and encourage the potential of all students. Our globalized world is demanding a level beyond multiculturalism, is demanding more and more bridges between cultures that can provide a better understanding of each other in order to achieve peace and global sustainability. Our globalized world is demanding innovation and expressions of intercultural relationships. In order to succeed in this task, we must learn and understand how “the others” learn, as well as how they construct and pass on knowledge.

Back in the summer of 1975, when my grandfather saw my hands and said *¿Jach waa jaaj táan a xokik páak'alil?* (Are you sure you are studying agriculture?), he meant to say that my hands did not show evidence of my learning of agriculture; my hands did not have callus because I had no practice. I was not learning through practice, so probably my learning was not strong enough. He was right; I am still amazed at how much traditional farmers know about their crops, their environment, and their social fabric. Their system of learning is effective and efficient, but it is not getting enough acknowledgment much less developed more and passed on to new generations. There is much to learn from them.

The final words from my grandfather that day still resonate with me: *To'on kóol-nalo'one' k'a'ana'an k-oojelo'on ya'abkach ba'alo'ob yo'ok'sal k'áax yéetel kuxtal, ma'u páajtal k-ch'aik tiukul chen éentas* (We, the *milperos*, must know a lot about almost everything: nature, animals, insects, weather, soil. We cannot afford to make bad judgment).

Now I get it, but it took me way too many years.

References

- Alcalá, L., Rogoff, B., Mejía-Arauz, R., Coppens, A. D., y Dexter, A. L. (2014). Children's initiative in contributions to family work in Indigenous-heritage and cosmopolitan communities in Mexico. *Human Development*, 57(2-3), 96-115.
- Barragán Alvarado, L. (2008). *Pueblos indígenas y áreas protegidas en América Latina*. Santiago, Chile: Organización de las Naciones Unidas para la Agricultura y la Alimentación; Red Latinoamericana de Cooperación Técnica en Parques Nacionales, otras Áreas Protegidas, Flora y Fauna Silvestres; y Organismo Autónomo Parques Nacionales del Ministerio de Medio Ambiente y Medio Rural y Marino de España.



- Berkes, F. (2004). *Traditional Ecological Knowledge in perspective*. Pages 1-6 in J.T. Inglis editor. *Traditional Ecological Knowledge: Concepts and Cases*. International Program on Traditional Ecological Knowledge, Ottawa, Canada.
- Berkes, F., Folke, C. & Gadgil, M. (1994). Traditional ecological knowledge, biodiversity, resilience and sustainability. In: C.A. Perrings, K.G. Mäler, C. Folke, C.S. Holling & B. O. Janson (Eds). *Biodiversity conservation. Problems & policies*. Dordrecht. The Netherlands: Kluwer Academic Publishers, pp. 281-299.
- Bolin, I. (2006). *Growing up in a culture of respect: Childrearing in highland Peru*. Austin: University of Texas Press.
- Cisneros, P. & McBreen, J. (2010). *Superposición de territorios indígenas y áreas protegidas en América del Sur*. Resumen ejecutivo. Quito, Ecuador: Unión Internacional para la Conservación de la Naturaleza, Department for International Development.
- Everton, M. (2016). *Los Mayas contemporáneos. Incidencias de viaje y amistad en Yucatan*. José María Morelos, Quintana Roo: Universidad Intercultural Maya de Quintana Roo, Capítulo IV, pp. 224-253.
- FMAM. (2008). *Comunidades indígenas y biodiversidad*. Washington: Fondo para el Medio Ambiente Mundial. Available at: http://beta.thegef.org/sites/default/files/publications/Indigenous-People-Spanish-PDF_0.pdf
- Gaskins, S. (1999). Children's daily lives in a Mayan Village: A case study of culturally constructed roles and activities. In: A. Göncü (Ed.), *Children's engagement in the world*, Cambridge: Cambridge University Press, pp. 25-61.
- Gaskins, S. (2003). From corn to cash: Change and continuity within Mayan families. *Ethos*, 31(2), 248-273.
- Gaskins, S., & Paradise, R. (2010). Learning through observation in daily life. In: D. F. Lancy, J. Bock & S. Gaskins (Eds.). *The anthropology of learning in childhood*. Lanham, MD: Alta Mira Press, pp. 100-140.



- Gómez-Baggethum, E., Corbera, E. & Reyes-García, V. (2013). Traditional ecological knowledge and global environmental change: research findings and policy implications. *Ecology and Society*, 18(4):72. doi: 10.5751/ES-06288-180472
- González Jácome, A. (2004). Ambiente y cultura en la agricultura tradicional de México: casos y perspectivas. *Ciencia Ergo Sum*, Julio-Octubre, 11(2), 153-163.
- González Jácome, A. (2009). El maíz como producto cultural desde los tiempos antiguos. En: C. Morales Valderrama, y C. Rodríguez Lazcano, (Coords.). *Desgranando una mazorca. Orígenes y etnografía de los maíces nativos*. Diario de Campo, Suplemento Número 52, Enero-Febrero, pp 40-67.
- González Jácome, A. (2011). *Historias varias. Un viaje en el tiempo con los agricultores mexicanos*. México: Universidad Iberoamericana.
- Mazzocchi, F. (2006). Western science and traditional knowledge. *EMBO Reports*, 7(5), 463-466.
- Mejía, A., Sennhauser, E. y Wellenstein, A. (2007). *El manejo del agua en territorios indígenas en México*. Washington: Banco Mundial, Departamento de México y Colombia, Región de América Latina y El Caribe.
- Paradise, R. (1985). Un análisis psicosocial de la motivación y participación emocional en un caso de aprendizaje individual. *Revista Latinoamericana de Estudios Educativos*, 15(1), 83-93.
- Paradise, R. (1994). The autonomous behavior of indigenous students in classroom activities. In: A. Álvarez and del Río, P. (Eds.). *Education as cultural construction*. Madrid: Fundación Infancia y Aprendizaje, pp. 89-95.
- Paradise, R., and De Haan, M. (2009). Responsibility and reciprocity: Social organization of Mazahua learning practices. *Anthropology & Education Quarterly*, 40(2), 187-204.
- Paradise, R., and Rogoff, B. (2009). Side by side: Learning through observation and participation. *Ethos*, 37, 102-138.



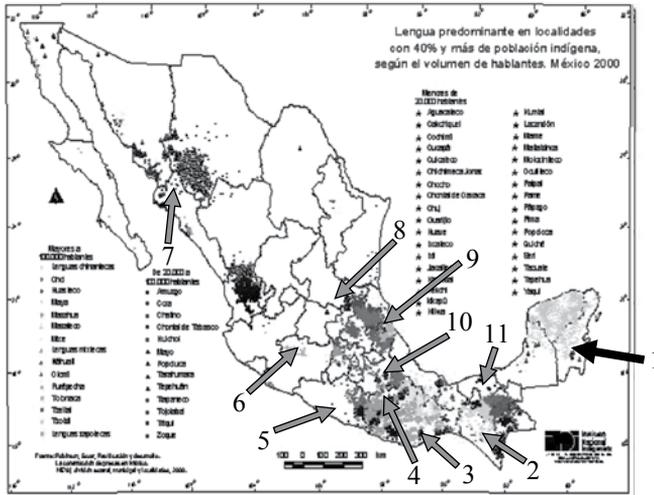
- Paradise, R., Mejía-Arauz, R., Silva, K. G., Dexter, A. L., and Rogoff, B. (2014). One, two, three, eyes on me! Adults attempting control versus guiding in support of initiative. *Human Development*, 57(2-3), 131-149.
- Price, M., Kallam, M., and Love, J. (2009). *The learning styles of Native American students and implications for classroom practice*. Eighth Native American Symposium and Film Festival: Images, Imaginations, and Beyond. Retrieved from: <http://homepages.se.edu/nas/files/2013/03/NAS-2009-Proceedings-M-Price.pdf>
- Rogoff, B. (2011). *Developing Destinies*. Oxford University Press.
- Rogoff, B. (2014). Learning by observing and pitching in to family and community endeavors: An orientation. *Human Development*, 57(2-3), 69-81.
- Rogoff, B., Najafi, B., and Mejía-Arauz, R. (2014). Constellations of cultural practices across generations: Indigenous American heritage and learning by observing and pitching in. *Human Development*, 57(2-3), 82-95.
- Rosado-May, F.J. (2012). Una perspectiva intercultural al concepto de tutoría académica. El caso de la UIMQRoo. En: I. Deance y V. Vázquez Valdés. *Aulas Diversas. Experiencias sobre educación intercultural en América*. Quito: ABYA/YALA Universidad Politécnica Salesiana, Deance-Vázquez y Universidad Intercultural Maya de Quintana Roo, pp. 65-90.
- Rosado-May, F. J. (2013). *Indigenous education. Which way to go? The intercultural model for higher education developed in Mexico*. II International Meeting Canada-Mexico On Indigenous Education, University of Lethbridge, Canada.
- Rosado-May, F.J. (2013a). Experiencias y visión de futuro de la Universidad Intercultural Maya de Quintana Roo. Aportaciones del modelo intercultural a la sociedad. En: A. Wind (Coord). *Experiencias y visiones para el futuro de las Universidades Indígenas en el mundo*. La Paz, Bolivia: Instituto Internacional de Integración- Convenio Andrés Bello, pp.157-172.
- Rosado-May, F.J. (2015). Papel de la visión/percepción en la gobernanza de una Universidad Intercultural: Impacto en la calidad, indicadores y el desarrollo



- institucional. *II Seminario Internacional sobre Educación Intercultural*. José María Morelos: Universidad Intercultural Maya de Quintana Roo, 12-14 de agosto.
- Rosado-May, F.J. (2016). *Educación superior sostenible en Quintana Roo, México. Elementos para la creación de un sistema articulado con la investigación, crecimiento económico y desarrollo*. Chetumal, Quintana Roo, México: Malu Villarreal Editores.
- Rosado-May, F.J. y Cuevas Albarrán, V. (2015). El programa educativo “Ingeniería en Desarrollo Empresarial”. ¿Qué justifica su creación? En: E. Brito Estrella (Coord.) Empresa, *sostenibilidad y desarrollo regional*. José María Morelos: Universidad Intercultural Maya de Quintana Roo, pp. 43-63.
- Rosado-May, F.J. y Osorio Vázquez, M.C. (2014). Construyendo interculturalidad a través de movilidad académica estudiantil. Experiencias UIMQRoo. En: S. Dideu (Coord.). *Los Programas de Educación Superior Indígena en América Latina y en México*. Componentes Tradicionales y Emergentes. Lima: UNESCO, CONALMEX, IESALC, Observatorio Sobre Movilidades Académicas y Científicas, pp. 153-168.
- Thrupp, L.A. (2000). Linking agricultural biodiversity and food security: the valuable role of sustainable agriculture. *International Affairs*, 76 (2), 265-281.
- Toledo, V. M. (2002). Ethnoecology: a conceptual framework for the study of indigenous knowledge of nature. In: STEPP, J. R. et al. (Eds.). *Ethnobiology and biocultural diversity*. Atlanta: International Society of Ethnobiology. pp. 511-522.
- United Nations Framework Convention on Climate Change (UNFCCC). (2015). *Las reservas de carbono forestal tropical en territorios indígenas: un análisis global*. New York: United Nations Framework Convention on Climate Change. Retrieved from: <http://www.burness.com/wp-content/uploads/2015/11/Las-reservas-de-carbono-forestal-en-los-territorios-indigenas.pdf>
- Wilcox, B.A., & Soulé, M.E. (1980). *Conservations biology: an evolutionary-ecological perspective*. Sunderland, Mass: Sinauer Associates.



Anexos



1. Quintana Roo
2. Chiapas
3. Oaxaca (Private)
4. Puebla
5. Guerrero
6. Michoacán
7. Sinaloa
8. San Luis Potosí
9. Veracruz
10. Estado de México
11. Tabasco

- There are 32 states in Mexico
- Color dots represent the different cultures/languages of indigenous population

Fig. 1. Location of intercultural universities in Mexico.

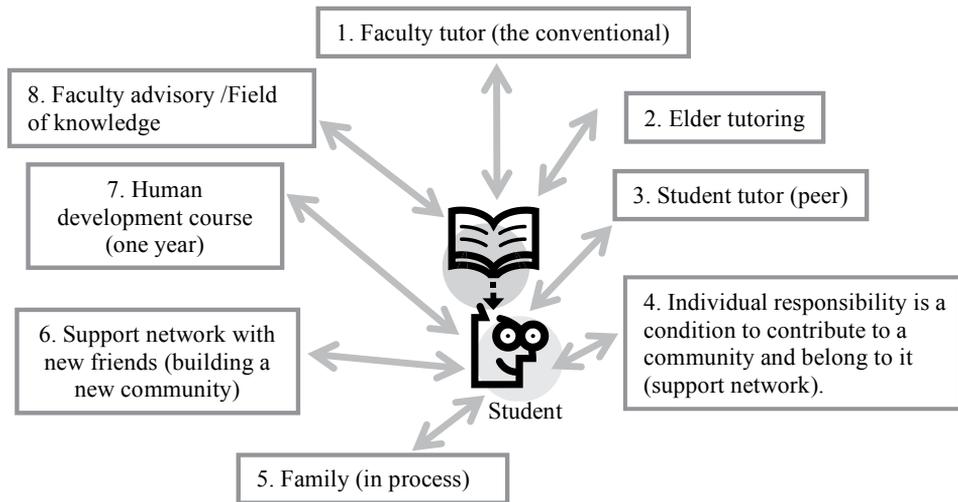


Fig. 2. Iknal is a system implemented at UIMQRoo that provides support to students. It is inspired in the support system that Maya communities provide to their young people for learning, as well as for construction of and sharing knowledge. Iknal is the Yucatec Maya version of LOPI.