An Educatıonal Ethnography of the Development of Complex Thınkıng: Students' Point of View on Theır Self-perception of Achievement

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Abstract: The United Nations 2030 Agenda for Sustainable Development and the Inner Development Goals argue that addressing the world's challenges in the 21st century requires people to develop diverse skills. On the one hand, anyone, regardless of age and educational level, can develop multifaceted, transdisciplinary, and integrated competencies to address these challenges. On the other hand, people must work on skills and qualities relevant to inner growth to contribute to a more sustainable global society. Latin America is one of the regions in the world with the lowest skills indexes. Developing complex thinking competency allows individuals to increase their ability to address problems and challenges in their environment, a necessary skill for any professional. However, little progress has been made in documenting pedagogical implementations that develop disciplinary and transversal competencies, such as complex thinking competency, and students' results in mastering this competency. The present contribution identifies the units of analysis for an educational ethnography focused on recording the complex dynamics of educational systems and the implications of a competency-based educational model and presents students' perceived achievement of complex thinking competency as measured by a validated instrument.

Keywords: Educational Innovation, Higher Education, Professional Education, Complex Thinking, Latin American Educational Ethnography

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Introduction

The United Nations 2030 Agenda for Sustainable Development sets as goal 4 to ensure inclusive and equitable

quality education and promote lifelong learning opportunities for all; and recognizes that the expansion of information and communication technologies and global interconnection offers great potential to accelerate human progress, overcoming the digital divide and developing knowledge societies (UN, 2015). Various international organizations such as the UN, UNESCO, OECD, WEF, PM, and IDGs have analyzed the future that people will face and detected some complex global problems that will need to be solved through education, specifically with the development of certain skills. Education in the twenty-first century has changed drastically from the previous century, now educational institutions recognize that each student has different knowledge, skills, attitudes, and values and, therefore, can learn differently.

Literature Review

A Commitment to Educational Innovation to Solve Complex Global Problems

According to the OECD (2019), curricula must allow for nonlinear learning trajectories rather than expecting all students to follow a linear progression along a single, standardized path. That is why the OECD's Education and Competencies 2030 project was created, which contains seven principles: the basic foundations that students must have (cognitive bases such as literacy and numeracy, physical and mental health, and social and emotional bases such as morality and ethics), three transformative competencies (create new value, reconcile tensions and dilemmas, and take responsibility), the student's agency and co-agency, four types of knowledge (disciplinary, interdisciplinary, epistemic, and procedural), three types of skills (cognitive and metacognitive; social and emotional; and practical and physical), attitudes and values, and an iterative learning process called the "Anticipation-Action-Reflection cycle" (AAR), where students continually improve their thinking and act intentionally and responsibly. The OECD defines competency as more than just "skills" because the latter is the prerequisite for acquiring competency.

In this sense, a competence involves more than the mere acquisition of knowledge and skills; it involves the mobilization of knowledge, skills, attitudes, and values to respond to complex demands in situations of uncertainty. As mentioned, these competencies must be transformative for students to have the ability to create new values, take responsibility, and reconcile conflicts, tensions, and dilemmas. Preparing students to be innovative helps them build greater resilience when faced with uncertainties and changes and build their self-esteem.

The sense of responsibility should be instilled in students, as it involves the understanding that actions have consequences and that people have the power to affect others. It is also important for students to expand their ability to reconcile multiple and often conflicting ideas or positions and recognize that there may be more than one solution or method of finding a solution. The AAR cycle provides guidelines for students to plan, act and reflect on the transformative competencies acquired to deepen their understanding and broaden their perspective. While the OECD project focuses on secondary education as a starting point, it establishes that the seven principles are applicable to all levels of formal and informal education, and lifelong learning.

UNESCO (2019) recognizes that curricula towards competency-based approaches have gained momentum, while noting that more and more countries are undertaking a process of aligning curricula with the competency approach. The curriculum is the first operational tool to ensure the sustained relevance of the development of education and learning systems and should adopt a competency-based approach to enable young people and adults to acquire the right tools to take advantage of opportunities effectively. Seven macro-competencies are considered relevant in the curriculum: lifelong learning; agency, interactive use of various tools and resources, interaction with others, interaction with the world, multi-literacy (digital, cultural, financial, health and media), and transdisciplinarity.

The World Economic Forum tried to build starting points through the global competency taxonomy (WEF, 2021). This taxonomy is a tool for new hiring practices that will help align the needs of employers, the curricula of educational institutions, and people's core competencies. The WEF's recommendations for adopting competency taxonomy in recruitment, learning, development and relocation practices are: understanding current skills gaps, setting targets and communicating the benefits of adopting a common taxonomy; adopt new competency-based recruitment, learning and development practices, and create opportunities for individuals to take ownership of their competency-based lifelong learning journeys; and incorporate competency-based practices across sectors, countries and globally, raising awareness among the general public of the benefits of aligning around a common taxonomy. According to this international organization, the top 5 of competencies projected for 2025 at global, national, and industrial levels are: analytical thinking and innovation, active learning and learning strategies, complex problem solving, critical thinking and analysis, and creativity, originality, and initiative. Nevertheless, from a critical perspective, this global competency taxonomy focuses on graduates finding a job. It does not reference the importance of a deep sense of responsibility and commitment to values and purposes related to the good of the whole.

However, from the perspective of a non-profit, open-source initiative, the only way to achieve the Sustainable Development Goals of the UN Agenda 2030 is through the Inner Development Goals, which encompass five dimensions and 23 skills and qualities (Inner Development Goals, 2021). The first dimension is "being," the relationship to self; the second comprises thinking and cognitive skills; the third is relating and caring for others and the world; the fourth comprises collaboration and social skills; and the fifth is acting to drive change. These goals infer that we talk much more about what needs to be done to solve the world's problems than about how to develop the skills of the actors in a position to achieve the visions. The purpose of the Project is to draw attention to the need to support the development of skills, abilities and other internal qualities of the people and organizations involved in efforts to contribute to a more sustainable global society. In short, the Project works to identify, popularize and support the development of skills, abilities and qualities relevant to inner growth, through consciously supportive organizations, companies and institutions, to better address global challenges.

Formal education is not enough to achieve the Sustainable Development Goals. What is required is an expanded vision of learning and action as a "lifewide" (every part of life at any point in time) and lifelong (every moment along life's journey) process and a culture that values learning in all aspects of life. The foundation of lifewide

education is a lifewide curriculum that enables learners to integrate learning, development, and achievement from any aspect of their lives into their educational experience (Jackson, 2021).

Education in Latin American region

Statistics indicate that a person born in Latin America and the Caribbean reaches adulthood with fewer skills than someone born in the United States (IDB, 2017:78). This knowledge gap, combined with the adverse effects of the COVID-19 pandemic, the current recession, and the high degree of uncertainty caused by technological changes and automation, means it is in everyone's interest to develop skills for complex problem-solving. It is estimated that between 5% and 10% of jobs in developing countries could be fully automated, 30% of activities in another 60% of occupations could be automated, and 8% of jobs in EBRD countries and 9% in developed economies could automate more than 70% of their tasks (AfDB, ADB, IDB, EBRD, 2018:6-14).

The displacement of human activity at work should not overshadow the pursuit of decent work for all men and women (International Labour Organization, 2018); productive and high-quality employment and inclusive labor markets are included in Goal 8 of the 2030 Agenda. Decent work is also a transversal theme under the SDGs, strongly present in many other goals, such as Goal 1 (End poverty), Goal 4 (Ensure quality education), Goal 5 (Achieve gender equality), Goal 10 (Reduce inequality), Goal 14 (Conserve marine resources), and Goal 16 (Promote justice and institutions).

Much remains to improve the skills of its young people and adults and to adapt jobs to the new social and economic context. The Human Capital Index of the World Economic Forum (WEF, 2017) indicates that Latin America, the Caribbean, and Africa have the lowest skills. Therefore, it is necessary to invest in human capital through education that embraces new high-level digital, socio-emotional, and cognitive skills (including creative thinking and the ability to learn and solve problems) (The World Bank, 2016; McKinsey Global Institute, 2018).

In Latin America there are innovative educational initiatives that have evolved teaching and learning methods and techniques with the intention of counteracting the context and problems in the region (González-Pérez and Ramírez-Montoya, 2022; Ramírez-Montoya et al., 2022). Educational innovations include psycho-pedagogical studies, the use and development of technology in education and educational and socio-cultural management, and new processes, products, services, and knowledge, which are the engines of change in education (Ramírez-Montoya and Lugo-Ocando, 2020).

However, little progress has been made in recording the process of implementing innovative pedagogies that develop disciplinary and transversal competences such as complex thinking competence, as well as the results obtained by students in the domain of this competence. This contribution proposes an educational ethnography research that offers the possibility of recording what has transformed the educational model based on competencies from the point of view of educators, students, and graduates.

An Ethnography of the Complex Educational System in the 21st Century

Educational ethnography is considered a field of research that brings together professionals from various disciplines, such as anthropology, sociology, pedagogy, psychology, and linguistics, among others, to understand an educational process from an ethnographic approach. According to Beach et al. (2018), in Latin America, educational ethnography encompasses the global and local spheres. It links the researcher with places, social agents, and objects; is based on a controlled and systematic participant observation; carries out fieldwork whose results show the lived experience; and incorporates the reflexivity that interprets how the theoretical framework of the researcher interacts with the beliefs and convictions of study subjects.

Latin American educational ethnography is permeated by the critical approach of the pedagogical postulates of authors such as Freire (2008), Fals Borda and Rodríguez Brandao (1987), and Rockwell (2011). Interestingly, educational ethnography in Mexico was derived from anthropological interventions in peasant communities and rural schools (Beach et al., 2018). Rockwell (1991) points out that in Latin America, ethnography arises from experiences of popular education and state projects of democratic education; therefore, discussions have arisen about the relevance of other forms of research, including a psychological perspective. However, British and American educational ethnography have also exerted an influence, and some authors interested in incorporating Anglo-Saxon paradigms, such as multiculturalism, have distanced themselves from Latin American social and educational reality. Since the 1980s, educational ethnography has contributed to overcoming the contradiction between formal education and the socio-cultural realities of educational agents, training educators, and facilitating changes.

Nowadays, educational ethnography in Latin America maintains its critical focus: it provides a detailed analysis of activities in the classroom and educational institutions, reveals the broad linguistic and cultural diversity of the continent, shows some problems in official programs that perpetuate exclusion and school dropout, and shines a light on the gender-differentiated experiences in formal and informal educational contexts. Furthermore, Latin American educational ethnography has been innovative in revealing educational issues that have been ignored. It highlights dimensions such as gender, ethnicity, race, and nationality; analyzes in a complex way the political aspect of everyday reality inside and outside educational environments; makes visible the inclusion of young students who have historically been underrepresented; and promotes interdisciplinarity in educational research.

Because educational ethnography has mainly developed a critical and innovative approach from inter-disciplinarity, we propose in this contribution that it is an adequate and relevant way to record the complexity in the process of implementing innovative pedagogies such as the megatrend of competency-based education, as well as to give voice to the actors that promote the development of competence of complex thinking and those who scale this competence to deepen the future adjustments that educational institutions will have to make of innovative pedagogies according to the specific sociocultural contexts in which they find themselves. There is a need to offer a wider range of innovative pedagogical options, aimed at invite educators and learners more

active participants in educational processes and content creators, as members of diverse and inclusive knowledge societies (Morin et al., 2003).

According to Chan and Lee (2021), there are four dimensions or levels in educational processes: (a) student learning that encompasses their motivations, their competencies and skills to reflect, their ethical concerns and emotional impact, and the relationship with their teachers; (b) teachers and teacher practices encompassing the difficulties of pedagogical practices, conceptualization of terms, purposes and processes, approaches to reflection, and advice and feedback; c) the institutional one that refers to the priorities in teaching and learning, and the support of the institution; (d) socio-cultural standards and social standards. In this contribution we consider that an educational ethnography focused on educational innovations must at least register these four dimensions or levels in educational processes.

Results

Sustainable Development Goal (SDG) 4, set out in the United Nations 2030 agenda, which focuses on ensuring inclusive and quality education for all and promoting lifelong learning, triggered the formation of the Interdisciplinary Research Group "Reasoning for Complexity" (IRG-R4C) in our educational institution to expand complex thinking for all through Open Science. The group aims to characterize the concentration and fragmentation of reasoning for the complexity of various disciplines through Open Science (Figure 1). Ultimately, IRG-R4C aims to contribute to the SDGs while promoting responsible citizenship through generating and transferring open knowledge, developing open and collaborative projects, and fostering entrepreneurship through open technology transfer processes (Ramírez-Montoya et al., 2021).

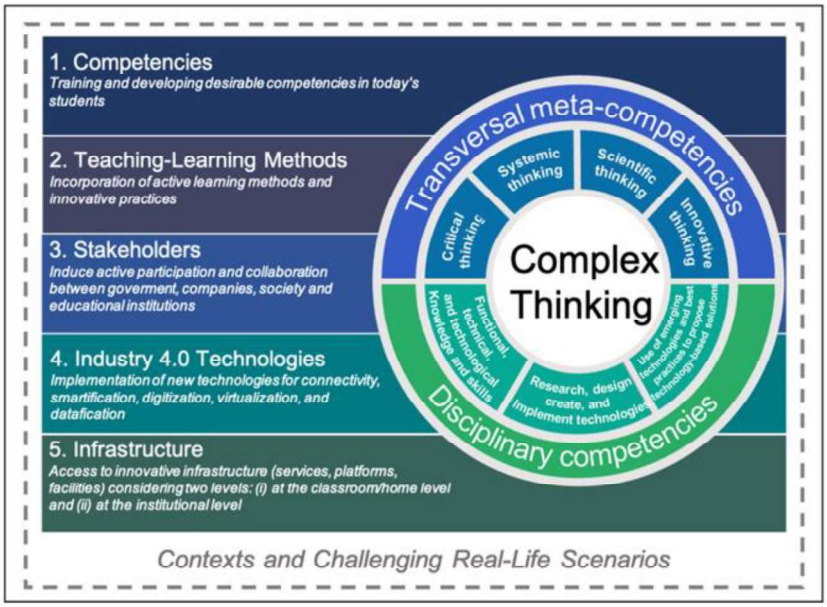

Figure 1. Complex Thinking in Education for Open Science

One result of the first phase of the project was the systematization of the principles of complex thinking theory by authors such as Edgar Morin (2001) to conceptualize and define the macro competency of complex thinking, integrated by four sub-competencies (critical, systems, scientific, and innovative thinking) (Baena-Rojas et al., 2022; Ramírez-Montoya et al., 2022). The macro competency of complex thinking is a cognitive tool that can expand people's thinking capacity when they face challenging situations or problems; it can also develop skills for thinking holistically about reality with a broad vision of the world (Vázquez-Parra et al., 2022). As for sub-the competencies, critical thinking is evaluating the soundness of one's own and others' reasoning to form a judgment about a situation or problem and identify false arguments; systems thinking analyzes the relevance of the system elements operating within the existing whole; scientific thinking encompasses a set of reasoning strategies or cognitive processes, such as inductive and deductive reasoning, problem-solving, and hypothesis formulation and testing; and innovative thinking allows problem-solving and designing and creating solutions for social progress (Rodríguez-Abitia et al., 2022). The development of instruments that record the actors' perception of their development of complex thinking competency is the basis of our proposal for an educational ethnography that opens the possibility for comparative studies in other regions.

One of the most significant results of the research group was designing the eComplexity instrument to measure students' perceived mastery of the complex thinking macro competency and its sub-competencies. This instrument was validated theoretically and statistically by a team of experts in the field (Castillo-Martínez et al., 2022; González-Pérez and Ramírez-Montoya, 2022). The instrument is composed of five items (each item is answered on a 5-level Likert scale), grouped into the four sub-competencies, and in turn, each sub-competency was divided into the areas of knowledge, skills, and attitudes or values (Vázquez-Parra et al., 2022). So far, we have used the instrument in various university institutions in 19 different countries: Argentina, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Finland, France, Germany, Guatemala, Italy, Mexico, Nicaragua, Paraguay, Peru, Spain, United States, and Venezuela.

Final Remarks

The results of applying the eComplexity instrument can be considered a substantial part of an educational ethnography, in the sense that it reflects the voice of the actors quantitatively. The eComplexity results reflect the first dimension or level in Chan and Lee's (2021) educational processes: students' perceptions of their abilities. The students' self-perception is their self-criticism. Therefore, this ethnography subscribes to constructivism and critical theoretical paradigms and is interdisciplinary; various researchers contribute to constructing a way to study, understand, and explain complex educational processes and phenomena in environments of great cultural and social diversity.

The design of an instrument to measure students' perceived mastery of the macro competency of complex thinking and its sub-competencies is the basis of our proposal for an educational ethnography focused on recording the implementation of innovative pedagogies such as competency-based education (a megatrend). An

educational ethnography to record the process of implementing innovative pedagogies, like competency-based education, will require more active participation by the actors and more robust infrastructures with more key actors and resources.

The result of the registry will generate methodologies to build a bridge between the SDG4, the global competency taxonomy proposed by the WEF (2021), the Inner Development Goals and the educational models of higher education institutions so that students scale their complex thinking skills, access to open education and collaboration, and insert themselves into the competitive labor market. This synergy and changes will have an impact on the level of skills and abilities in Latin America.

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References

AfDB, ADB, IDB, EBRD (2018). *The future of work: regional perspectives*.

Baena-Rojas, J. J., Ramírez-Montoya, M.S., Mazo-Cuervo, D.M., & López-Caudana, E. O. (2022). Traits of Complex Thinking: A Bibliometric Review of a Disruptive Construct in Education. *Journal of Intelligence*, 10(37), 1-17. https://doi.org/10.3390/jintelligence10030037.

Beach, D., Bagley, C., & Sofia Marques da Silva, S. (2018). *The Wiley Handbook of Ethnography of Education*. John Willey & Sons, Inc.

IDB (2017). *Learn better: Public policies for skills development*.

Castillo-Martínez, I., Ramírez-Montoya, M., & Torres-Delgado, G. (2022). Reasoning for complexity competency instrument (e-Complexity): Content validation and expert judgment. *Education in the Knowledge Society* (In Press).

Chan, C.K.Y., & Lee, K.K.W. (2021). Reflection literacy: A multilevel perspective on the challenges of using reflections in higher education through a comprehensive literature review. *Educational Research Review*, 32, 1-18.

Cruz-Sandoval, M., Vázquez-Parra, J.C., & Alonso-Galicia, P. (2022). Student Perception of Competencies and Skills for Social Entrepreneurship in Complex Environments: An Approach with Mexican University Students. *Social Sciences*, 11(314), 1-13. https://doi.org/10.3390/socsci11070314.

Fals Borda, O, & Rodrigues Brandao C. (1987). *Investigación participativa*. De la Banda Oriental.

Freire, P. (2008). *Pedagogía del oprimido* Siglo XXI Editores.

González-Pérez, L.I., & Ramírez-Montoya, M.S. (2022). Components of Education 4.0 in 21st Century Skills Frameworks: Systematic Review. *Sustainability*, 14, 1493. https://doi.org/10.3390/su14031493.

Inner Development Goals (2021). *Inner Development Goals: Background, method, and the IDG framework*. https://static1.squarespace.com/static/600d80b3387b98582a60354a/t/61aa2f96dfd3fb39c4fc4283/1638543258249/211201_IDG_Report_Full.pdf.

International Labour Organization (2018). *Decent Work and the Sustainable Development Goals: A Guidebook on SDG Labour Market Indicators*. ILO. https://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/publication/wcms_647109.pdf.

Jackson, Norman (2021). *Enriching and Vivifying the Concept of Lifelong Learning through Lifewide Learning and Ecologies for Learning & Practice*. White paper, Lifewide Education. https://www.lifewideeducation.uk/uploads/1/3/5/4/13542890/white_paper_.pdf.

McKinsey Global Institute (2018). *Solving the Productivity Puzzle: The Role of Demand and the Promise of Digitalization*.

Morin, E. (2001). *Introducción al pensamiento complejo*. Gedisa.

Morin, E., Ciurana E. R., & Motta R. D. (2003). *Educar en la era planetaria*. Gedisa.

Organisation for Economic Co-operation and Development [OECD] (2019). *OECD Future of Education and Skills 2030. OECD learning compass* 2030. https://www.oecd.org/education/2030project/contact/OECD_Learning_Compass_2030_Concept_Note_Series.pdf

Ramírez-Montoya, M., & Lugo-Ocando, J. (2020). Systematic review of mixed methods in the framework of educational innovation. *Communicate*, XXVIII, 65, 9-20.

Ramírez-Montoya, M. S., Álvarez-Icaza, I., Sanabria-Zepeda, J.C., López-Caudana, E.O., Alonso, P. E. & Miranda, J. (2021). Scaling Complex Thinking for Everyone through Open Science: A Conceptual and Methodological Framework. In Proceedings of the 9th International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM 2021). University of Barcelona. Spain. https://repositorio.tec.mx/handle/11285/638023.

Ramírez-Montoya, M. S., Castillo-Martínez, I.M., Sanabria-Zepeda, J.C., & Miranda, J. (2022). Complex Thinking in the Framework of Education 4.0 and Open Innovation—A Systematic Literature Review. *Journal of Open Innovation: Technology, Market, and Complexity*, 8(4), 1-15. https://doi.org/10.3390/joitmc8010004.

Rockwell, E. (2011). Recovering History in the Anthropology of Education. In Bradley A.U. Levinson and Mica Pollock (Ed.), *A Companion to the Anthropology of Education* (pp. 65-80). Blackwell.

Rodríguez-Abitia, G., Ramírez-Montoya, M. S., Martínez-Pérez, S., & López- Caudana, E.O. (2022). Cultural differences in complexity reasoning in higher education. In Proceedings of the 10th International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM 2021). Salamanca University. Spain.

The World Bank (2016). *Digital Dividends*. World Development Report.

UN (2015). A/RES/70/1-*Transforming our world: the 2030 Agenda for Sustainable Development*.

UNESCO (2019). *Future competencies and the future of curriculum a global reference for curricula transformation.* http://www.ibe.unesco.org/sites/default/files/resources/future_competencies_and_the_future_of_curriculum.pdf?fbclid=IwAR1Y3Ac0dNgpHqle02-OwYQ-b-eAZfwEHJ3PwnbUZa8TXIa-PZQpTrMjnhU

Vázquez-Parra, J.C., Castillo-Martínez, I.M., Ramírez-Montoya, M.S., & Millán, A. (2022). Development of the perception of achievement of complex thinking: A disciplinary approach in a Latin American student population. *Education Sciences*, 12(289), 1-12. https://doi.org/10.3390/educsci12050289.

WEF (2017). *The Human Capital Report 2017: Preparing People for the Future of Work*.

WEF (2021). *Building a common language for skills at work a global taxonomy.* https://www3.weforum.org/docs/WEF_Skills_Taxonomy_2021.pdf