

Imagining a feminist and inclusive academia: Multicultural, collaborative, and multidisciplinary redesign of educational resources

Imaginando una academia feminista e inclusiva: Rediseño multicultural, colaborativo y multidisciplinario de recursos educativos

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ABSTRACT

The educational system is exposed to biases and stereotypes that operate under capacities, androcentric, and patriarchal logics, where Science, Technology, Engineering, and Mathematics (STEM) classrooms are not exempt from a worldwide recognised gender gap. This article aims to illustrate another way of organizing and being in academia with a concrete example of multicultural, collaborative, and multidisciplinary work towards decolonizing how we position ourselves in shaping a feminist and inclusive practice. Educational resources developed by an international foundation were adapted to a combined/blended teaching-learning format, considering the conditions of distance education during the health emergency scenario caused by the COVID-19 pandemic. The resources were developed incorporating gender perspective, inclusive approach, and aspects of our Latin American identity. This work was carried out collaboratively with specialists from different Latin American countries. Given the current scenario of global challenges, collaborative work between countries allows us to rescue strategies and solutions with a territorial stamp, highlighting our knowledge and putting it at the service of educational resources relevant to each context and science education.

Keywords: feminist and inclusive practice, multicultural, collaborative and multidisciplinary academia

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RESUMEN

El sistema educativo está expuesto a sesgos y estereotipos que operan bajo lógicas de capacidades, androcéntricas y patriarcales, donde las aulas de Ciencias, Tecnología, Ingeniería y Matemáticas (STEM) no están exentas de una brecha de género reconocida a nivel internacional. Este artículo tiene como objetivo ilustrar otra forma de organizarse y estar en la academia con un ejemplo concreto de trabajo multicultural, colaborativo y multidisciplinario para descolonizar cómo nos posicionamos en la configuración de una práctica feminista e inclusiva. Se adaptaron recursos educativos desarrollados por una fundación internacional a un formato de enseñanza-aprendizaje combinado, considerando las condiciones de la educación a distancia durante el escenario de emergencia sanitaria por la pandemia del COVID-19. Los recursos fueron desarrollados incorporando perspectiva de género, enfoque inclusivo y aspectos de nuestra identidad latinoamericana. El trabajo se realizó en colaboración con especialistas de diferentes países latinoamericanos. Ante el escenario actual de desafíos globales, el trabajo colaborativo entre países nos permite rescatar estrategias y soluciones con sello territorial, poniendo en valor nuestro conocimiento y poniéndolo al servicio de recursos educativos pertinentes a cada contexto y a la enseñanza de las ciencias.

Palabras clave: práctica feminista e inclusiva, academia multicultural, colaborativa y multidisciplinaria



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The educational system formed by different agents is exposed to biases and stereotypes that operate under capacities, androcentric, and patriarchal logics (Azúa et al., 2019), where Science, Technology, Engineering, and Mathematics (STEM) classrooms are not exempt from a worldwide recognised gender gap (Rahman & Halim, 2022). For instance, even though girls, adolescents and adult women have access to science lessons, our experience is different from that of boys and men, where girls are given less room of a say, and feedback is less challenging, among others (Melo-Letelier & Martínez-Galaz, 2018). These biases and stereotypes are evident both at a practical and symbolic level. The use of a sexist and often totalitarian language is observed, especially in Spanish speaker context where the masculine appears as the figure that alludes to all humanity (Ardiles, 2021), using, for example, the phrase “evolution of man” and not “evolution of the human species”. In science lessons, European scientists are presented as contributing to the advancement of knowledge (Edelsztein et al., 2020) as Albert Einstein, Newton, and Charles Darwin are taught to name a few, above the history of women who have also had an important role in the development of scientific knowledge in our societies (García & Perez, 2017).

The previous questioning of science education is related to a recent call to engage more explicitly and collectively with the sociopolitical dimension of the science education discipline in acknowledgement of the limited study of political discourses within the field (Tolbert & Bazzul, 2017), attempting to break the science education secrecy to open the potentialities of “what may also be, but not yet is” (Moura, 2021, p. 1). An example of a Latin American exploration of the sociopolitical in science education combines a Freirean pedagogy with a humanistic approach, including dialogue in the classroom (Santos, 2009). Santos’ (2009) call is to understand, through critical reflection, the political role of science education by questioning the banking model of schools ‘depositing’ knowledge while the students ‘consume’ it. Inside science education, there are critical voices raised against this Freirean approach because it presumed a “unified, conscious, rational subject of humanism” (Lather, 2012, p. 1024), which is contested by notions of subjectivity, exploring how the limits of thought and action are constructed. Still, some Freirean notions of emancipation or the banking model of education resonate strongly, especially in the Latin American context (Bravo-González et al., 2023), owing to its (de)colonisation process.

The term “decolonial” emerged to protest colonisation and occidental modernisation in the Latin American context (Mignolo & Walsh, 2018). The decolonial question is posed to trouble, for example, dominant discourses about science, attempting rather break the hermetic science education in practice and shift it towards transformation. According to Walsh (2013), decolonial pedagogies align with critical pedagogies in that decolonial pedagogies are part of a bigger decolonial struggle that can induce theorisation and reflection as non-linear movements that are rooted in the idea of new ways of transitioning and new ways of being. The recent sociopolitical call-in science education can be theorised and put into practice from current social struggles towards possibilities of resistance by transgressing boundaries (Wong & Dillon, 2020); in that sense, the Latin American context could offer a rich scenario in which to develop this sociopolitical dimension of science education which might add other perspectives, both of how knowledge is produced and how it is understood, attempting to decolonise school science too.

In the context of science education, acknowledging that scientific discourse is not pure could open the opportunity to ask who decides what knowledge is valid and why some categories of knowledge are universally accepted while others are not (Harding, 1991). Decolonial pedagogies are related to the understanding that teaching is not just instrumental (Walsh, 2013). In Freire’s (1970) terms, pedagogy is a methodology inside and outside the school as a social fight for liberation. This questioning may become decolonial by the Butlerian notion of ‘asking after’ (Butler, 1997) the norms of knowledge production and its transmission, especially when the knowledge is understood as neutral and detached from its subjects’ different world views. As stated by Avraamidou (2020), positions that dispute those assumptions open spaces for “multiplicity, diversity, subjectivity, and hybridity” (p. 4) to experience and acknowledge the many possibilities of being a science person, a process always already embedded socio-politically.

Sociopolitical questioning of the STEM approach

The integration of educational approach STEM (Science, Technology, Engineering and Mathematics), which, as a movement, appeared at the beginning of the 1990s (Martín-Páez et al., 2019) has been singled out as the main aim of science education (Freeman et al., 2015). In doing so, STEM attempts to connect scientific knowledge and economic growth when environmental problems and social issues are increasing (Organisation for Economic Co-operation and Development (OECD), 2016). Freeman et al. (2015) stated that STEM is related to learn or work in the disciplines of the acronym from the school level to, eventually, the disciplines at the university level. Nevertheless, according to Carter (2016) STEM has neoliberal foundations that could be “silencing other perspectives” (p. 31), which is worrying considering its broader acceptance in science curriculums worldwide (Higgins et al., 2018).

In South America, STEM education did not have a unique understanding which could be related to the external and diverse influence from some places in Europe, USA, and South Korea; in countries such as Argentina, Chile, Ecuador, and Colombia, there is increasing interest in integrating STEM disciplines through both research within academia and in speeches from national educational institutions (Tovar-Rodríguez, 2019). In Chile, STEM is part of the discourse of the national science curriculum, which states: “students should develop competencies to live and work in jobs that do not yet exist”¹. However, apart from just thinking on the future life of the students, there is no practical integration of the disciplines in the current Chilean science curriculum nor initial training of a STEM teacher at the university level.

Despite the neoliberal origin of STEM oriented to production, in recent years, progress has been made towards a new understanding of STEM, which shift that original aim towards an integrative educational approach -more in line with a pedagogical perspective- that allows incorporating all the experience, knowledge, skills, and attitudes that come from science, technology, engineering, mathematics and other disciplines (such as humanities and arts) to solve relevant problems, through creativity, collaborative work, innovation, interdisciplinary thinking and contextualisation (Moore et al., 2020;). This new understanding calls also for a new configuration at the university level too. Then it bears asking, how does that educational institution function under neo liberal logics?

The neoliberal university

The university and other institutions have been permeated by a neoliberal business-like logic (Sisto, 2020) with managerial understandings related to the production and dissemination of knowledge. Ball (2003) pointed out that transforming public education to a market-oriented mindset has three main policy technologies: “the market, managerialism and performativity” (p. 215). The privatisation of the university is positioning students as consumers (Fardella et al., 2022), while academic staff have seen their remuneration decreasing and their working conditions deteriorating. Besides, the increasing casualisation as a way of employment is transforming the university into a ‘fast’ academia (Gill, 2009). Blackmore and Kandiko (2011) pointed out that because of privatisation, many academic activities are not paid at all or are poorly paid; this also has to do with fast academia because there is a sense of ‘always on’ availability to respond to the increasing requirements (Gill, 2009, p. 9). In that sense, university workers feel more pressure, feeling that their working environment is toxic.

In Chile, the neoliberal model is also experienced at the university level with rankings, productivity indices and the promotion of competition among colleagues (Fardella & Corvalán, 2020). In Chile, since the dictatorship (1973-1990), universities, as well as other institutions and settings, have experienced a progressive neo-liberalisation (Sisto, 2020), which, for example, has imposed a sense of competition and individualism on how to conduct academic work. Besides, a high percentage of academic staff in Chilean higher education, nearly 60%, suffer the casualisation of their employment with “unstable part-time contracts with little institutional support” (Montenegro, 2016, p. 528). This situation of hyper-productive

¹ Web of the Ministry of Education in Chile <https://www.curriculumnacional.cl/portal/Innovacion/Lineas-de-Innovacion/STEM-Aprendizaje-Basado-en-Proyecto-ABP>

and competitive universities and its associated difficulties are accentuated in the case of women (Jenkins, 2020).

According to Fardella et al. (2022), the relationship between the neoliberal agenda and the subjectivity produced in this scenario is unavoidable. In this context, there is the subject production of the “hyper-productive” academic with multiple publications and projects. Such hyper-productive staff attempt to minimise the influence of their institutional context in favour of maximising their agency, meaning that they do not recognise overwhelming the university’s requirements; instead, they assume the requirements as personal tasks. This author concluded that satisfaction is involved in this hyperproduction that can even disguise the precariousness of these subjects’ context. As pointed out by Butler and Athanasiou (2017), neoliberal recognition is a way to allow the survival of the individual who, on the one hand, resists because of the promise of recognition while keeping hidden the conditions to obtain it.

Rethinking the work in academia

For many years, science has been considered an impartial and objective enterprise, and apparently, free of human bias. However, like any other social and cultural product, science is intrinsically linked to its context while reflecting the interests, values, and prejudices of those practising it. In other words, scientific activity cannot be separated from the social identity of its researchers (Stengers, 2019).

Studies from feminisms and gender perspective have evidenced both discourses and representations impregnated with sexist ideology (Enciso et al, 2021). The power relations around scientific production are explicit, revealing the positivist logics that mask the desired ‘objectivity’, androcentrism and the hegemony around knowledge (Guil, 2016; Méndez Caro, 2020). In doing so, science has often been masculinised, and it had been conceived and designed largely by and for men (Fox, 1985). This sexism is evident at different levels, both practical and symbolic (Harding, 1986), and as Durán (1981) suggests, it is observed in all dimensions of the scientific field, from the choice of research topics, the participation of women in certain areas of study, and the social practices of work groups, to name a few. In Chile, for example, it is observed that the percentage of women generally decreases as women advance in academic degrees (Ministerio de Ciencia, Tecnología, Conocimiento e Innovación [de Chile] (MINCIENCIA) 2022). Considering STEM disciplines, in 2021, the gap between the percentage of women enrolled in undergraduate (22%), master's (29%) and doctoral programmes (37%) is still inferior to men enrolled in the same type of programmes (MINCIENCIA, 2022).

Then, to address this pattern, we must rethink the objectives and modify our practices in the academy within a framework of decolonised and feminist leadership. This framework questions the hegemonic modes in the academia of white people who uncritically assume a natural order of leadership based on academic achievements under neoliberal logic (Sisto, 2020), linked, for example, to meritocracy. Thus, our purpose as a work team follows what is described by Wallace and Wallin (2015) as sharing a commitment to rigour and the values of equity and social justice in academia, where we attempt to have these values permeating the work in the professional field and in our lives on a personal level. Similarly, it adheres to principles such as emancipation and social change, while now the academy is put at the service of historically subordinated groups (Flores, 2014).

Feminist work in academia appeals to the contextual and the socially relevant, considering the role of experience and subjectivity in research (Flores, 2014; Guil, 2016), positioning emotions as vital elements to build knowledge (Enciso & Lara, 2014). Feminist work in academia challenges the power relations that underlie research practice so that knowledge is no longer ‘produced’ but constructed. Therefore, rather than talking about study subjects, we must recognise the role of collaborators, who work, relate, and jointly construct knowledge based on mutual collaborations (Briones, 2020). When collaboration is the aim, towards promoting relationships based on good treatment (Hipólito & Martínez, 2021), there is the

possibility to develop horizontal relationships, where people are recognised as agents capable of knowing, validating their experiences, feelings, knowledges, and their ways of constructing them.

Purpose of this experience

In this patriarchal and neoliberal context, our proposal attempts to ‘crack’ the hegemonic way of being in Academia in Walsh’s sense of decolonial cracks (2017). According to Walsh, these spaces of rupture are defined as giving birth to little hopes because “they reveal the irruption, the beginning, the emergence, the possibility and also the existence of the very other that makes life despite -and cracking- the very conditions of its negation” (Walsh, 2017, p. 83). In so doing, we aim to experience multiple becomings or, as Freire would put it, open up the possibility of “being from being more” (Freire 1970, p. 99) by incorporating feminist, inclusive, and Latinx perspectives into the redesign of educational resources to be used in Latin America.

Aiming to put into practice these ideas into a concrete experience, we adapted open-access educational resources of an international non-profit foundation that are possible to be used in the Latin-American context to a combined teaching-learning format, considering the conditions of distance education during the health emergency scenario caused by the COVID-19 pandemic, incorporating a feminist perspective and the inclusive approach as essential pillars when addressing education in STEM disciplines. What we are going to describe next is the process experienced for a group of academics, teachers and science educators working in the redesign of the education material. The resulted adapted material is described alongside the process.

Description of the intervention

The scenario of this experience is the development of an international project inside a Latin-American initiative bringing together different people and institutions in the region. The project aims to strengthen Latinoamerican STEM education in the context of emergency education produced because of the COVID-19 pandemic. The project was carried out between December 2020 and June 2022. The aim was to adapt and co-design educational resources to a blended learning format, incorporating gender and inclusive perspective and contextualising them to our territories’ reality. The adapted activities are part of a STEM education programme of an international non-profit foundation that addresses health, environment, and energy issues for students from 4 to 18 years old (including three educational levels). The original activities had certain limitations in distance education, such as not being adapted outside the classroom or requiring specific and inaccessible materials for its implementation. Besides, some of the activities had accessibility limitations, such as the absence of a gender perspective and the lack of contextualisation of the characteristics of Latin American countries.

How did we work?

This project was carried out through a collaborative, multidisciplinary, and multicultural work strategy, divided into two main stages: a first stage of local work and a second stage of international work (**Figure 1**). In addition, at the beginning of the project, a diagnosis to teachers in different Latin American countries was carried out to gather information about the challenges and opportunities associated with education in the context of pandemics.

Participants

The local work stage was carried out from Chile by a multidisciplinary team formed by 12 people: a special needs educator, a biology teacher with experience in the design of educational resources, an educational psychologist, a biology teacher with a PhD in gender studies, a science teacher with a PhD in science; a primary education teacher with a science background working in a rural school; a primary education teacher with a geography background; a kindergarten teacher in a rural school; a chemistry teacher, a physics teacher, a designer, and an illustrator. It is important to mention that diversity is not only evident in the professions and training of the participants, but also in aspects of identity, due to neurodivergent

and neurotypical professionals, from the LGBTQIA+ community participate in this group. Besides, there participants also differ in ages and social class.

Figure 1
General infographic about the scope of the project and its stages



The whole group contributed with their experience and knowledge in constructing a framework to redesign the STEM educational resources. These 12 people had an employment contract financed by the project, which included a time commitment of between eight and sixteen hours per week, depending on the specific tasks associated with the project.

The international work stage involved 22 teachers from different educational levels and geographical areas: four teachers from Ecuador, including one teacher from an educational institution located in the Galapagos; four teachers from Peru, including one teacher from a rural school; four teachers from Chile, including two teachers from rural schools; and ten teachers from Colombia, including three teachers from rural schools (one of them Wayuu from the ei'ruku Epinayuu of the Ishamana community).

The call for teachers from Colombia, Ecuador and Peru was made through the collaboration of people linked to educational institutions working in STEM education in Latin America: Universidad San Francisco de Quito, Ecuador; Universidad de La Sabana, Colombia; and Instituto Apoyo, Peru. Each teacher received a stipend and a certificate for participating in the project. In addition, all teachers participating in this process are authors of the co-designed educational resources. The Chilean teachers who participated in this stage are the same as those who worked in the local work stage.

Ethical aspects

All the people who participated in this project have given their authorisation for using audio and video records from the meetings, photographs and audiovisual material derived from the process to disseminate the experience and generate knowledge. The educational resources produced in this project are disseminated under Creative Commons 4.0 licensing.

Systematization of the Experience

The main actions developed at each stage of this experience are described below:

Diagnosis of opportunities

During the project's first period, a diagnosis was conducted to determine how distance education was developed in Latin America. Participants were 652 teachers from Colombia, Mexico, Ecuador, Argentina, Peru, Bolivia, Venezuela, and Chile, reporting their main problems and needs associated with science education in the context of the COVID-19 pandemic. They also identified opportunities and topics to work with their students. A questionnaire was administered virtually through the SurveyMonkey platform, between December 2020 and March 2021. The following are the most relevant results of this diagnosis organised by areas of analysis.

Connectivity problems

During the pandemic quarantine, internet connectivity became an indispensable resource to continue teaching. When asked about their Internet access, 72% of teachers reported having stable connectivity, only 27% had unstable or intermittent connectivity, and 1% had no connectivity at all. Nevertheless, regarding the reality of the students, the questionnaire showed quite the opposite situation, where 73% have unstable or intermittent connectivity, 7% have no connectivity, and only 20% have access to a stable signal. Regarding the tools used in distance education, 88% of the students use smartphones, followed by laptops (52%) and tablets (24%). 20% declared that students do not have technological tools. In terms of the ways to communicate with their students, the leading platform (86%) is WhatsApp (institutional or personal), while Zoom is the most used application (90%), allowing videoconferencing. As per the pedagogical resources for teaching distance education, the participating teachers value self-made work guides as the most helpful resource (80%), followed by Video Capsules (77%) and school texts (68%). The Ministerio de Educación [de Chile] (MINEDUC) platforms or other governmental entities obtain 49% usefulness appreciation.

Personal resources as primary support

The main aspects facilitating professional work during the pandemic were: "my personal characteristics" (63%), "school conditions or decisions" (51%), "interdisciplinary work" (48%), "support from parents" (40%), "national decisions" (24%), and "local district decisions" (11%). Regarding the experience of teaching science virtually, 64.7% of those who participated in this survey indicated having little or no experience in this regard, while 93% said they had to learn to use virtual tools during the pandemic.

Environment as a focus

Some participants considered three main topics in which they have the most teaching experience, namely, health and nutrition (44%), climate change (39%) and recycling (38%). Others pointed out the topics they would be interested in working with their students, such as renewable energy sources (31%), household waste treatment (30%), and water pollution (28%). Based on the analysis of the diagnosis, we worked on selecting the activities included in the adaptation 25% of the total of the original educational programme, and defining the fundamental principles that would guide the design of each educational resource.

Local work stage

In this stage, weekly 120-min virtual meetings were held to analyse the original educational resources and discuss the adaptation's objectives and characteristics, both in terms of format and the specific content of each activity. During each meeting, the local team worked on a draft design of an educational resource, analysing together each of the sections, the issues to be addressed, the way of questioning the students, the materials, the language used, the incorporation of characters, the incorporation of Latin American experiences and stories, the possibilities of articulation with the curriculum, and the contextualisation to the reality of our territories, among others. Each team member proposed

recommendations from their professional and personal experience to be included in the design of the activities. Then, the whole group discussed the implications and relevance of each decision.

As a result of this first stage, we established the following guiding principles:

- The vision of science as a human activity constituting a dynamic body of knowledge influenced by the political, social, and cultural context in which it is developed (Heinsch et al., 2023; Latour, 2001).
- The value of diversity as an inherent attribute of all people and the places where they live, develop, and interact.
- The principle of inclusion and cognitive accessibility, recognising the value of diversity and the possibility to generate conditions within the environment favouring the entire presence, participation, learning and development of everyone (Ainscow, 2020).
- and Gender perspective, as a way of highlighting all life experiences by understanding that boys, girls, and other non-binary gender expressions have the same learning potential, regardless of their biological differences. By assuming this perspective, we seek to make inequalities and gaps visible and problematise the gender gap, considering that all gender expressions have the same potential for learning (Avolio et al., 2020).

These principles were unshakable for us because they reflect the project's objectives, the needs and opportunities identified from the diagnosis and the knowledge about education of all the professionals in the multidisciplinary team. Then, once the principles were defined, we moved on to the co-creation stage, where the activities of each educational level were elaborated. The work was conducted recursively, meaning that it began by analysing a draft educational resource that included different activities, sections, ideas of situations, problems associated with the central theme, Latin American experiences, materials, characters, dialogues, and images, among others.

The process, in general, was carried out based on the following structure:

1. Review of the original activities in contrast to the results of the diagnosis
2. Selection of activities to be adapted.
3. Development of an adapted and contextualised activity proposal by one of the team members (preferably teachers)
4. Presentation of the proposal to the team and feedback
5. Design of the new activity, including the type of instructions, structure, sections, iconography, materials, and guidelines
6. Review of the preliminary design with emphasis on the guiding principles (inclusion, gender, relevance of the territory)
7. Incorporation of suggestions and recommendations
8. Testing in the classroom by the teacher's team members
9. Further review by the team and new modifications
10. Closing of the preliminary design and delivery to the designer and illustrator
11. Group review of the design and adjustments

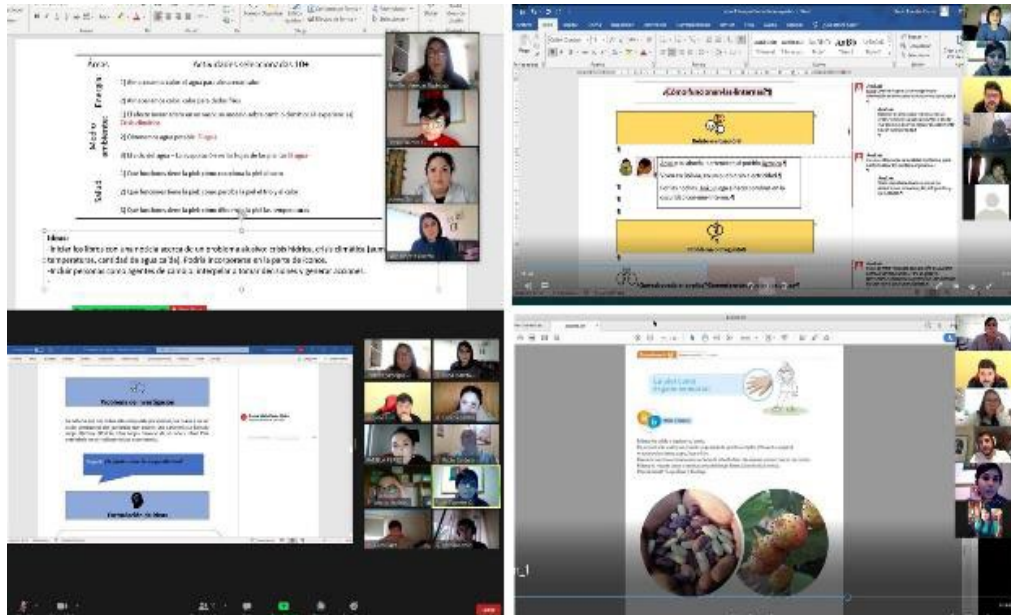
During the meetings, each team member contributed from their professional background by proposing suggestions for improving the draft or indicating aspects not considered in the initial design. Collaboratively, word by word, action by action was revised (**Figure 2**), and the final format of the educational resource was co-designed. In this stage, not only the disciplinary knowledge of each professional was included, but also their life experiences. Considering these resources, it was possible to generate activities contextualised to the reality of our territories; recovering from each member, the value of our diverse ways of life, food, clothing, ways of being a family, and landscapes, amongst other aspects that are relevant when involving students and ourselves in the teaching and learning process towards making it more situated.

Each week, progress was made in adapting and co-designing a different educational resource. The process started with the activities corresponding to level 4+ for students from four to seven years old. A total of four sets of educational resources were developed: Water, Our Food and Senses, Energy, and

Pollution and the Environment. This stage was followed by level 8+ for students ages eight to twelve. Three sets of resources were developed: Our Food and Health, Energy in Latin America, and Recycling. Finally, work was done on developing level 10+ for students from ten to fifteen years old. Four sets of resources were co-designed: Latin America and the Richness of its Skin, Water in Latin America, Climate Crisis, and Energy Storage.

Figure 2

Photographs of the working sessions of the local team carried out virtually through Zoom platform - Selection of activities, collaborative review of activity proposals, analysis and incorporation of modifications, and design review

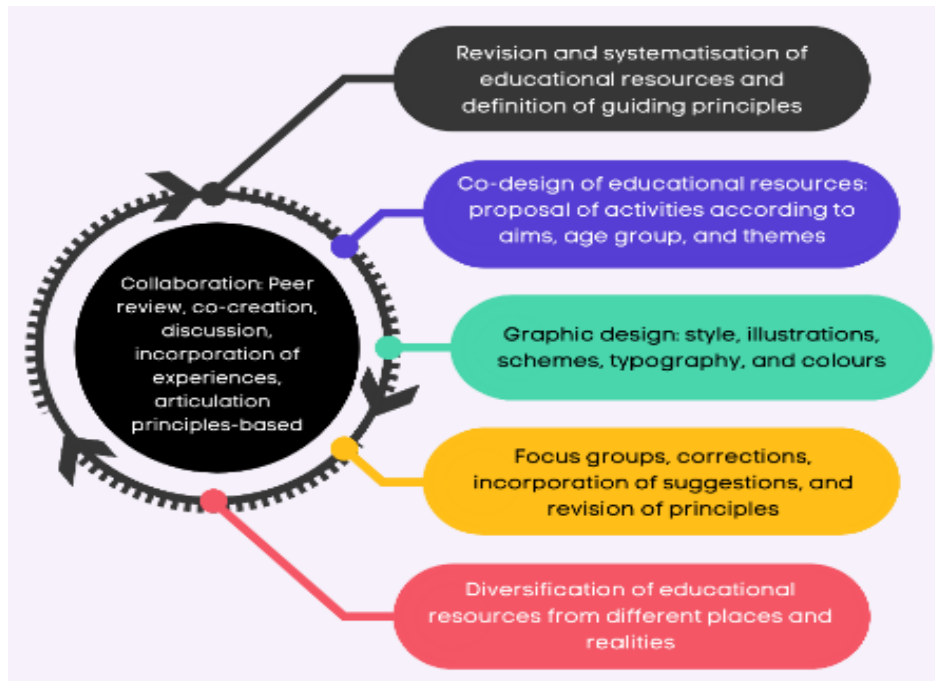


Then, considering the objectives of the project and the guiding principles, work was done on the graphic design aspects, such as the choice of the general style of the educational resources, considering the articulation between the interests of the different age groups and our Latin American characteristics. Notably, aspects such as the typography, colours, and use of iconography were considering criteria of cognitive accessibility and aspects of language and use of images and illustrations based on incorporating the gender perspective and the inclusive approach of accessibility of the resulting material.

The systematisation of the working model developed can be seen in **Figure 3**. Each stage is linked to a central strategy based on collaborative work, the peer review process, co-creation, the incorporation of experiences that nurture professional decision-making, and, ultimately, the constant effort to articulate the design of each of the activities to the guiding principles defined as a fundamental part of the project. Each of the stages affects the overall co-design process and, in turn, feeds back into the knowledge generated in each of the subsequent stages.

Figure 3

The working model for the design of educational resources is based on the collaboration and exchange of experiences of a multidisciplinary and multicultural work team



International work stage

The second stage included an international group aiming to diversify and contextualise the activities to the reality of other Latin American countries (**Figure 4**).

Figure 4

Inaugural meeting of the International Work Stage



Notes: Anonymised photograph extracted from Zoom platform (©2023 Zoom Video Communications, Inc).

A total of seven virtual meetings were held, with an average length of 120 minutes, between September and December 2021. An overview of each of the international working sessions is presented in **Figure 5**.

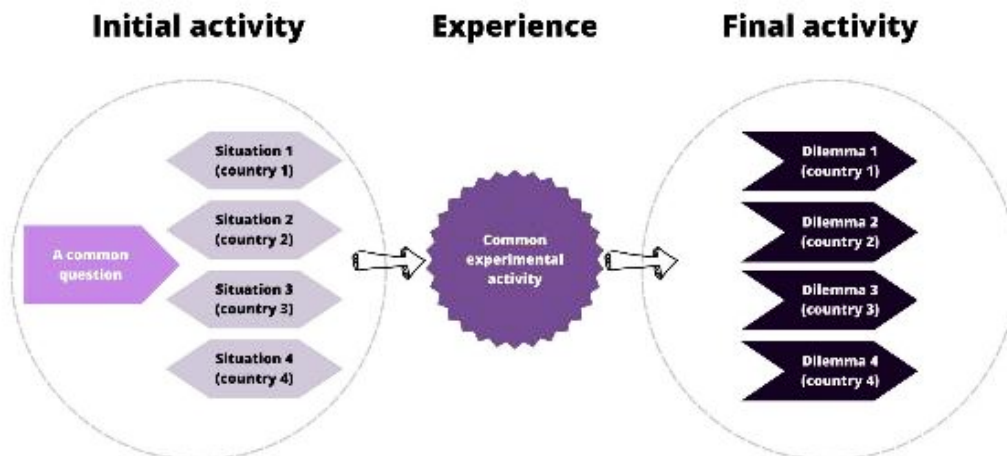
It is noteworthy that every meeting started by asking each participant how they were feeling that day or how their week was so far; that initial moment was important to establish a dialogue that was not just focused on the product but rather generating an interaction based on trust and care. This moment was held as part of both stages during the local and international group meetings.

Figure 5
Meetings held during the international work stage

| Meeting-Date | Activity | Products/Results |
|---------------|---|--|
| 1- 15/09/2021 | Welcome meeting: presentation of the team, project characteristics, objectives, guiding principles, and introduction of co-designed educational resources. | Project documents and activities to be analysed are provided. |
| 2- 06/10/2021 | A revision practice, contextualisation and diversification of the activities corresponding to the "Nutrition, Hygiene and Health" resource set. | Contextualisation worksheets with the structure of the activities. |
| 3- 20/10/2021 | Presentation of the local teamwork results associated with the diversification of activities of the educational resource set "Nutrition, hygiene and health". Group feedback. | Contextualised initial activities and dilemmas for each country. Set of educational resources related to "Nutrition, hygiene and health" |
| 4- 03/11/2021 | Exercise of revision, contextualisation and diversification of the activities corresponding to the resource set "Recycling". Group work by country and plenary. | Preliminary design of the worksheets of activities. |
| 5- 17/11/2021 | Review of proposals for activities developed by each country. Group feedback. | Contextualised initial activities and dilemmas for each country. Set of educational resources for the "Recycling" set. |
| 6-01/12/2021 | Exercise of revision, contextualisation and diversification of the activities corresponding to the resource set "Energy in Latin America". Group work by country and plenary. | Preliminary design worksheets of the activities. |
| 7-15/12/2021 | Review of proposals for activities developed by each country. Group feedback and closure of the process. | Contextualised initial activities and dilemmas for each country. Set of educational resources for "Energy in Latin America" |

The work strategy consisted of diversifying the level 8+ activities co-designed in the local work stage to make them more relevant to the reality of the other territories (**Figure 6**). Working groups were formed for each country to propose a specific situation associated with the local reality and some questions to motivate student discussion. Then, in a plenary session, each team shared their ideas, the proposed activities and questions, and the images they would use in their context.

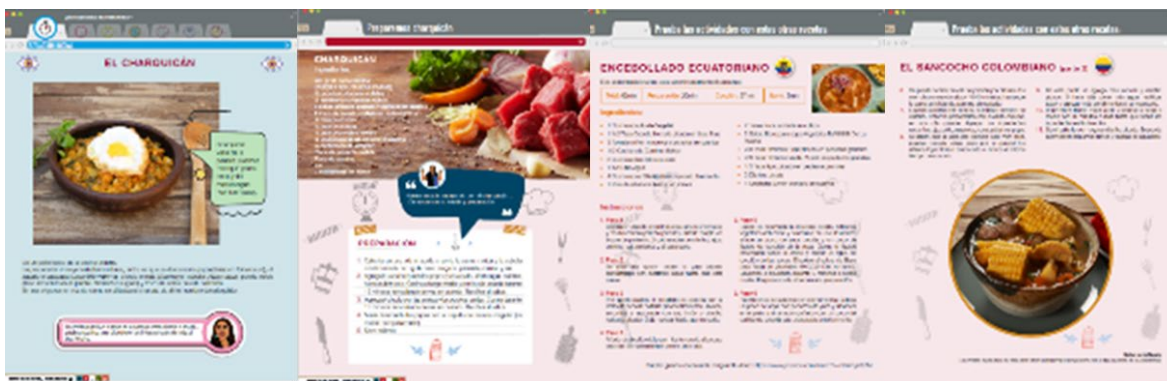
Figure 6
Model activity's structure developed in the international work stage



The working groups participants' local and personal experiences associated with the topic to be addressed in the educational resource were shared. Valuing especially the similarities and differences in each context that were put into the discussion. For instance, in the case of nutrient identification activities aimed at students from 8 to 12 years old, from Chile, it was proposed to approach the topic based on traditional Chilean food called "Charquicán"; from Peru, it was proposed to approach the experience based on "Papa a la Huancaína"; from Ecuador, it was proposed to use the "Encebollado"; and from Colombia the "Sancocho colombiano" (Figure 7). As a result, 30 worksheets with complementary activities to the educational resource sets were produced.

Figure 7

Example of diversification of educational resources through the international work phase



As an example of how the conversation was held, in meeting 2 (see Figure 5) there was a dialogue regarding "Nutrition, Hygiene and Health" where the international group shared their personal experiences with food considering their own countries. This kind of conversation were giving shape to the final resources. An illustrative utterance of this exchange is presented as follows.

Ecuadorian teacher: In our country, it is called '*encebollado*' (...) is typical from the coast, the ancestors made it with salad fish (...) it is very easy to be made and it is delicious (...)

Chilean teacher: In the case of Chile, we are going to talk about '*charquicán*' (...) when I heard your dish, I thought it was cold because you say that it is a refreshing dish, but I realise now that it is hot, like our '*mariscal*', I remember going to the '*Mercado central*' (...)

Ecuadorian teacher: (...) yes! We called it '*levantamuertos*' it is perfect right before a big party

Chilean teacher: (...) in Chile, we call it '*levantamuertos*' too (...)

In the utterance, the dialogue is held in the academic space of building the educational resources, yet the exchange is intertwining the personal experience and the academic task. For us, this became a key feature to consider the creation of a new academy that is feminist (because of the plurality of experiences) and decolonial (because of the disruption of the supposed academic language). This strategy on the international stage allows us to diversify the previously designed resources and enrich the educational programme by presenting new realities, words, and ways of naming things such as food. Besides, the stage also made visible some problems and ways of approaching them, highlighting our Latin American diversity.

What was the result? A STEM education programme contextualised to Latin America based on a feminist and inclusive working model

As a result of this experience, a comprehensive STEM education programme that addresses energy, environment, and health issues for students from 4 to 15 years old was developed². These educational resources are open, in a blended learning format, with a gender perspective, contextualised to Latin America, and inclusive because they are developed under the Universal Design for Learning. It includes activities based on the presentation of real problems contextualised to a specific place in Latin America. For students, a journey through different countries is presented, accompanied by characters who tell stories and invite them to participate. In addition, it includes a guide for facilitators, an alignment with the learning objectives of the curricula, a self-assessment sheet that involves “knowledge” and “*sentires*”³, and a YouTube channel with complementary audiovisual material.

Regarding the blended learning format, the characteristics of these educational resources allow them to be used in different ways: they can be used as digital or printed material, in colour or in black and white. When used in printed form, it allows students to record their answers, draw, cut out or paste different elements that will enable them to interact with the material. When used in digital format, they can record their answers using a notebook or any other resource that suits them. The resources have been elaborated considering that those using them can be at school or home. In doing so, a document with guidelines for facilitators is included, understanding that any person can accompany the teaching and learning process. This consideration recognises the critical role of the family, which teachers reported during the diagnostic stage. In turn, the educational resources contemplate the use of easily accessible, low-cost materials, which can be substituted according to what is available at the time and place where the activity takes place. Materials are listed according to their function in action (e.g., “to do this activity, you need something to protect your hands”) to guide decision-making and facilitate student participation and action.

The activities of this educational programme present a suggested pathway but can be used independently and adapted as necessary. The important thing is to select those activities that are useful and interesting for each learner, recognising the context, the proposed objectives, and previous experiences. The main objective of the programme is for each student to be able to tell part of their daily lives, to tell what they know, to question, to analyse situations, to imagine, to test their ideas, to design, to learn about other life experiences, to participate with their ideas in problem-solving and to engage in actions that contribute to their community.

Accessibility and gender perspective: Towards a feminist and inclusive practice

These educational resources were developed from an inclusive education approach associated with cognitive accessibility. This can be understood as the generation of conditions, whether environments, materials, activities, instructions and others, that seek to promote the understanding of the resource and participation in an autonomous manner, diversifying learning experiences to respond to the characteristics and needs of a greater number of people.

Experimento blended has been developed under a Universal Design for Learning model (Frolli et al., 2023), which means that, from its foundations, different forms of motivation, representation and expression have been considered to cover a wide range of learning possibilities. In this sense, the design of the activities includes the presentation of different characters -boys, girls, women scientists, adolescents from Latin America- (**Figure 8**), the use of iconography to clarify the type of tasks to be carried out and the writing of the texts in an easy-to-read format.

² Webpage with the resources: (anonymised version) [https://\[name of the centre\].cl/experimento-blended/](https://[name of the centre].cl/experimento-blended/)

³ We choose to say *sentires* in Spanish because is more than ‘to feel’ in English, *sentires* in plural tries to incorporate the idea of diversity in the way ‘sentir’ is experience in every individual.

Figure 8
Main characters of the co-designed educational resources



Source: Examples from the co-designed educational resources.

The gender perspective was addressed by diversifying representations of gender, families, bodies, intellectual attributes, and the affective and emotional dimensions (Cordero & Troncoso, 2020; **Figure 8**). All activities were designed to avoid simplifications and generalisations and use stereotypical attributions. In addition, inclusive language was used to address people, avoiding using the masculine as universal and instead using epicene nouns and non-personal forms of verbs. Finally, from a feminist perspective, we promote both the encounter and the resignification between public and private knowledge and popular and academic knowledge. We try to avoid the different expressions that could encourage or mask gender-based violence (MINEDUC, 2019).

Figure 9
Incorporating gender perspective by diversifying gender, bodies, intellectual attributes, and affective dimensions



Source: Examples from the co-designed educational resources.

Therefore, inclusive language was used to challenge people, avoiding the masculine as universal and instead using epicene nouns and non-personal forms of verbs following an ongoing discussion of inclusive language, which in Chile has resurfaced from 2018 regarding gendered words. In Spanish, the most general use when referring to a person are gendered forms such as *he* (in Spanish *él* or *ellos* as masculine plural) which assumes the masculine as neutral. However, there is a slow increment of inclusive language forms, for example, using the words *las*, *los* and *les* (*les* rarely and controversially used), where *las* refers in plural to women, *los* refers in plural to men and *les* with the incorporation of the letter ‘e’ as a non-binary understanding of gender. In doing so, there is a shift in the activities, language, and images presented in educational resources allowing students to fully access the different knowledge surrounding them, dignifying and reinforcing diversity and the various ways of building knowledge. Thus, language and images are ‘allies’ because they allow us to show various representations highlighting our society’s diversity.

Discussion and conclusion

Regarding the process of redesigning the material, there was a shift in terms of the perspectives incorporated (feminist and inclusive), which, in turn, shifted the potential of the resulting materials. This shift was due to a mode of working on both the local and international stage, which can be transferred to other realities that attempt to include feminist, inclusive and multicultural perspectives to the products and the process itself.

The following diagram (Figure 10) shows a summary of the main aspects related to the process of redesigning the material. It illustrates the central elements of a working model that we have characterised as feminist and inclusive. As stated by Flores (2014) and hooks (2021), among other authors, it is of interest to promote in the academy a re-signification of experiences and *sentires* (Enciso et al., 2021) because it is not only from cognition that knowledge/*saberes* is constructed, but it involves all the dimensions that constitute the person.

Figure 10
Diagram characterising the working model developed



Feminist studies recognise the role of emotions in producing knowledge by dismantling the mind-body, man-woman and reason-emotion dichotomies (Enciso & Lara, 2014). In this framework, the resources were developed through a work strategy based on collaboration and good treatment (Hipólito & Martínez, 2021), in which a diverse group of people participated - teachers from different disciplines and

educational levels, professionals with different life experiences - who were able to be involved in the exercise not only from their theoretical knowledge, but also from their ideas about education, visions, interests, and the personal experiences of their life trajectories. This made it possible to develop a STEM education programme that dignifies diversity and challenges students in all its dimensions. Beyond developing an educational programme that pursues goals associated with a particular economic development model, this experience constitutes a new way of conducting research in education with a STEM focus, towards one that is contextualised, sensitive to culture and to the problems that affect us as a society.

This positioning is also related to establishing horizontal relations, where all voices are heard and respected, without subordination, thus straining the hegemonic power relations characterising the academic space. As Briones (2020) mentions, it is only when people collaborate and articulate together that new forms of knowledge production can be opened up. In this case, new ways of developing educational resources that promote the same respect, the same collaboration, and the same new ways of learning among students.

In our view, this shared experience meant another possibility of being in Academia. The scientific enterprise has mostly assumed itself to hold qualities conceptualised in the Western tradition as masculine attributes, such as social autonomy, the transcendence of the socially concrete, competence, objectivity, and impartiality. This has led, as pointed out by Isabelle Stengers in her work titled “Another science is possible” (2019, p. 42), to “most scientists representing and presenting themselves as those who heroically resist the temptations of the ‘opinion’” as if something to be avoided. This problem has resulted in the invisibility of the political, social, and attitudinal aspects and interests of science (Tolbert & Bazzul, 2017), which has allowed biases and stereotypes to permeate the scientific activity through the ethos of science, its guiding principles, and its function, as well as the problems/body of knowledge studied, and the content produced.

In response to this academy that denies, excludes, and makes invisible the knowledge configured *in/from/by/for* the global South, and because its rhetoric hides its logic directed towards epistemic, epistemological, and methodological coloniality (Mignolo & Walsh, 2018), we propose, from a feminist epistemology built through a process of deconstruction, a way to dismantle the guiding principles of science that is hegemonic-androcentric-white-adult and bourgeois. In doing so and based on principles such as emancipation and social change, research and academic work now must serve historically subordinated groups, questioning authoritarian attitudes and positively positioning personal experience in the scientific field as a way of being a science person (Avraamidou, 2020). For us, a way to address that is throughout the Feminist epistemologies, which stress the androcentric and sexist character of the scientific enterprise, evidencing the exclusion of stories, experiences and interests of women and diversities, and the gender inequalities in the constructing knowledge (Haraway, 1995; Harding, 1991).

This positionality comes from the feminisms of situated science and the feminisms of the South, framed within critical thinking, which question and stress the objectivity of science, the relationship between the body and the territory, and the relationship between thinking, feeling and experiencing scientific research; invited us to move away from a traditional epistemology and to adopt a position from the border, bringing with it the influence of alternative epistemologies (Moore, 2018).

In this sense, it is urgent to promote collaborative academic spaces such as the one from this experience, where collaboration is recognised as a strategy that allows addressing the difficulties that may arise in our work or context, like the challenge of distance education. This collaboration is presented as an alternative to the competition, considered a fundamental aspect of today’s scientific activity, so this project allowed us to test/question substantial elements of the traditional academy, inviting us to reflect on new ways of building knowledge.

We conclude that the resulting material and the work conducted to design them highlight collaborative, multidisciplinary, and multicultural work in undertaking creative solutions in diverse and changing contexts. The process aligns with the ideals of equity, development, and sustainability of the 21st century conceived in collaboration. Given the current scenario of global challenges, collaborative work between countries allows us to rescue strategies and solutions with a territorial imprint, highlighting our knowledge/*saberes* (Smith, 2016) while putting them at the service of educational resources relevant to each context. The experience presented here constitutes a working model that could bestow the generation of spaces for dialogue between countries, not only in Latin America but also for cooperation worldwide. From these spaces of collaboration, possibilities of decolonising subjects and knowledge can be opened up, articulating solutions to shared problems in fields such as science education and education with a STEM approach.

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