

An integral intervention

The enchantment and ethics of STEM
Education among public servants in
Colombia

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I, Juan Forero Duarte, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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Abstract

This thesis studies STEM Education in Colombia. It explores how different types of actors in Colombia design and disseminate public policies that prioritise the usage of technology in education in relation to the moral pursue of a 'collective good.' Through 14 months of ethnographic fieldwork inside educational innovation labs, capacity-building workshops, policymaking meetings, and promotional events, plus interviews with policymakers, international consultants, private contractors, mid-level state managers, and teachers, the thesis asks what 'work' does moralisation do to establish STEM Education as national policy in Colombia, and what can that process tell us about the persistence of technology-based solutions in education as a neoliberal form of governance. The question is based on the observation that the public servants who identify themselves as 'STEM enthusiasts' celebrate the social potential of technology whilst critiquing approaches that rest on technical solutionism alone. The thesis examines the emic concept of 'integral intervention' (*intervención integral*) as a heuristic to approach these ambivalences. An integral intervention is one that weds imperatives of a systematic, technical state solution and ethical-political exhortations to work for a marginalised other. By analysing the various ways and moments in which STEM Education becomes an integral intervention, I argue that the promises of technology transforming the country's public education system are not only sustained by political 'branding' and fetishisations of STEM but also through the revaluing of STEM's limitations as a way to value the actors' practices of sacrifice and care towards the public good. The thesis sheds new light on how technology keeps being an enchanting promise in state-making projects in Latin America and beyond. It also proposes the notion of 'techno-moral valuing' to generate a dialogue with critical studies of technology education, policy, and politics.

Impact statement

This thesis brings new empirical findings and an alternative analysis to the anthropological study of technology within state policies and interventions. By asking how to understand public servants' recurrent enthusiasm for technology amid failures and shortcomings in Colombia's public education sector, the thesis questions the privilege of technology-based solutions in the imaginaries of state representatives, policy programmes, and state institutions.

The thesis focuses on state education, an ethnographic setting relatively unexplored among anthropologists interested in the intersection between technology, politics, and the state. Moreover, the thesis examines Science, Technology, Engineering, and Maths Education (STEM). Despite its immense popularity, STEM is a pedagogical approach that has barely been studied ethnographically and anthropologically. Beyond the novelty, the thesis' empirical focus revealed two main findings. Firstly, the thesis showed that public servants in Colombia, especially public schoolteachers, value their ethical drive and moral project when implementing STEM projects – rather than just feeling enthusiastic about the transformative potential of STEM at schools. This insight is important because it brings the theme of ethics and morality to the forefront within discussions of science and technology and state promises to bring progress, development, or social improvement in general. In other words, it offers an alternative analytical route through the concept of 'technomoral imagination.'

Secondly, the ethnography showed that STEM enthusiasts within the Colombian state have a specific reaction to failure – i.e. when they realise that STEM will not fulfil its promise of improvement. Instead of rejecting STEM altogether or denying/occluding its limitations, public servants revalue them. They make shortcomings an indicator that more ethical work is needed. This insight is relevant because it adds an alternative ethnographic explanation of why technology keeps being the preferred tool of state intervention even

when it is evident that it does not do what it promises. The thesis brings a Global South perspective that takes seriously the legacies and effects of the Global North casting countries such as Colombia as 'failed.' Failure inhabits the imagination of state representatives in complex ways. Hence, the thesis offers a way of understanding failure from an emic perspective, not just something that only the ethnographer can see and evaluate.

Beyond academia, this thesis can help policymakers evaluate the role and place of crucial actors around techno-educational policies. The thesis showed how public schoolteachers play a vital role in implementing the policy. There are already efforts to integrate teachers into the policy process and recognise their importance. However, this recognition has yet to effectively break the power dynamics that cast teachers as second-class public servants. The thesis advocates for policies that benefit and recognise teachers' efforts.

Finally, this thesis can contribute to a wider public debate about the actual benefit of technology-driven educational policies beyond the inflated expectations and grandiloquent promises behind them. Can we detach our imagination from technology's promises? Can we break its spell? Can we go beyond the idea that technology's advancement is inevitable?

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All mistakes in this thesis are my own.

Abbreviations

AI – Artificial Intelligence

ASCyT – *Apropiación Social de la Ciencia y la Tecnología*, Social Appropriation of Science and Technology.

CIED – *Centro de Investigación y Educación Docente*, Teacher Education and Research Centre.

CpE – *Computadores para Educar*, Computers for Education.

CTA – *Centro de Ciencia y Tecnología de Antioquia*, Antioquia's Centre of Science and Technology.

ICT – Information and Communication Technology.

IIA – Inter-Institutional Articulation.

KVD – *Kioscos Vive Digital*, Digital Living Kiosks.

MEN – *Ministerio de Educación Nacional*, National Ministry of Education

MinCiencias – *Ministerio de Ciencia, Tecnología e Innovación*, Ministry of Science, Technology, and Innovation.

Mova – *Centro de Innovación al Maestro*, Centre for Teaching Innovation.

MP – *Movimiento Pedagógico Nacional*, National Pedagogical Movement.

OECD – Organisation for Economic Co-operation and Development.

PBL – Problem-Based Learning

SEM - *Secretaría de Educación de Medellín*, Medellín's Secretariat of Education.

SENA – *Servicio Nacional de Aprendizaje*, National Learning Service.

STEM – Science, Technology, Engineering, and Maths.

TpA - *Tecnologías para Aprender*, Technologies for Learning (public policy).

VS – *Vivero del Software*, The Software Greenhouse.

WEF – World Economic Forum

Introduction

Technology can make us better – and technology will make us better. Or, as the geeks would say, given enough apps, all of humanity’s bugs are shallow.

– Evgeny Morozov.

Through the quote above, Evgeny Morozov was defining with a touch of sarcasm what in his book *To Save Everything, Click Here* (2014) he calls ‘techno-solutionism’: the recurrent and ubiquitous promise that technology can (and will) solve every problem in settings as varied as personal health, leisure, work productivity, democracy, politics, and bureaucracy. Education has been one of those sectors in which such a promise has taken hold. Technology education (also known as EdTech)¹ is the set of apps, platforms, methods, and policies that aim to “impact or gain knowledge of skills in educational settings” (Mirrlees and Alvi 2020, 3). The term is usually related to discourses of skills improvement in terms of employability and entrepreneurship (c.f. Bacevic 2014). However, in post-conflict Colombia, the promise of technology education seemed different: it was about how education and technology could be used to produce a tolerant and peaceful citizen.

In 2016, the Colombian government reached a Peace Accord with the Revolutionary Armed Forces of Colombia (FARC), finishing half a decade of armed conflict with the oldest Left-wing guerrilla in the continent. The Accords fed from liberal and

¹ I choose the term technology education over EdTech. I treat technology education as the umbrella term, and EdTech as one of many buzzwords that aim to make the industry catchy and alluring. I do this because, as I will later show, I will focus on STEM Education, another term that acts as buzzword and that sometimes competes with EdTech, so in this way, I want to avoid confusion and make analytical distance between my object of analysis and the emic terms that appear in my field site. I also choose technology education over digital education because the term technology comprises other, not necessarily digital, technical objects.

technocratic peace-making procedures from the international community to reincorporate guerrilla fighters into 'civil society' and created several new policies to target the social and economic inequalities that originated and perpetuated the political armed conflict. The Accord and its subsequent implementation broke with the militarist approach of the previous government, led by right-wing politician Álvaro Uribe, who saw violence as the root of social and economic problems rather than the other way around (Rojas 2009) and considered armed force as the only viable way to end with the rebel groups.

The stakes were high at that time. Apart from the official signing of the Peace Accord, Juan Manuel Santos – the country's then president – promised Colombians to take the text to a popular referendum so that the 'Colombian people' could decide on approving the agreements. The government has set several strategies to disseminate the contents of the Accord and make the 300-page text into more pedagogical and friendly formats, calling the strategy a "Peace Pedagogy" (Burnyeat 2020). In that way, Colombians could understand the importance of the agreements and vote “yes” to the implementation of the Accord. Following that same institutional enthusiasm and drive to approve the Accords, the Colombian Ministry of Information and Communication Technologies (MinTIC) announced that they were going to repurpose a network of public internet kiosks – called *Puntos Vive Digital* or Digital Living Points – into what they termed 'Peace Points' (*Puntos de Paz*). The *Puntos Vive Digital* (henceforth KVD) were public Internet cafés that provided internet access and technological resources to rural and remote areas of the country. However, with the new announcement, the MinTIC wanted to foster community engagement in Colombia's peacebuilding efforts. The kiosks became spaces for education, dialogue, and collaboration around the ongoing peace process (*El Tiempo* 2016).

Official state-led efforts such as the Peace Points interested me. I originally conceived this research project in Colombia to inquire how technology and education could be enrolled in state-led interventions that diverged from the mainstream discourse on employability and economic development. While state-led, technology-driven approaches to education are often examined as neoliberal, market-oriented projects of

self-improvement (c.f. Rudd 2013; Greene 2021; Apple 2004), I was intrigued by the implications of these technologies being framed in Colombia as tools for reconstructing citizenship and social harmony in a post-conflict context. The critical approach to technology education was helpful in understanding what was happening in Colombia. The Digital Kiosks were initially designed to offer Internet connectivity and train citizens in technical skills to improve their competitiveness in the labour market. They served as hubs where citizens could access online services, acquire new skills by themselves, and adopt technology for their entrepreneurial projects. Still, the new emphasis on keywords such as peace, social reconstruction, and conflict resolution raised the question of the result of state-led technology education projects navigating between fostering individual market competitiveness and promoting collective goals of reconciliation and citizenship-building in a society emerging from conflict.

However, when I could finally start fieldwork after the COVID-19 pandemic in 2020, almost five years after my initial research idea, the framing of education technology through a lens of post-conflict reconstruction faded away. Similarly to what happened in 2016 with the Brexit referendum in the UK, 50,2% of Colombians voted “no” to approving the Peace Accord, forcing the government to renegotiate some of the agreements (BBC 2016).² A year later, Iván Duque, a former Inter-American Development Bank technocrat and Álvaro Uribe’s protégée, won the presidential elections. Even though the Colombian state had to implement the agreements by law, Duque's right-wing government continued Uribe's logic that peace could only be attained through military offence and separated conflict resolution from any other social and economic policy in the country. Soon after taking office, the word ‘post-conflict’ dropped from public discourse, funding for peace-making projects diminished significantly, and government initiatives such as the KVDs erased any reference to the Peace Accords.

² Behind this result was a group of right-wing parties, conservative politicians, Christian collectives, and political marketers who, driven by the figure of Álvaro Uribe, disseminated misinformation to generate hatred towards the ex-guerrilla fighters and the government’s agreement – a usual trope in Colombia that builds a division between a national ‘us’ and a threatening, internal ‘other’.

The story of the KVDs taught me that in Colombia, the issue was not an either/or struggle between 'peace' (understood as a concern with the 'social') and 'neoliberalism' (understood as the marketisation of the self) within technology education. Instead, it was a struggle between two political projects that, although using different buzzwords, both used moral reasons to deploy technological and educational policies and projects in their governmental repertoire. By 'moral reasons', I mean ways of defining and enacting technology education as capable of attempting a 'common good.' The common good can be expressed through words like national peace and social reconciliation, as with post-conflict policies. However, the common good also goes beyond – that is, it can appear through notions such as the inclusion of marginalised populations, class equality, integration into the global market, national-scale development, social justice, environmental sustainability, cultural values, and the individual attainment of social norms. Thus, this thesis enquires about the moralisation of technology education in Colombia, and it does so by considering it a part of political, state-led processes of intervention through the form of policy. Let me briefly introduce the Colombian setting and my empirical case to explain what moralisation looked like in Colombia beyond the post-conflict debate.

Public, competitive, humanistic, holistic

The popularisation of technology – informatics, electronic, or digital – in the educational sector started in Colombia around the 1970s, with the arrival of the first personal computers in private and elite schools and then into the public school system (Martínez and Obregón 1988, 162). State-led projects that aimed to bring the benefits of technology into educational settings framed its importance in terms of inclusive modernisation and social development. Historian Jorge Benavides (2012) shows that the first public and national attempts at adopting technologies such as personal computers came through partnerships between the Colombian government, the Japanese government, and the

Massachusetts Institute of Technology (MIT), which was driven by a concern with both the increase of employability or human capital as well as the “acquainting of *all* Colombians with computers ... and the use of these by *every* student” (2012, 30; my emphasis). In the following decades, policies like KVDs and national law have also made explicit the importance of inclusion and access for all the nation through notions like “social internet” and the “right to information” (*Conpes* 3171 of 2002; Law 1341 of 2009).

Simultaneously, in the 1980s and 1990s, a strand of critical academics, unionised teachers, and policymakers influenced the Colombian public education sector and added other moral elements that also expanded to the subsector of technology education. These actors popularised the notion that technology education had to be an ‘integral’ intervention, that is, having a technical but also a ‘human’ dimension (c.f. Benavides 2012; Casas Nova 2021). Daniela Romero-Amaya (2024) notes that making educational policies ‘integral’ in Colombia was influenced by global discourses about the need to teach students technical and social skills. However, she also proves how Colombia’s educational policies were inflected by ideas connected to internal conflict and how politicians and policymakers understood the population as needing citizenship education to be ethical, tolerant, and non-violent subjects. Since then, state-led documents have placed emphasis not just on access and inclusion in technology education. Even though the Law 1341 of 2009 established the internet as a ‘right,’ it also stated that the internet and other communication technologies had to serve towards both the “increase of productivity and competitiveness” and the “respect towards Human Rights.” Recent technology education policies also used terms such as “integral education,” which, according to the Ministry of Education, involves “the recognition of [social and cultural] difference and the questions that interrogate the human condition and the state of culture” (Ministry of Education, n.d.)³.

Although the moralisation of technology education was present in several histories and scales of public and ‘state’ initiatives, and those histories will be important for the

³ “La formación integral en el ámbito universitario colombiano: Marco de reflexión.” Link: https://www.mineducacion.gov.co/1759/articles-302596_archivo_pdf_medellin_formacionintegral_nueve.pdf. Last accessed 30 December 2024.

analysis, I will focus on one specific case from an ethnographic approach. That ethnographic object will not be the KVDs. It will be a popular term in the country called STEM Education. As I said earlier, I initially set my research project to study KVDs as both an observation setting and a state programme being deployed. However, in July 2020, a national corruption scandal surrounded the renovation of the KVDs. The MinTIC and the consortium in charge of the project deployment stood accused of document forging and embezzlement. Once the scandal was out, the MinTIC announced that they would cease the contract with the private consortium to show that they were not allowing corruption practices within the institution. However, the consortium fought back and sued the Ministry for mishandling their contract, creating a double-bind situation: the Ministry could not hire a new contractor because of the legal action, and the consortium could not execute the project given that they were not the contractors anymore. The effect was that the KVD programme was paused indefinitely, and the public internet cafés ceased operations. On top of that, Karen Abudinen, the then Head of the Ministry, prohibited everyone inside the institution from talking to 'external' actors about the KVD project. That included me, so the few MinTIC officials I reached at that moment told me that our conversations would stop. I was left without 'my field' and interlocutors to talk to.

Before cutting ties with me, one of the MinTIC officials recommended I examine another technology education policy she knew about, called *Tecnologías para Aprender* (Technologies for Learning – TPA). I researched that policy and learned about STEM Education – the acronym for Science, Technology, Engineering, and Maths. After that moment, I heard the term ubiquitously: numerous textbooks and publications appeared on the topic (c.f. Botero Espinosa 2018; Cano Vásquez and Ángel Uribe 2020; Cano, Bermúdez, and Arango 2021), dozens of STEM projects have appeared in schools nationwide, several events and conferences have been celebrated, and at least a dozen local governments have designed their own STEM policies. However, apart from its popularity, the relevance of STEM lies in its ability to stand as the solution to economic and social problems. The National Science Foundation (NSF) coined the term in The United States in the early 2000s (Lyons 2020) to join all the professional disciplines in

charge of innovation-related economic growth and promote them together through a national policy to make more high-schoolers interested in pursuing a degree in one (or more) of them. In that way, more 'talent' would be available to strengthen that country's economy. However, STEM was not just about dazzling students. Over the years, other actors have adapted the term to mean a set of skills and methods from the Technology sector (i.e., Silicon Valley) that can help students and their contexts beyond employment. It was common for me to hear that STEM could help towards climate change, territorial sustainability, conflict resolution, local cultural values, inequality reduction, and other moral aims that involved pursuing a common good. It was common for me to hear that this was all possible because STEM was 'integral' and holistic – it joined disciplines, actors, approaches, and technical and ethical skills together to create a single, complete intervention.

Thus, in Colombia (and in the case of STEM in particular), there is a particularly strong emphasis on public institutions in the policy sector on the moral impact of technology education in terms of how it includes the entire population and how it creates humanist and holistic (technical and non-technical) effects. That moral impact does not fit entirely with the neoliberal equation that technology will create employability and economic growth, bringing social prosperity. Instead, moralisation in Colombia means bringing competitiveness and marketisation *plus* social inclusion and ethics through technology – as if morality exceeded the neoliberal promises of social prosperity through market growth and made that framework insufficient. This thesis will examine such forms of moralising technology education – why, how, and when has STEM Education acquired those specific moral inflexions in Colombia – and through that ethnographic aim, the thesis will enquire more broadly about the role of moralisation in governance projects such as technology education.

Neoliberal politics and the place of moralisation

Given that this thesis explores the moralisation of technology education as part of a public governance process, I engage with recent studies in the social sciences that examine technology education's social and political side. As Neil Selwyn and Keri Facer (2013) have already noted, a critical⁴ strand studying technology education has emerged in response to an over-emphasis in studies that examine technology education exclusively in terms of 'learning' within the confines of specific school activities, with little attention to how these activities are embedded in wider social and cultural processes. These critical authors have made a significant contribution in revealing the politics – understood by them as the power relations and governance projects – behind the arrival of techno-solutionist discourses and businesses into the educational setting (Mirrlees and Alvi 2020; Grimaldi, Ball, and Peruzzo 2023; Selwyn 2016; Greene 2021). Concretely, they have illuminated how, with the arrival of new technologies, there has been a simultaneous transformation and reinforcement of the already popular neoliberal discourses that vilify public schooling, privatise learning, define education in terms of efficiency and service-providing, and establish teleological, market-driven futures. They have shown how private, for-profit actors have become part of the policy ecosystem of technology education (Ortegón, Decuypere, and Williamson 2024; M. Ivancheva and Courtois 2024; Komljenovic et al. 2023; S. Ball and Grimaldi 2022; Chan 2019), and how relations between investors, policymakers, and project recipients acquire an economic value through processes of assetization, consumerism, and profit-making (Wollscheid et al. 2023; Peruzzo, Ball, and Grimaldi 2022). They have contributed by showing how a regime of governance in technology education is more dynamic and heterogeneous than we usually think of and that this new political configuration is tightly bound to capitalist actors and neoliberal logic.

However, an issue that is less explored and problematised within this body of literature is the role of moral judgements and justifications within neoliberal and capitalist

⁴ I use the term critical because it is the way many of these authors describe themselves as. However, in theoretical terms, the critical strand in technology education is varied, condensing approaches coming from political economy, governmentality studies, postcolonial studies, and STS among others. It also comprises studies from different disciplines: anthropology, sociology, history, education, and political theory, among others.

colonisation of education through technology. Apart from a few exceptions (M. P. Ivancheva et al. 2020; Grimaldi, Ball, and Peruzzo 2023; Martínez and Olsson 2021), the topic appears tangentially, so there is still a need for studies that take moralisation as their main object of interrogation and that explore its place within the governance and politics of technology education in order to add to those existing insights.

When the topic of moralisation appears, critical authors of technology education usually interpret the claims of social and public benefits as a rhetorical tool that private actors deploy to enthuse, persuade, and enchant policymakers, state officials, teachers, and other 'conventional' actors of the technology education sector to work towards their interests and reproduce ideologies, practices, and hierarchies (c.f. Mirrlees and Alvi 2020, 18; Rudd 2013, 156). For instance, Emiliano Grimaldi *et al.* (2024) examine Microsoft's educational tools during the COVID-19 pandemic and argue that these platforms have become central to education governance, transforming educational interactions into economic transactions (intending to secure educational institutions as long-term clients through the offering of free tools). More specifically, they contend that such transformation involves a process of moralisation, whereby digital platforms and technology education companies frame their actions as morally and socially beneficial, aligning themselves with values like equity, inclusion, and democratisation of education. This moralisation creates a neoliberal moral economy in which private companies present their profit-driven interventions as solutions to public education problems. Moral justifications make part of a "branding" effort to make technology education "a commonplace in daily practices, ... establishing a relationship between the [technology education] brand, feelings of trust, moral well-doing, and public recognition" (Grimaldi et al. 2024, 125).

In the words of Francesca Peruzzo *et al.* (2022), technology education "is very much a field of incitement, seduction, multiplication and expansion" (2022, 13). In this field of persuasion and expansion, new policy actors give a place to moralisation as a discursive tool that consecrates an ideal collective order and devotes people to making it come true in the future. Moral claims of social improvement serve investors to position themselves – it gives them relevance as saviours of a dying public education system. Such

a narrative usually follows a message that is well condensed in the title of an article by Janja Komljenovic *et al.* (2023): "When policy education 'fails'[,] venture capital 'saves' education." The 'common good' narrative at stake also encompasses teachers and policymakers, casting them as 'heroes' as long as they work towards the 'future' of education in the direction indicated by the technology education industry (Peruzzo et al. 2022, 12). Finally, this ideal also generates the concealing of past failures (Chan 2019), present shortcomings (Sims 2017; Ames 2019), and future consequences (Mazzarella 2010) of technology education.

What I have been trying to show in this section is that, within the existing research on technology education's political processes of governmentality, an important yet marginal question is: what 'work' does moralisation do for the establishment and reproduction of neoliberal, capitalist forms of the education sector's governance? It is a query that points to the empirical appearances of moral justifications and valuations and to what place moralisation has in our conceptualisations as researchers when thinking about the politics of technology education and beyond. The usual answer is that moralisation appears as part of a rhetorical toolbox that private actors and policymakers possess to advance their interests. In a conceptual sense, moralisation is subordinated to political actions and power relations among a given set of actors.

My research also deals with the political side of technology education – i.e., when technology education is embedded in forms of governance, like state-led national policies in Colombia. Furthermore, my empirical question on the moral form and value of technology education in the specific setting of post-conflict Colombia points towards a similar direction regarding understanding the place and role of moralisation in technology education. However, the answer I arrive at is, to a certain extent, different. What I argue here is that, as much as the role of moralisation in the political economy of technology education points to branding an ideal of 'social improvement through technology,' moralisation also does another 'work': sustaining the cyclic appearance of technology education policy amid failures and shortcomings. Conceptually, while I agree that moralisation depends on the political manoeuvres and dynamics of governance that

sustain neoliberal technology education, I also see moralisation as the base through which political distinctions and dynamics appear in the first place, which is what re-ignites the hopes towards technology education. Perhaps it is best to start with my points of departure to unpack this argument.

Multiple policy and the diversity of moralisation

As I said earlier, the critical social and anthropological studies of technology education have successfully unveiled important aspects of the workings and effects of technosolutionist (Morozov 2014), neoliberal, and capitalist logic in education, and they have done so by going beyond the 'state oppressor versus oppressed society' simplification. They show how power relations in technology education can be better understood as emergent and heterarchical networks of expected and unexpected actors that encompass but exceed public workers and state institutions. In most of their accounts, those unexpected actors are private organisations involved in business and profit: technology education entrepreneurs, venture capitalists, platform managers, Big Tech companies, and even technological products like computers and software (Nichols and Dixon-Román 2024).

A key notion in this analysis is 'policy' (Žmavc and Bezlaj 2024; Ramiel 2021; S. J. Ball 2016). Policy is, in many cases, central within these 'new networks of power' (Williamson 2019) and an analytical entry point to examine those networks as dynamic and emergent. Many of those private actors target policymakers and educational institutions to lobby their views through new policies and programmes, and state institutions use policy to implement those same (or similar) views into the educational sector. This set of heterogeneous actors does not simply comply with policy; they do 'policy work' by establishing and disseminating forms of governing relations and values (Williamson 2019; S. J. Ball et al. 2011).

The critical literature of technology education feeds from a wider contribution in policy studies that has been growing: policy is not simply a technical, ordered procedure with established steps, a perfectly bounded scope, a clear purpose, and a homogeneous set of policy actors. Pioneering anthropological studies in the 2000s showed how policy is constantly changing meaning (Shore and Wright 1997; Shore, Wright, and Però 2011): policy is the sum of all the inflexions and resignifications of different actors and situations that coalesce in the process, creating spaces for persuasions, negotiations, and resistances. More recently, authors have borrowed and developed concepts that allowed them to explore the multiplicity and internal differentiation of policy without thinking exclusively in terms of discourse, meaning, and representation. Terms such as assemblages, translations, entanglements, and ecologies have become central in exploring these more-than-discursive processes (Lendvai-Bainton and Stubbs 2024; Lea 2020; Clarke et al. 2015; Mosse 2004). Rather than limiting the analysis to different meanings as tidy and distinguishable interpretations of policy, these terms have allowed us to see the policy as a material, contingent, ambiguous, and heterogeneous encounter of humans and non-humans. Within these assemblages, interactions of all types produce translations, negotiations, and compromises of what the policy is and should be (Clarke et al., 2015). In neoliberalism, policy becomes a central form of governance, and policies get constantly manufactured and moved in a way Jamie Peck and Nick Theodore call 'fast policy' (2015). Policy (and technology education policy specifically) is multiple and dispersed, but simultaneously, it is interconnected and unified as a form of governance (Mosse 2004).

I bring this wider view of policy because, similarly to other critical studies of technology education, I also feed from these insights on policy to approach STEM education. This approach is important to understand the multiple and sometimes messy appearances of STEM Education as policy. After the KVD's corruption scandal and my pivoting towards TPA and STEM Education, I researched these terms more. In doing so, I found various definitions, dozens of actors interested in and promoting it passionately, and several programmes and policy documents trying to implement it. I realised at that

moment that there was not only one policy, one policy document, and one form of delivering STEM as a project. Using Tess Lea's (2020) terms, I was taking for granted the rationality, order, and tidiness of policies when – as I showed above – policy was much more messy and unruly than policymakers claimed it to be. KVD was not the only technology education policy in the country, nor was TPA. By the time I was researching STEM in Colombia, at least half a dozen local policies had been designed, and other national policies were using other technology education buzzwords similar to STEM, such as Technological Appropriation, Maker Culture, Computational Thinking, and digital education, among others. KVDs and TPA were but one materialisation of a more general idea of how science and technology could improve education. STEM was similar, as it was among many other ways of framing the promises of technology in education, and it was a way of framing technology education that was constantly proliferating and repeating itself in different contexts.

However, I also find it curious that, even though there is an emphasis on policymaking as a heterogeneous and multiple process, there is no correspondence between such multiplicity and the way moralisation appears as mostly a 'branding' phenomenon. If policy is such a dynamic process, and if it involves bringing about moral justifications in technology education, why does moralisation seem unidimensional (i.e., as pertaining only to 'branding')? My first point of departure is that I see the heterogeneity of technology education policy as linked with the heterogeneity of moral justifications and moral evaluations. As Laurent Thévenaut and Luc Boltanski (2006) argue, there is not just one way of conceiving the moralised order of society – what we can call a normative ontology of what society should be. They identify many types of these ideal common worlds in which different types of actors receive a different place and sense of worth within it, and each of these orders points at different entities reifying and illustrating them: the kingdom of God, Society, the State, and the Market, among others. Thus, the economist's view of the collective order as behaving like a 'Market' is also moral because it is a normative order that values actions as 'good' or 'bad'. These orders do not appear in pure form in everyday life; instead, they are materialised and brought into social interactions in

hybrid forms: they are mixed and transformed when actors want to justify an action of their own or evaluate a situation or an action of others. Mariya Ivancheva *et al.* (2020) show this in the case of online higher education in South Africa, arguing that learning platforms and university managers enact two different, conflicting, yet entangled moral logics: social and market-oriented. I want to add to this argument by developing the idea that there are different ways (happening simultaneously) of mixing and entangling these moral orders when making and sustaining technology education policy. Those enactments and materialisations of moral valuations can be more heterogeneous and contingent than expected. However, they can also be connected to each other in how they advance the same government regimes. Thus, within the more general enquiry of the role of moralisation in the establishment of technology education policy as a neoliberal form of governance, we could ask what the different forms of moralisation are (and the different combinations of them) in the process of making STEM Education a policy in Colombia.

State-related actors and the fetishisation of ‘the state’

The possibility of more ways of apprehending moralisation takes me to a second point of departure. While I enthusiastically embrace the approach of heterogeneous social networks of governance and power instead of assuming the existence of a thing called ‘the State’ that is apart from social and economic processes (*sensu* Mitchell 1999), I also identify a lack of empirical attention of these critical studies of technology education policy on public institutions, publicly-paid professionals, and the idea of ‘the state’ in general – a space I consider fertile to explore moralisation more diversely. For example, through the examination of an online platform for pedagogical resources in the UK, Francesca Peruzzo *et al.* (2022) argue that within the making of technology education as a ‘fast policy’ that establishes a technological solution to a social problem and that can be replicated everywhere, there is a process of *destatisation*, that is, the de-centring of ‘conventional’

state institutions and actors and its relocation into an assemblage of new actors such as investors and companies.

However, for these authors, the destatisation of education through technology does not mean that governance is over. On the contrary, destatisation produces *restatisation*, that is, the reproduction of state governance through a different shape and means. However, for these authors, 'old' state-related actors and institutions become "a market midwife, fostering and forging an infrastructure within which the private sector can flourish and at the same time addressing what are identified as entrenched problems with the education sector" (2022, 6; for another argument going on a similar direction, see Rudd 2013; Selwyn and Facer 2013, 14). As much as I share their conclusion (i.e., that we have to see technology education policy as a disparate and heterogeneous form of public-private governance that does not fit with the idea of 'the state' as a homogeneous apparatus), I do not share their view of 'old' state institutions and the relegation of 'the state' merely as a facilitator.

Instead, I approach state-related institutions and roles (policymakers, state managers, state-paid teachers) as active participants and 'the state' as a still important reification (in an emic sense) in making technology education policy. In fact, I suggest that the re-centring of our attention towards bureaucracy and the state provide the spaces and practices through which we can explore other angles of moralisation beyond 1) its enchanting role for 'branding' and 2) as subordinated to new forms of power and politics. I follow sociological and anthropological studies of bureaucracy that have shown the importance of clerks, managers, police officers, teachers, and social workers' agency and positionality in the reproduction of state and non-state government (Lipsky 1983; Dubois 2010; Maynard-Moody and Musheno 2009; Bernstein and Mertz 2011; Lea 2020). More specifically, I align with studies that show how, in the Latin American context, such agency and positionality of bureaucrats is strongly moralised – it seeks social equality and inclusion – and that moralisation of bureaucratic power is directly linked to an imaginary of 'the state' and its still-relevant role (Dávila 2017; Gatti 2013; Nading 2017; Levy 2019; Beitler 2013; Ramos and Gallego 2014). In the words of Inés Dussel *et al.* (2013), when

examining a technology education programme in Argentina, "unlike much global jargon about individualism and liberal freedom, the central statements of the [technology education] policy refer to the need to level an unequal [social] playing field through the intervention of the state" (2013, 129).

Similarly to the accounts of technology education's heterarchical networks of power, the presence and influence of private actors (both for-profit and not-for-profit) around STEM Education policies in Colombia is undeniable. Their presence was evident through two roles. The most explicit and obvious one was through the process of outsourcing 'state' tasks of deployment and management of private actors as 'contractors.' The outsourcing of public services has a long history in Colombia, coming from the popularisation of neoliberal approaches to public management in the 1980s and increasingly important in the 1990s and 2000s. In 2002, a state reform shrank the state by half and mandated that every state institution had to translate policy into projects and hire private organisations to materialise such projects through Invitations to Tender (Ocampo 2018). In the technology education sector, three main services were offered: The buying and delivery of technical objects like computers and 3D printers, done by crafting and distribution companies; the making of events like conferences, contests, capacity-building workshops, and networking spaces, made by event companies or education consultants; and the crafting of pedagogical guides and materials, made usually by special teams from local universities that acted as 'consultants' and service providers. These private contractors influenced what objects were delivered to schools, how and when they were delivered, and the specific content of pedagogical guides.

On top of contractors, other private actors and institutions were influencing the constitution of technology education as policy. These private actors were usually not hired by state institutions. Rather, they worked in partnership, pushing forward their interests and viewpoints of what education technology, specifically STEM, should look like and produce. These actors usually came from the third sector: multilateral organisations like the Organisation of Economic Co-operation and Development (OECD), bilateral organisations like the British Council, think tanks and 'expert' academics from national and

international universities, and the philanthropic arm of Big Tech companies. In the case of STEM, the most influential actor was Siemens Stiftung, the foundation of the German technology giant Siemens. They saw STEM as the best way to generate collaboration among students and teachers and nurture practices of sustainable development in the classroom as a result. Siemens Stiftung sustained a Latin American network of teachers, advised local and national governments in creating their STEM policy documents, and created an open-access platform full of pedagogical resources.

These 'new' policy actors were undoubtedly influential, and one could say they used state institutions and actors as 'proxies' (Vonderau 2019) to advance their own interests and goals. However, the presence and influence of public and state-related actors were also too significant to ignore. In Colombia, there were three main national ministries in charge of technology education policy, working synchronously in some moments and separately in others: The National Ministry of Education (MEN), the MinTIC, and the Ministry of Science, Technology, and Innovation (MinCiencias). MinCiencias⁵ has been historically relevant in the emergence of technology education in the country. Through several programmes, the Ministry worked closely with new ideas from academia and the public teachers' union (see Chapter 1). MinCiencias was also one of the leading proponents of the country's first popular education technology term: Social Appropriation of Science and Technology (ASCyT; see Escobar 2019). MinTIC, which I already talked about earlier, influenced infrastructure – it was the institution in charge of providing communication infrastructures to the whole country and teaching people how to use them. They were one of the first national-level state institutions interested in STEM Education. Finally, the MEN was also an active force in education technology for almost as long as MinCiencias. However, it did not have an explicit national STEM policy document. That changed in 2021 when they launched a policy strategy to partner with local governments

⁵ I chose not to focus on MinCiencias ethnographically, firstly because their approach with the specific notion of STEM was incipient in comparison with the other Ministries, and because I was funded by one of their offices, so I wanted to avoid any conflicts of interest. It is worth noting that my research was funded by a 'PhDs abroad' scholarships programme, which had nothing to do in administrative terms with the offices in charge of implementing ASCyT and STEM.

and help them make local STEM policies. The MEN created a policy blueprint, a step-by-step policymaking template that all local governments should follow to create their own.

As Illustration 1 shows below, there were other state-related institutional actors apart from these three National ministries. On a national level, there were the government or executive agencies. Government agencies depended financially on Ministries but were also autonomous in terms of functioning. They deploy and execute, whereas Ministries oversee and formulate policy. The most relevant government agency in technology education was *Computadores para Educar* (CpE), which depended financially on MinTIC. TPA, one of the three policies I explored, was the most recent policy that CpE needed to deploy.⁶ On the local level, there were three relevant public actors: city or municipal councils, secretariats of education, and public schools. City councils moved their own governmental agendas and managed their own funds. The most salient in the technology education sector was the city council of Medellín, one of the country's most prominent and industrially important cities, which dedicated a considerable amount of its resources to deploying STEM programmes and projects. Secretariats of Education were local instances of the MEN. For that reason, they depended financially and missionally both on the Ministry and on the council of the city where they worked. Finally, public schools (and their teaching staff) had the most ambiguous position, as they had the autonomy to create their own curriculum but had to follow the MEN's guidelines and depended financially on the Secretariats of Education.

⁶ CpE was not just the deployer but was also involved in the process of formulating TPA as a policy document.

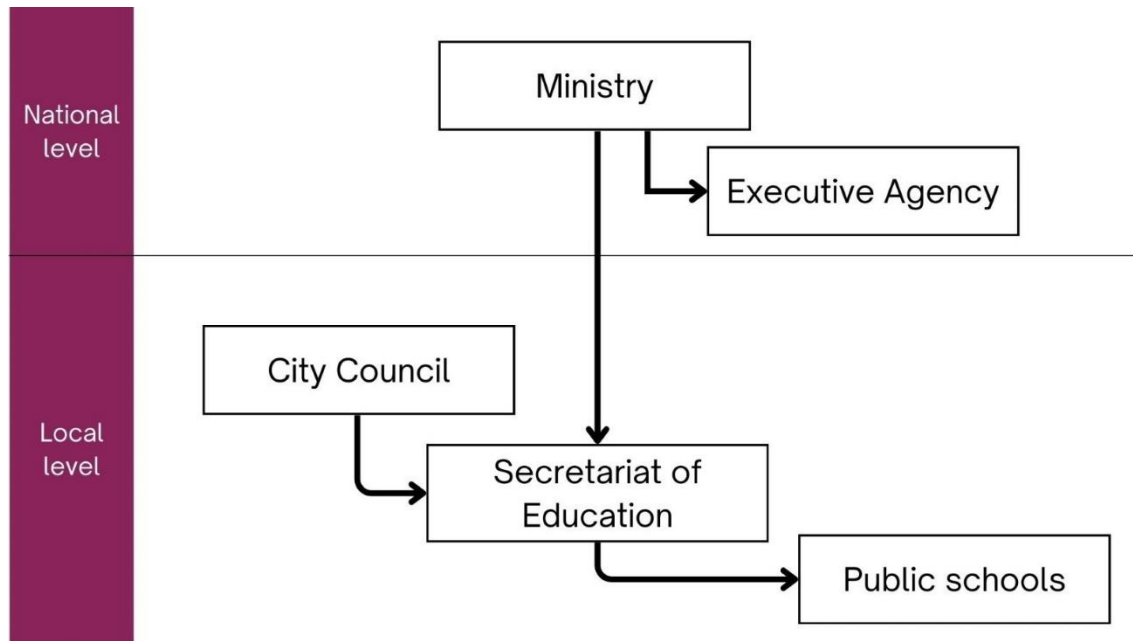


Illustration 1. Types of public institutions in technology education and their hierarchical relations

Excluding schools, all the other public institutions (ministries, government agencies, local councils, and secretariats of education) had the obligation to deploy policies through private contractors. On top of that, they all had different positionalities and deployed policy in different roles. Adding all this to the fact that many of the officials working on these institutions lived in different parts of the country (i.e., they had different cultural backgrounds) and came from different socio-economic backgrounds, it is easy to see how all these public actors had different experiences with technology education and had different understandings of its moral value. In this thesis, I embrace these positional and praxiological differences and explore them locally and historically in terms of how they all differ in (and contribute to) giving moral value to STEM and, more broadly, to technology education.

Traversing all the heterogeneity and minding irreducible specificities, what they all had in common – what we can call a pattern – is that the moral value of STEM Education as an ‘integral solution’ to both economic and social problems was closely related to how

these publicly-paid actors could distinguish themselves as ‘good’ state representatives from ‘bad’ ones (*sensu* Krupa and Nugent 2015). Even though in practice many teachers fulfilled policymaking or administrative roles, and state managers were undertaking and developing pedagogical activities, there were usually moments of distinction between *funcionarios* (state officials) and *profes* (teachers). At some points, being a *funcionario/a* changed to *funcionario/a público/a*, adding the adjective “public” to highlight their vocational drive towards the collective good in contrast to teachers, who were just fulfilling their professional roles; whereas in other moments, being an *educador/a* (educator) acquired a heavily-moralised value of sacrifice and love towards the other, allowing state officials to highlight the moments in which they worked in education in contrast to other colleagues that they called *técnicos* (technocrats), who only knew about contracts and budgets. Similarly, teachers made a distinction between being *profes* as synonymous with being a *servidor público* (public servant) and casting elected state officials as *políticos* (politicians), that is, people that only work in the public sector because someone powerful put them there and misuse the public budget for selfish reasons. All these publicly paid actors could value themselves and their work (each using their own specific terminologies) as one of ‘public servants’ in contrast to selfish or lazy bureaucrats and politicians.

These forms of giving value to their own actions amid the deployment of STEM policies and projects revolved around the idea of ‘the state’ and the possibility (or impossibility) to materialise it as something that produces a common good. As the wider field of the anthropology of the state has shown, ‘the state’ appears as a mystified or fetishised idea through images in the media, affects, and everyday relations (Gupta 1995; Laszczkowski and Reeves 2018). Furthermore, the relevance of this fetish endures despite (or due to) its distributedness and opacity in a context of neoliberal decentralisation and the prominence of the state crisis discourse (Ong 2006; Aretxaga 2003; Vokes and Dundon 2021; Harvey, 2021). Thus, rather than assuming ‘the state’ as something that has vanished, I take it here as a question of how its presence or absence as a fetishisation has an impact on how technology education in Colombia gets valued as

'good' or as capable of solving problems holistically through technological determinisms and privatisation.

Politics and the political

As I said earlier, my point in this thesis goes beyond highlighting empirical diversity when examining moralisation in technology education. My argument is also that this heterogeneity can help us understand the role of morality in relation to the politics of technology education in a broader sense. For that, I need a third and more theoretical point of departure. Critical technology education studies understand moralisation as happening *within* political dynamics of power and governance. The notion of 'politics' has a long genealogy in anthropology (Kurtz 2001; Lewellen 2003; Wydra and Thomassen 2018). However, one of the most influential contemporary resources to define politics is the work of Michel Foucault on discipline, biopolitics, governmentality, and liberalism (Foucault 1979; 2008; 1998). Foucault's work was heavily influenced by Friedrich Nietzsche's explorations of 'the will to power' as the main driving force of human action. Philosopher Hans Sluga (2011) suggests that the problem with Nietzsche's (and, by extension, Foucault's) understanding of power and agency is that his theory did not solve the interdependence of those two concepts. If we define power as the casting of personal and interpersonal actions (power is the base of human behaviour), we cannot understand power without resorting to some human action starting it in the first place. Thus, for Sluga, we could divide Foucault's understanding of politics into two moments, each emphasising one of the two elements composing the power-action continuum. The first Foucault explored politics through power, and the second explored politics through action.

The earlier Foucault focused on showing how power was intrinsic to social relations, and for that reason, one could not talk of 'the state' as a specific thing or group of individuals where power came from – rather, power is non-subjective, unevenly distributed, capillary, and dynamic. However, that definition raises the question of whether

politics is the same as power. If power is everywhere, does that mean that everything is politics? Sluga unearths a few interviews made with Foucault in which he is asked what he means by politics, and his answer was 'no:' Politics is not the same as power relations; politics is "a more-or-less global strategy for coordinating and directing those relations" (Foucault 1980, 189 in Sluga 2011, 73). Politics is a specific set or array of relations of force that aim to "coordinate and direct force relations in society" (*Ibid.*). Power is expressed in every type of relation (family, education, sexuality, work), but politics is the governance of such relations – the ways of conceiving them and managing them. Here, Foucauldian notions like discipline (the control of bodies) and biopolitics (the control of populations through statistics and other mechanisms) respond to the exploration of how the specific form of politics is expressed in liberal modernity.

Such an understanding of power and politics matches with (at least some of) the critical approaches to technology education. From this emphasis on power, governance is the politicisation of relations such as the ones happening within the educational system, as it is a form of applying a strategic and global view of these relations. So, if technodeterminism and capitalism become the way of conceiving and casting educational relations through specific policies, then we can understand the politics of technology education as a (neo)liberal form of governance that stems from the distributed power relations of disparate actors and actions. It also follows that moralisation is part of this process of governance: if politics is about strategy and global intervention, moral orders give a representation of what such strategy should aim towards and give legitimacy to the project, and moralisation provides a way of evaluating whether that aim is being achieved.

The relevance and veracity of these propositions are beyond doubt – as I have already shown above, there are plenty of examples of how they reveal new and complex aspects of technology education. But once again, the problem has to do with homogeneity. From this view, politics becomes a single governmental process – even if it is distributed and simultaneous. The later Foucault – the one influenced by the Algerian uprising and revolutionary movements – saw politics differently. If the earlier Foucault characterised power as non-subjective and did not mention individual agency in his accounts, this 'new'

Foucault foregrounded human agency – hence why he started focusing on ethics, care, and self-cultivation. When placing subject and agency in his analysis, Sluga (2011) tells us that Foucault's definition of power and politics also changed. Power became "a mode of action upon the action of others" (Foucault 2000, 341). Adding human action to the definition means that, even though power still is about relations of force, it also means possibilities of transformation. Transformation can be seen in terms of resistance and freedom, as well as different forms of achieving global control. Thus, keeping the idea that politics is the strategic control of relations of force, Foucault proposes another definition of politics in this new action-oriented line: "What is politics, in the end, if not both the interplay of these different arts of government with their different reference points and the debate to which these different areas of government give rise?" (Foucault 2008, 313 in Sluga 2011, 76). Politics is not just one strategic form of governance but also the struggle to position that form against others.

Through that new definition, Foucault highlights the centrality of struggle *in the process of* deploying politics as a form of governance. Struggle does not appear only between the powerful and the governed. It also appears among different actors with their own understandings of what governing and its outcomes should be. Sluga finishes his article by noting that Foucault's later definition does not get far from more standard (Weberian) definitions in political science and kindred disciplines. But I take this resemblance as an opportunity, for it creates a bridge with other anthropological and sociological forms of defining politics in terms of struggle and shifting forms of governance (and its relation to moralisation, which is my aim).

One such convergence happens with the work of Pierre Clastres and his definition of political power. In his famous book *Society Against the State* (1987), Clastres made a crucial distinction: what we usually understand as power – coercion, control, and authority – is not political power itself; instead, coercion is a historically concrete and culturally situated manifestation of political power. What is, then, political power? For Clastres, political power is a sort of pulse or drive towards individuation and differentiation. Political power is indeed the drive towards commanding society, which implies an internal

distinction between a State (or chief) that commands and a Society that obeys. But that drive does not mean it inevitably materialises into coercion – collective ways exist to stop this pulse. The unfolding of political power into non-coercion was important for Clastres because it allowed him to take Amazonian indigenous societies seriously and consider their stateless political forms as legitimate. However, this last part goes beyond my argument. What I want to take from his theory is that we can see politics as something that encompasses, but exceeds, coercion and governance.

Such an idea of politics as a will to differentiation makes a good match with other studies that feed from the work of Carl T. Schmidt and his understanding of politics as the distinction between ‘us’ and ‘them.’ For Schmidt (1932) and other political philosophers like Helmuth Plessner (2018), the political domain is constituted by the definition of a ‘people,’ and such collective identification inevitably goes through a process of inclusion and exclusion – who is inside ‘the people’ and who is outside of it. Following political theorist Chantal Mouffe (2011), who takes Schmidt’s insights (though not his political conclusions), we can make a distinction between politics and the political. ‘Politics’ is “the set of practices and institutions through which an order is created,” and ‘the political’ is “the dimension of antagonism which [is] constitutive of human societies” (2011, 9). There are always several ways of making politics, so “proper political questions,” Mouffe suggests, “always involve decisions which require us to make a choice between conflicting alternatives” (*Idem*, 10). Thus, joining the insights of all these authors so far, we could say that the differentiations constitutive of ‘the political’ (Mouffe 2011) are the drive towards power that Clastres (1987) highlighted, which ignites what Foucault saw as the struggles that are part of the process of establishing a strategic and global form of governance.

However, this second form of understanding raises the question of how ‘the political’ relates to the establishment of ‘politics.’ In other words, how is the differentiation of state governance related to forming and enduring a wider way of ordering social relations globally and strategically? The question points to how differentiation and dissent produce governmental continuity instead of complications, breakdown, and, finally,

transformation. It resembles a deep, longstanding question in anthropology about political change and continuity (Kapferer 2005; Turner 1996). In policy studies, that question has been approached through the notion of the cycle of policy - a political dynamic in which political struggles, structural inequalities, technical mistakes, and previous failed attempts get papered over or omitted in the benefit of the moral ideal that the policy promises (Ferguson 1994; Li 2007; in the case of technology education, see Sims 2017; Ames 2019; Chan 2019). My way of narrowing it down and engaging it to my research topic is by asking how are moralisations involved in the relation between political differentiation and the unity and continuity of technology education as a form of politics.

Techno-moral revaluing

My way of addressing the three points of enquiry – the heterogeneity of moralisation in relation to the heterogeneity of policymaking, the place of ‘the state’ in technology education, and the role of moralisation in political differentiations amid the establishment of technology education as a form of governance – is through the concept of *techno-moral revaluing*. I have borrowed the first part (techno-moral) from Erica Bornstein and Aradhana Sharma’s (2016) concept of ‘techno-moral politics,’ although I have made my own tweaks to repurpose it. Bornstein and Sharma use the term to define how development NGOs in India need to resort to both the legal/technocratic lexicon of law and policy and moral justifications to legitimise their actions for their governmental counterparts. The techno-moral is an expression of neoliberal governance in which technocracy, audit culture, and the commodification of the ‘public good’ (see also Bear and Mathur 2015) appear as the way to find the legitimacy to steer society from the point of view of (non-)governmental organisations. So, in a sense, techno-moral politics denotes the form of organising and governing relations in which moralisation takes a central part – following the line that politics is governance and moralisation is an expression of that politics. However, what is also valuable about Bornstein and Sharma’s descriptions is that

they show different strategies and forms of justification according to different NGOs. It means that the techno-moral is not just a form of governance but also a regime – a field in which different positions and political differences are imposed but also emerge (Rojas 2002). The techno-moral denotes not just an umbrella term for different forms of justifying and legitimising certain actors and approaches over others but also the substrate for political differentiation – 'the political' as Mouffe (2011) defines it.

The difference between Bornstein and Sharma's concept is that I define 'techno' and 'moral' in other ways. While they define the 'techno' part of the 'techno-moral' as technocratic – the imagination of the legal and technical as neutral, depoliticised and made to solve a concrete problem –, I define it as including but also exceeding the technocratic. I follow recent anthropological studies that approach the technical (or technological) as something beyond discourse and include heterogeneous materialities in the analysis (c.f. Harvey and Knox 2015; Collier 2011). Different technical objects of information and communication, policy documents, bureaucratic reports, pedagogical guides, the material emplacement of events, and even large infrastructures play a part in how political enactments and differentiations happen. My main source of inspiration comes from Hannah Knox's (2017) take on road infrastructures in Peru as an effective source of political imagination. Through the examination of different 'ruptures', that is, moments like breakdowns but also political performances that take roads out from its technical invisibility (Star and Ruhleder 1996), Knox suggests that the engagement of actors with these socio-technical systems generate an affectively mediated diagnosis of political dynamics, the need of resist governmental power, and interpret the state of the collective in general. While my object of enquiry is less materially concrete, I take this invitation to understand the techno-moral regime as going beyond technocratic discourse, giving more substance and heterogeneity to the *engagement* that different actors experience when encountering techno-solutionist policies like STEM Education.

I also understand the 'moral' of the 'techno-moral' differently. As I said earlier, I understand morality as composed of many moral orders, and moralisation – the justification of an action or thing as beneficial for the 'common good' – as happening in

multiple ways. Furthermore, I start from the premise that the fetishisation of 'the state' has a big role in moralisation – at least in Latin America. Thus, I resort to Tatjana Thelen *et al.* (2018) treatment of morality in relation to politics and the constant making of 'the state.' They propose three categories to examine that interplay: 'relational modalities,' 'boundary work,' and 'embeddedness.' Relational modalities “draw on differing normative concepts of what a state should be and how it should act and embody past experiences in structural environments that translate into contingent expectations for the future” (2018, 7). I take those “normative concepts” to have a similar meaning to the normative collective orders that I explained about above (*sensu* Boltanski and Thévenaut 2006). Moral orders guide forms in which actors negotiate what 'the state' is and should be – what Thelen *et al.* (2018) call 'boundary work'. Furthermore, those processes of negotiation of what the fetish of 'the state' is also impact the way specific actors can adhere or recede from material-symbolic resources and wider networks of power – what they call 'embeddedness.' The techno-moral is a dynamic field that allows for multiple engagements and constant negotiations on what a project of governance – such as technology education – can mean and what 'the good public servant' realising it could look like.

Finally, I add the notion of *revaluing* to this 'techno-moral' regime of politics. Moralisation is justifying an action or thing as beneficial for the 'common good,' which means that moralisation attaches value to that action or thing because it suggests that it will realise that normative order (Munn 1992). I see the techno-moral regime as a field in which valuations happen constantly and, most importantly, in *ambivalent* ways. Stating that technology education can improve the educational system and bring ethical relations within society implies giving it positive value. Conversely, if some view technology education as failing in this collective purpose, it would be valued negatively. However, that does not always have to be the only outcome. The affective engagement with the materialisations of a given policy and the negotiation of who the legitimate state representative is according to a given moral order can create more valuations. It means that the failure of technology education can be *revalued*: it can mean that an 'other' did it

incorrectly and that an 'us' can improve it. Technology education's negative value can mean positively valuing a specific actor's actions and intrinsic characteristics within the varied regime of techno-moralisation.

Thus, the concept of techno-moral revaluing will allow me to answer what 'work' does moralisation do by foregrounding how the constant negotiation of who is the political 'us' and the 'them' in a techno-moral sense brings about new opportunities for STEM Education to *endure* as an hegemonic capitalist and neoliberal form of governance in education.

On methods and positionality

Now that I have described how I approached my research questions conceptually let me give an account of how I approached my field site methodologically to respond to such questions. This thesis is based on 14 months of multi-sited ethnographic fieldwork in Colombia, between July 2021 and September 2022. Most of it happened in local and national state institutions in Bogotá and Medellín, but also in other non-state locations and in other places of the country. As I said earlier at the beginning of this introduction, after the corruption scandal of KVDs, I chose to examine STEM Education through a national policy called TPA, given the moral weight that STEM had in documents and for my interlocutors. TPA was designed by the MinTIC and executed by CpE. I chose to focus on CpE, its team and its facilities, especially the 'educational innovation lab' they had in an industrial area of West Bogotá. I chose it because CpE oversaw the policy deployment and because its innovation lab became a hub for different actors – contractors, non-governmental organisations seeking partnerships, academics, students, public schoolteachers, and officials from other state institutions. However, I also chose a more mobile position when I realised that TPA was not the only STEM policy and that these other ones were worth examining. I decided to also find other strategic policies and institutions from where to look at STEM.

I travelled to different parts of the country, exploring how STEM appeared (or did not appear) beyond TPA. However, for the second part of my fieldwork period, I chose to focus on one specific city: Medellín. As I also mentioned earlier, Medellín was the place where technology education received the most attention and funding. Furthermore, the city has a long history of implementing policies, programmes, and projects involving technology and education. I decided to move there to examine their local STEM policy, *Ser+STEM*. I centred my attention on the workshops and events from one section of the secretariat of education called *Vivero del Software* (henceforth VS). VS was the office in charge of deploying the *Ser+STEM* policy, and their new and modern building also became a place in which local state officials, teachers, contractors, and academics gathered through specific capacity-building projects in education. When I was not attending VS's workshops, I paid visits to teachers I met in their schools. In that process, I met Rosario, an energetic headteacher and pioneer of STEM education in the country. She invited me to her school, which was located in a neighbouring town near Medellín (that I here call San Carlos). She also took me to a meeting where she was invited to co-create San Carlos' local STEM policy. That policy was connected to a national policy initiative that the MEN was implementing called *Territorios STEM+*. I dedicated the last months of fieldwork to these policy meetings to delve into the design of a STEM policy.

Following STEM in different instantiations and seeing who and what else gathered around STEM in other assemblages allowed me to cut across the 'wildness' of policy (Lea 2020) while also finding patterns and points of commonality between different instances of STEM. It was my methodological way of exploring how EdTech, in all its complexity, became policy within a techno-moral regime and how different techno-moral modes of politics emerged from them.

Following different policy forms of STEM Education put me in situations in which I could interact with several types of actors: policymakers, state managers, elected politicians, public schoolteachers, consultants, academics, and NGO workers. They all experienced the policy design and implementation differently, so examining their discourses, practices, and positionalities gave me different angles to my question on the

role of moralisation in STEM policy in Colombia. Semi-structured interviews and casual conversations were an important form of interacting with many of them. That happened for two main reasons. First, I started fieldwork before the effects of the COVID-19 pandemic completely dissipated. It meant that, at least during the first months, most of my interlocutors were working from home, and I still had travel restrictions to meet people outside Bogotá, where I was based. Online interviews were my only way of interacting with them. Second, many of my interlocutors were incredibly busy people, and some of them did not agree to allow me to observe and participate in their activities beyond the initial interview. Instead of seeing those conversations as a one-off moment, I took them as one of several ethnographic moments of interaction that could take different shapes – what Hugh Gusterson (1997) or Nick Seaver (2017) call a ‘polymorphous engagement’ with the field (see also Hannerz 2003). In concrete terms, it meant that I could complement the interview by attending related events, reading official documents, watching meeting recordings, and doing participant observation if the opportunity appeared.

When participant observation was possible, it took the specific form of active collaboration. As Casper Bruun Jensen and Britt Ross Winthereik (2011) note, in the development industry, partnerships become the only possible way of relating, and this applies to both the ethnographer and the people in the field. When I asked my interlocutors if I could shadow their activities, they found it strange. As it is understandable, they were expecting me to ‘give back’ or contribute to the project. The specific shapes of those participatory observations depended on who I interacted with and how they understood and valued my positionality. For instance, my background as an anthropologist was unclear to some of my interlocutors, especially state officials and teachers with a background in engineering or ‘hard’ sciences. I took my time to explain what anthropology is and what can contribute to policy, but many times they translated anthropology into the more generic term of ‘humanities,’ and valued my contribution in terms of my knowledge of the ‘social’ and the ‘human.’ In addition to my disciplinary background, many of my interlocutors – especially teachers – put value in my degree from a European university. When I followed teachers to policymaking meetings or ‘important’

events, my PhD gave me the status of 'expert' academic in STEM policy. I was in charge of advising policy meetings on how to include 'social' issues in the policy text, give a wider global context to STEM Education, and write reports on what was said during the meetings. That role is more explicit in Chapter 2.

However, other interlocutors like state officials, who also had post-graduate degrees and had done research themselves, were not as impressed with my qualifications and instead saw me as a young and inexperienced student. With them, collaboration took the shape of a 'helper' or 'volunteer.' They valued my role as an apprentice while also asking me to bring my specific knowledge to develop education technology products, reports, or pedagogical guides. That status of 'volunteer' is most explicit in Chapter 7. All in all, my experience with participant observation in technology education policy contexts showed me the difficulty of sustaining the image of fieldwork as a pristine thing 'out there,' external to the ethnographer and untouched by their actions.

Finally, during my fieldwork interactions, I was not just an anthropologist from a UK university. I was also a young, upper-middle-class, white Colombian male from the capital city. I also had previous experience working both in the Colombian public sector and as a manager in an EdTech private organisation before starting my PhD. I was doing 'anthropology at home,' with all the class, gender, and racial differences and nuances that come with it. That relative proximity to some of my interlocutors gave me benefits in how I accessed locations and moments of ethnographic interaction. I had previous knowledge of the policy jargon and the dynamics of the Colombian state. I was also similar in age, class, race, and accent to some of my state official interlocutors, and I even had friends in common with some of them, which made it easier to ask for their time and help. However, the proximity also came with its challenges and ambiguities.

I implicitly shared with teachers, state officials, and policymakers an ethics of duty with the country, especially the marginalised populations 'abandoned' and oppressed by 'the state' – a familiar narrative along many Colombians (Ramírez 2015; Burnyeat 2019). As Myriam Jimeno (2011) notes, the context of the disciplinary formation of anthropology

in the country gave value to our role as translators and defenders of marginalised populations in opposition to the violent practices of state institutions. According to Jimeno, Colombian anthropologists are 'citizen-anthropologists' with an activist or committed ethos beyond the scientific interest in producing knowledge, which usually involves vindication towards a non-violent and inclusive state. In my case, it meant that I shared an interest in 'the state' and its role in building a more equal nation with my interlocutors. It meant that my interest in my interlocutors' ethical commitments and enactments of care and sacrifice was more challenging to see from an analytical distance. While writing and presenting my work, I have found ways to see their practices critically – but it is still an ongoing process.

Nonetheless, I also had moments in fieldwork where I identified nuances within that 'lack of distance' between me and my interlocutors and turned it into a productive question of ethnographic difference. After a few months of examining STEM by undertaking interviews, observing events, and participating in projects and meetings, I noticed that some aspects of technology education were rejected in those spaces. It was as if there was no space for critical comments on the problematic sides of STEM. For example, I attended a capacity-building workshop in which the workshop facilitator (an academic from Medellín) was showing how schools in China were using AI to do face recognition to students and spot which ones were not paying attention. A teacher from the public spoke up and said that such application of technology could be seen as a form of control and harmful disciplining, but the facilitator responded by saying that these sorts of comments were not useful: "We need to look at things with positive eyes; that negative attitude takes us nowhere." Similarly, when I was at a policy meeting discussing San Carlos' local STEM policy, the facilitator asked us to write on post-it notes what we identified as problems that STEM could solve. I wrote that while policies usually focus on STEM as a way to improve employability and skills, there was a context of everyday violence that students and teachers of marginalised areas of the city had to endure, and that had to be taken into account in the policy. However, when the facilitator read my note, she opened her eyes and said with some surprise: "well, isn't that a bit too strong? (*¿eso no está como muy*

fuertecito?).” Her reaction triggered other attendants to translate my comment into a more amicable euphemism. They suggested changing my post-it for one that said “social problems” – a term that could fit the established understanding of STEM transforming society positively.

Even though my interlocutors and I shared an ethical preoccupation with the moral implications of STEM policy, and even though we talked about the same terms and projects, our notions differed. The deployment of STEM as policy was surrounded by a normative affective field of positivity and enthusiasm (sensu Ahmed 2019). Such realisation affected me. I started to feel irritated every time I heard the same words being used over and over in events (e.g., innovation, leadership, STEM, entrepreneurship), and I could not help rolling my eyes each time I heard yes-you-can phrases such as “it's all about changing people's mentalities.” The first few times I noticed those emotional reactions, I felt ashamed and tried to hide my wry face. I worried that showing anything different than enthusiasm would create problems in my interactions with people who claimed to be “in love” with STEM. I recognised that, even if I was still interested in the topic, their proposed solution differed from my ethical and political views. Many (but not all) of my interlocutors were uncomfortable others (Faust and Pfeifer 2021). That is, actors that “we don't (necessarily) like” (Bangstad 2017) because they reproduce neoliberal, developmentalist, or other harmful worldviews that oppose the committed ethos of anthropology against exploitation and the marginalisation of subaltern communities (Jimeno and Arias 2011; Guber 2010).

However, as Ana María Forero Ángel (2017) suggests (see also Burnyeat 2020), the exercise of *empathy* (though not alignment) can still be present in the process of doing ethnography with state representatives, elites, experts, or other non-subaltern groups. In my case, the ethnographic empathy took the shape of asking two questions: if the technomoral discourse of STEM generates such negative reactions in me, what reactions does it trigger in my interlocutors? And how are they different to mine? By talking with them about it, I realised that they also felt frustrated, tired, and in disagreement when working on the implementation of a STEM policy – although for different reasons and expressed

differently, as I will expand on in Chapter 5. These were the realisations that took me to the enquiry about the role of moralisation in the making of STEM as policy: the establishment of STEM as doing 'good' created reflections on my interlocutors (and myself) about who is part of the process and who is not, and what is the best way to do STEM and how to understand when it is not working.

Argument and structure

In short, this thesis focuses on technology education in Colombia as a policy and asks what moralisation's role is in making technology education a neoliberal form of governance. I suggest we expand the current exploration of morality by critical studies of technical education both empirically and conceptually. The thesis takes three sub-questions as points of enquiry: how is the appearance of moralisation in Colombia related to the multiplicity of STEM Education policy; what is the role of 'the state' in the construction of new networks of power in technology education (Williamson 2019); and how does moralisation mediate between the political and politics. My thesis is that, apart from serving as a persuasive tool within a neoliberal form of governance, moralisation appears as a techno-moral regime – an ecology of discourses, materials and practices that give rise to a constant negotiation of who can be considered a legitimate state representative when deploying STEM education as policy, which, in turn, renews a political order that consecrates technology education as a solution. I will finish this introductory chapter by showing how this thesis will arrive at such a conclusion by presenting the thesis' chapters and how they relate to the sub-questions stated above.

This thesis comprises one historical chapter and six ethnographic ones. Each ethnographic chapter approaches a concrete instance where different actors like state managers, teachers, private contractors, and institutions like ministries, NGOs, and Secretaries of Education coalesced around one of the three STEM Education policies I described above (TPA, Ser+STEM, and STEM+). I grouped the chapters in empirical pairs

– i.e., Chapters 2 and 3 will explore the STEM+ policy, Chapters 4 and 5 will examine Ser+STEM, and Chapters 6 and 7 will analyse TPA.

On the question of how the appearance of moralisation is related to the heterogeneity of STEM Education policy, this thesis will show that, among all the local and national policy instantiations of STEM, there is a diversity of modes of understanding 'the state,' the 'common good,' and what an ideal state representative should look like. They all coalesced in the emic notion of 'the integral intervention' (*intervención integral*). The term expressed the desire to create a policy that a) could bring together different state institutions working in a synchronised, technically efficient manner (an integrated state with a systemic policy); and b) that could do so following an ethical agenda, that is, being caring, inclusive, non-violent, and just (a citizens and a 'state' that possesses integrity).

Chapter 1 also deals with the genealogy of the term 'integral' and its simultaneous technical and moral emphasis in Colombia in the context of technology education. The chapter shows how the notion of the integral predates the neoliberal period of the country, connecting to a pattern running from the post-colonial period in the nineteenth century to the present: the representation of Colombia's citizens and state as lacking both technical proficiency and morality. The chapter shows that, in the popularisation of this idea and the making of state-led educational interventions to fix that lack, a logic or approach developed to value those policies, which I call the 'not only' logic. The 'not only' resembles what Penny Harvey and Hannah Knox (2015) call the 'as long as': a subjunctive mode in which the implementation of a project and its contingencies can match with the promises of improvement that the project brings with it only when certain conditions are met. A technology education policy was valuable not just because it used systematic and technocratic implementation; it also needed to bring about moral improvement and 'humanism' to students' lives to match the realities and complexities of the Colombian context – i.e., violence, poverty, and marginalisation, among others.

Differently to other places, where STEM is understood merely as the acronym of Science, Technology, Engineering, and Maths⁶, in Colombia, the term STEM exceeded its

immediate meaning and came to stand as many things, including other disciplines like the Arts and Humanities, and technical as well as interpersonal skills. Chapter 2 shows how this plasticity made STEM the perfect candidate to become an 'integral intervention' in the ethnographic present. The chapter examines the promises of transformation that STEM (and technology education more generally) brings forth, doing 'work' to enrol other actors into the process. However, the 'magic' that this term does is not limited to marketing, branding, and the political rituals in which it is embedded. The magic is about creating an *integral effect*: crafting the STEM+ policy in San Carlos as if it had the potential to make students 'integral citizens' (technically savvy and good with interpersonal relations in order to be employable) but also as if it was working because there were ethical (hard-working) state officials behind it – enacting the ideal of the 'good' state. There were many practices to achieve that effect, including asking politicians for help as a personal favour – something the state officials saw as unethical when others did it. But in the end, the appeal of the policy was to make all the policy actors work for the public's interests, either by making them follow indicators and technical plans or by challenging other officials to act ethically.

Chapter 3 focuses on the 'integral effect' of STEM+ policy from Chapter 2. However, it does so in another setting and explores a different modality of action that a publicly-paid professional should follow. The chapter follows one of the headteachers who attended the policymaking meetings in the previous chapter into her work of making STEM the guiding pedagogical method of her school. The chapter explores how, in the eyes of some teachers at school, STEM fits their ethical framework as educators – one that values care, sacrifice, and passion over salary. Their understanding of the 'good' state differs from state officials, and the 'integral effect' of STEM makes the policy capable of connecting the individual with 'the market' and other reifications like 'the environment' and 'the Self.' STEM changes in terms of what it is that makes it 'integral,' yet keeping its value of being both a technical and a moral policy.

On the question of the role of the idea of 'the state' in technology education policy, the thesis shows that the reifications of 'the state' are vital to the way different actors in

Colombia give merit to their actions or consider others' as underserving of legitimacy. Chapter 4 starts this enquiry by focusing on the depictions and castings of different public actors in terms of lacks and incapacities – who is not 'the state'? The chapter changes the setting from designing San Carlos' STEM+ policy to the implementation of the Ser+STEM policy in Medellín. It describes the capacity-building workshops developed at VS and how the workshop developers (local state officials, private contractors, and even a few teachers) rendered other teachers as both the problem and the (future) solution to make STEM an integral and, thus, effective intervention. In this enacted narrative, teachers were depicted as unmotivated and technologically and pedagogically outdated. However, if they acquired motivation and skills, they could be responsible for successfully implementing STEM in their schools. The fate of STEM as an integral intervention fell on individual teachers and how they did or did not follow the ethics of public service.

Chapter 5 remains in the same setting (VS and their capacity-building workshops) but shifts perspectives on the teachers who attended those events. The chapter analyses how and why many of the teachers at VS did not explicitly reject the workshops' imperative of being motivated and enthusiastic about STEM. It shows how, although they were not vocal in questioning the approach of the workshop developers, they did not accept the assumption that they lacked skills and morality either. Teachers vindicated their agency and power to follow the ethics of public service and help students. They enacted their own form of responsabilisation: blaming the state's educational and technical infrastructure as failed and the bureaucrats, politicians, and lazy teachers behind those failings as unethical. Seen together, the chapters show how moralisation (judging who deserves to be included and who deserves to be excluded from the success of STEM because of their virtuosity or integrity) is vital in the process of working and reworking the boundaries of who is or is not representing 'the state' in a way that transcends the lines between roles, institutions, professions, and political orientation. In other words, the chapters show how STEM policy becomes the setting for emergent techno-moral politics.

Finally, on the question of the relationship between the political (what the previous chapters showed) and politics (what critical studies of technology education show as a

neoliberal form of governance), the thesis shows that the constant shifting and reconstitution of 'the state' and legitimate state representatives is integral to the way technology education policy reproduces in time and appears over and over regardless of failures and shortcomings (what some studies have called the policy cycle; Li 2007; Rao 2022; for the specific case of technology education, see Sims 2017; Ames 2019; Chan 2019). Through the experiences of teachers, Chapter 5 also shows how the teachers' responsabilisation of 'the state' as guilty of the STEM policy's implementation problems did not stop with blaming and judging. The frustrations and tiredness of teachers with the way the state was doing things became something else. They *revalued* these problems as evidence that they were committed to sacrifice and do extra work for the future of their students. Difficulties became a sign of an opportunity to show commitment towards working for (whatever the definition of) the common good.

Chapter 6 brings other elements to the fore when thinking about this process of responsabilisation and revaluation of policy problems and failures. Empirically, the chapter makes a scalar jump, so to speak, and describes CpE and its work on a national-level policy – TPA. The chapter focuses on the relationship between national-level state officials, private state contractors, and public schoolteachers. It explores the uses and role of standardised, globally-circulating and technocratic forms of enacting STEM – what Kimberly Chong (2018) calls 'best practice.' Through the description of a policy project from CpE called *Educa Digital*, which aims to share the benefits of STEM and make teachers' efforts visible, the chapter shows how STEM's best practices, brought by NGOs, tech companies, and educational consultants and academics, is used by CpE officials to act as the evaluation metric to decide which teacher can be judged for not applying the best practice, or celebrated and legitimised for replicating it. The chapter shows how technocratisation and moralisation work together (as techno-moral politics) towards a revaluation of failure as something that can be improved – the cycle of policy that renders problems technical and suggests an equally technical solution.

Chapter 7 combines all the previous insights into one ethnographic process that I call the 'cycle of failure.' The chapter keeps the ethnographic focus on CpE and its efforts

to deploy TPA as a national STEM policy. However, it focuses on CpE's educational prototyping lab. The chapter centres on the notion of failure and how, within CpE staff and their collaborators, the meaning of failure changed from 'negative' to 'positive' and back again. The focus on failure helps bring the previous chapters' notions. The integral intervention as a holographic desire based on both technical and moral requirements (Chapter 1), the integral effect and its shifting promises (Chapters 2 and 3), the framing of ethical and individual limitations (Chapter 4), the redistribution of responsibility and the revaluing of failure (Chapter 5), and the uses of technocratic procedures to enforce moralisation (Chapter 6) will appear as doing 'work' together to make (and keep) STEM as the 'integral' policy that the public education system in Colombia needs in order to improve.

In the Conclusion chapter, I will draw on the implications of seeing the moralisation of technology education as part of a techno-moral regime in which political distinctions and unifications appear. It will show how this thesis helps see the shortcomings of technology education through a different lens. The enactments and materialisations of 'the good state' and 'the good public servant' are vital to the way technology education policy becomes a neoliberal and capitalist form of governance. The shifting boundaries of who is a legitimate state representative (based on ideas of hard work, sacrifice, and care) help revalue failure as motivation for further work. It means that while the moralisation of technology education can be seen as following and creating the expansion of policy through persuasion and enchantment (c.f. Peruzzo et al. 2022), it can also be seen as being the ground for the continuity of technology education despite its failures (we can even say, *thanks to* its failures). The concluding chapter will also show how this insight helps us rethink the role of 'conventional' state actors and publicly paid teachers as both challenging and replicating the neoliberal ideologies fuelling technology education as an enticing intervention.

Chapter 1

A genealogy of the ‘integral’

This first chapter acts as a historical frame for the following ethnographic chapters. It traces the emergence of the notion of ‘the integral’ in Colombia’s history of science and technology education. Following the introduction’s discussion on the term technomoral, the chapter examines how the word ‘integral’ has acquired (ambivalent) moral inflexions in education and how those moralisations have intermingled with the promises of technology. The word ‘integral’ became notable around the 1940s, when the international development industry arrived in the country with ‘new’ theories about total state planning and technical tools that treated education as a whole with all its parts interconnected – in other words, a system. However, the moral sense of holism that the term ‘integral’ condenses was present decades before, so this chapter also examines these holistic precursors that set the scene for the appearance of the integral intervention as a technomoral ideal.

The choice of such historiographic move finds a reason in John Clarke’s (2007, 239) provocative question: “what is *not* neoliberal?”. He urges us to distinguish between the recognition that neoliberalism is quite an effective form of governance and the implicit acceptance that neoliberalism has won and there is nothing beyond or outside of it. There are, and there were, elements of politics and policy (among many other settings of social life) that do not fit entirely with the ideologies and agendas of (neo)liberalism. Clarke’s question establishes the enquiry of how neoliberal forms of technology education cohabit, mix, or enter into friction with simultaneous or previous forms of governance, and this chapter embraces the latter. That allows us to see how neoliberal governance continues

enduring colonial orders and logics (Stoler 2016; Lendvai-Bainton and Stubbs 2024), and how the intransigence of materialised policies creates hybrids between neoliberalism and other political formations (Collier 2011; Muehlebach 2012). The historical examination of what seems to be merely a (neo)liberal concept – the integral intervention – opens the space to see what forms of moralisation differ and/or make part of neoliberal policies of technology education.

I take Cristina Rojas' (2002) work on the history of the state in Colombia as my main interpretative framework, and I start my enquiry in a similar period: nineteenth-century Colombia, a few decades after its independence from the Spanish empire. Out of her historical analysis, Rojas proposes the concept of “regimes of representation” (2002, *xix-xx*) to understand how ideas circulated in post-colonial Colombia. For Rojas, a regime of representation describes the field of power relations that emerge through the circulation of words, images and commodities between colonial powers (in this case, Europe and the US) and colonised populations. Rojas argues that the sense of supremacy of some European countries and the US has also relied on disseminating and imposing self-definitions and worldviews in which they appear more advanced or civilised than the rest of the world (c.f. Said 1995). Europe and the US (and other empires) circulate images and knowledge that depict them as superior and thus generate a desire in others to be like them. However, what circulates within the regime of representation is a self-image and the positioning of the self-acclaimed superior into a wider order of things. Following Luc Boltanski and Laurent Thévenot (2006), one could say that what gives someone the legitimacy to consider themselves more 'worthy' than someone else is the fact that they are complying with a set of expectations that point to something that transcends the individual – be it God, society, or the market. We are thus talking about regimes of representation and justification about different world-organising views (normative ontologies).

This description of a regime of representation offers a helpful approach to understanding the arrival of the 'integral' in Colombia in the 1940s: the US and other political forces imposed themselves as more 'developed' because they could solve

problems technically and systemically. However, following Rojas, one could say that this regime of representation started decades before, although with other terminologies. For Rojas, Colombia began its post-colonial history when one regime of representation replaced another. Until the XIX century, European countries represented themselves as more 'civilised' than other nations because they had three elements: scientific thought, industrial production, and a moral character that materialised in democratic institutions and a solid Christian dogma. Rojas called this regime 'the will to civilisation.' After the nineteenth century, however, Europe changed its self-representation by following new ideas of political economy. In those new liberal theories, individuals became rational actors following their interests, and the sum of such individuals formed a market-like totality called 'society' – Rojas called this the 'laissez-faire' regime. Europe represented itself as superior because it followed those rational precepts of the market (a normative ontology), leaving behind religious dogmas and other social forms that limited the rational choices of individuals.

Whether or not those self-depictions of Europe were accurate is irrelevant to this chapter. The crucial factor is how Colombians interpreted those supremacist depictions. Colonised populations also struggle to make themselves part of such representation, navigating both the desire to mimic Europe and the simultaneous pressure to differentiate themselves for autonomy and sovereignty. The distinction is important because regimes of representation are not just spaces of unilateral circulation. According to Rojas, regimes of representation are also dialogical – local actors receive such representations and make sense of them in their local context. In the case of Colombia, after its independence from the Spanish empire, the white *criollo* elite governed the country in coexistence with Indigenous and Black populations. Colombian white elites interpreted Europe's supremacist representations as showing how those elements that made Europeans 'superior' were absent in the native populations. Because they were white, they saw themselves as having more of those European attributes, whereas Indigenous and Black populations acquired the status of fully uncivilised ('savages'). The focus is on how the white elite, which materialised and shaped the state in reflection of their worldviews, dealt

with the change between regimes of representation and how those representations transformed through time.

Following these ideas, I show that 'the integral' sits between those two competing forms of understanding what the Colombian population and the political institutions that govern it should look like. These two competing frames of legitimation – 'the will to civilisation' (Enlightenment vis-à-vis Catholic morality) and the 'laissez-faire' (market rationality) in the nineteenth century – endured in time while incorporating different terms and concepts – the 'integral' being one of them. The oldest of these regimes, 'the will to civilisation,' never fully disappeared and became what I call the 'not only' logic: social life cannot be reduced to economic transactions and industrial production because there are other transcendental principles that make us 'human', such as society, culture, and even a spiritual dimension – that some populations supposedly lack. If this holism is not considered, the logic follows, the intervention becomes illegitimate – it becomes amoral and harmful.

I argue that in Colombia, the word integral points to this predating logic and its relation to the moral order of things brought about by post-war economic development (1940s) and, later, neoliberalism (1980s). This chapter is organised into four sections to show how this 'not only' logic endured in time and transformed in the process, making the integral a technomoral ideal. The first one spans most of the nineteenth century and explores how the 'not only' logic emerged among a group of Catholics and conservatives governing the country. The second one also starts in the nineteenth century but crosses to the early twentieth century to explore how this logic endured in time, even at moments when the Colombian state rejected the Catholic Church's intervention and advocated for secular education. The third section focuses on the mid-part of the twentieth century, when the word 'integral' started appearing, and describes how the 'not only' logic became attached to the word 'integral.' Finally, the fourth section centres on the last part of the twentieth century and explores how 'the integral' got framed first as opposed to neoliberalism and then became integrated into state discourses of education technology.

When the integral was called civilisation (XIX century)

The word 'integral' was not present in nineteenth-century Colombia. However, one can still identify a sense of holism and its social value (as something desirable and 'good') present at least since the independence from the Spanish empire in 1810. Cristina Rojas' (2002) historical study on the post-colonial elites that ruled the country in the first decades after the independence can give us a clue of what this sense of 'the integral' looked like in nineteenth-century Colombia.

Rojas shows how, after its independence, the new country (back then called New Granada) became governed almost exclusively by the Criollos, the Colombian-born sons of Spanish colonisers. These white (male) elites saw themselves as superior and in charge of guiding the other populations of the country: indigenous and black communities. The criollos based their self-proclaimed superiority on the popular idea at the time, within the Enlightened circles of both Colombia and Europe, that European countries achieved the highest stage of progress (civilisation) not only because of their industrial development but also because of their correct moral values and democratic forms of government (Castro-Gómez 2005) ⁵. Furthermore, these moral values were attributed to racial distinctions. Europeans were seen as more civilised because their race made them responsible, hard-working, and just. On the other hand, colonised populations – Indigenous Americans, Africans, and Asians – had other inherent attributes that made them unable to achieve civilisation. Education and religious conversion were seen as vital amongst the Colombian white elite: acquiring discipline (through instruction) and a strong sense of morality (through the Catholic religion) could bring non-white populations closer to the ideal of civilisation – although they could never achieve it completely. Thus, criollo elites governing the state saw civilisation as a 'whole' encompassing Christian moral values, racial superiority, industrial production, and liberal democratic institutions –

making them (according to themselves) the owners of civilisation because of their racial characteristics.

Rojas highlights two other circumstances at the time related to this holistic idea of civilisation. Firstly, there was a contradictory relationship between the Criollo elites and Spain. On the one hand, they were basing their superiority on a racial and cultural continuity with the former colonisers; on the other hand, criollos needed to distinguish themselves from Spain to justify being in power. These tensions regarding how much the Colombian government should imitate Spain generated an internal division that created two political factions. For a start, early criollo rulers (such as Simón Bolívar) were inspired by French Jacobinism, and all of them agreed with replacing the tyrannical figure of the Monarchy to implant democratic institutions as a mirror or instantiation of 'the people' (Sanchez 2016). However, the consensus about other governmental institutions, such as taxation and the Catholic Church, was highly debated. On one side of the debate, a faction of the elite (eventually known as conservatives) advocated for preserving all the Spanish colonial institutions except the Monarchy, thus including the Catholic Church and its control over education. On the other side, the faction that eventually became known as liberals started pivoting towards other European countries, such as France and England, and the United States, using them as exemplars of how to carry the country towards civilisation. The liberal faction proposed eliminating most Spanish traditions, including the Catholic religion and the centralised form of taxation, to imitate the secular and Federalist forms of other 'civilised' countries. The Criollo elites were unsure which elements should compose the holistic process of civilisation.

Here, the second aspect that Rojas highlights in her study becomes relevant. A few years after independence from Spain, Jeremy Bentham's ideas entered the country and popularised what became known as *laissez-faire*, or *dejar hacer*. Its proponents, usually liberals, argued that individuals should be free to follow their 'interests.' But in contrast to what people usually understand nowadays, whereby *laissez-faire* theory is used to talk exclusively about the freedom to exchange goods and commodities, the theory at that time was understood to apply in all realms of life: money, sex, family, and government. In

Boltanski and Thévenot's (2006) terms, *laissez-faire* was proposing a new "political metaphysics" (2006, 27), that is, a new form of ordering individuals, their desired qualities, and their relation to a bigger entity that transcends individuality – a "higher common principle" (2006, 28). In *laissez-faire*, the transcendental principle is the market (though understood more broadly), and morality is understood as the individual's capacity to "distance themselves from their particularities" to form this commonality (*ibid.*). In *laissez-faire*, individuals are seen in the abstract as equal, and herein lies the main issue of the time between the liberal and conservative factions: this idea clashed with the criollo elite conception that there were inherent differences between white and non-white populations, in which the latter ones were not able to leave behind their vices – that included laziness and violence. Furthermore, it clashed more specifically with the idea that individuals (especially non-white populations) had to be close to Catholic moral teachings. It was a clash of elite factions and different forms of understanding the 'wholes' of which individuals and populations are a part.

In the remainder of this section, I will focus on how this clash between the morality-plus-industry whole of 'civilisation' and the individualistic moral idea of the market in *laissez-faire* impacted the emergence of what later became known as 'technical education.'

Enlightened Catholics and technical education

Our contemporary understanding associates market rationality with neoliberalism and technical solutionism. It would be intuitive to conclude, following the emphasis of radical liberals on *laissez-faire* and individual freedom, that this faction first talked about industrial (technical) education in the country. Surprisingly, however, the conservative and Catholic faction of the Criollo elite first promoted technical education for the country's progress. Following the ideas of liberal thinkers of the time and the news of England and the US,

these conservatives saw “profitable employment through technical training” as a form through which the country could achieve wealth. But it was also because “[t]hey wanted to implant practicality (...) as a means of preserving social order” (Safford 1976, 13) . These elites believed that “maintaining social order required more than moralistic preaching. The masses would live virtuously only if their energies were engaged by productive activity” (*Ibid.*). Thus, conservatives adapted technical education to the political metaphysics of ‘the will to civilisation,’ that is, to the idea that individuals should be productive and industrious as long as they also followed the moral ethos of Christianity.

If we follow Rojas' (2002) contextualisation of the criollo elites as divided between laissez-faire liberals and pro-Catholic conservatives, how can we understand this appropriation of industrial production outside of the logic of the market? The first answer is that the ideas of 'practicality' and 'usefulness' in the mechanical arts (later known as technical arts) came before the arrival of the laissez-faire theory. This is why historian Frank Safford (1976) called this conservative group the Neo-Bourbons, as they followed a similar pattern of educational policies implemented during the Bourbon Reforms under Spanish colonial rule in eighteenth-century Colombia. At that time, the word technical was not invented, and what we could call ‘technical’ was denominated by a wide range of words: ‘practical,’ ‘useful,’ and ‘mechanical’ activities, which pointed to the handling of industrial machinery – but also to what was known as the ‘experimental sciences:’ chemistry, physics, botany, and up to some point, mathematics. The relevance of the experimental sciences became forceful decades before. As far back as the 1790s, for example, a group of students in Bogotá sent a letter to the Viceroy of New Granada to include such academic topics instead of what was seen as an outdated Aristotelian philosophy (Dávila 2012, 102) . Because these sciences were based on the Enlightenment idea that truth can be obtained from the senses rather than a Divine source, they acquired the value of helping people “think clearly” (*Ibid.*). Other topics, such as metaphysics, logic, and rhetoric taught in the Law curriculum became the opposite: they “obfuscated the mind” because they were not based on experience. Enlightened and Catholic conservatives also followed this trend. In 1826, José Manuel Restrepo, a

conservative politician from Medellín, launched an educational reform in which every Colegio had to teach experimental sciences to their students (Safford 1976, 108). Thus, the ideas of experience, practice, and usefulness were already in place before the arrival of the laissez-faire.

Nonetheless, the 1826 law was not straightforward. Following the logic that not everyone has the same intellectual and moral attributes, Restrepo's law added a mandate. Even though every Colegio should teach practical sciences, only the schools from the main cities could teach Law, and smaller provincial Colegios had to stick to natural sciences, theology, and other basic subjects. This law was turned down years later by liberal politicians, who defended the idea that every provincial Colegio should have the right to choose which subjects to teach. But once again, another Catholic conservative living in Medellín, called Mariano Ospina Rodríguez⁶, deployed a law in 1840 that reinstated what Restrepo did decades before. As evidenced in the articles that Ospina Rodríguez published in the conservative newspaper *Civilización* years later (1849), it was clear that he admired the US because of the capacity of its people to generate wealth through industrial work. But his laws also proved that he and other Neo-Bourbons made a racial and geographic distinction. Practical sciences were taught alongside Law in the main Colegios of Bogotá, Medellín, and Popayán because those cities were home to the white elites. White elites would use the practical sciences to become fair and committed rulers of the nation. Provincial elites, which were seen as less advanced because they had more presence of indigenous and black populations, would benefit from the useful sciences in a different sense: practical sciences were going to keep them away from their inherent vices and corruptions.

Finally, the elitist appropriation of 'practical' and 'industrial' sciences by conservative elites had Catholic morality at its heart. In one of the articles written by Ospina Rodríguez in *Civilización* (1849), he compared the Republican experiences of France and the United States. France was undergoing a second wave of revolutionary action then, with riots and violence included. Ospina Rodríguez used France's political situation as an example of the government's error. For him, French leaders were right in

posing a good form of government, such as the Republic, but imposing "materialism" (secularism) as the main social value was a mistake. Riots and violence were proof of that. In contrast, the US workers' Christian ethics carried them towards hard and honest work instead of joining unions that corrupted their souls into anarchy. For him, "[t]he United States appear, therefore, as the area destined to save Christian civilisation with their law, science, literature, arts, industry and culture from the cataclysm that threatens Europe" (1849, 14). In short, without Christian morality, practical sciences would degenerate into materialism, which would make the nation go back into a barbaric stage of violence and anarchy.

I argue that this logic forms the basis of what nowadays is understood as 'integral' – the one that STEM will be seen as representing. The understanding of practical sciences and religious morality endured in time and was popularised throughout the last decades of the nineteenth century, to the point that historian Oscar Saldarriaga (2001) talks about these ideas circulating in academic debates in the 1870s as creating a "hinge" between science and religion – one that makes an "epistemic hierarchy" in the sense that it puts God-originated knowledge as more important than empirical knowledge, although both needed to come together (2001, 887). However, a second question emerges, and it is about how this logic lasted through time. To begin with, between Ospina's law in the 1840s and Saldarriaga's intellectual debates in the 1870s, there were decades in which radical liberals reclaimed power and tried to erase every trace of conservative laws and reforms. For example, in 1850, a new law overthrew Ospina's. It imposed a radical liberal vision of freedom of teaching in the sense that provinces and individuals had total freedom to choose topics and schools. How did this logic survive the political (and literal) war between liberal and conservative factions, even into the twentieth century? The next section will focus on educational textbooks as devices that help this logic endure in time.

The endurance of the 'not only': Textbooks and pedagogues (1840 – 1940)

Given the length of years that this section covers, I have subdivided it into two. The first subsection focuses on the ideas of a famous nineteenth-century German intellectual, John Heinrich Pestalozzi, and how the reprinting of his ideas in school textbooks between 1840 and 1870 helped to reproduce the 'integral' association between practical knowledge or skills and a God-driven morality. The second subsection focuses on the life and ideas of Agustín Nieto-Caballero, a Catholic liberal who reproduced similar ideas to Pestalozzi – although his main concern was updating Pestalozzi from the curriculum with more modern ideas from Europe.

Pestalozzian textbooks (1840s to 1920s)

As well as prohibiting provincial Colegios from teaching law and focusing on practical sciences, according to historian Olga Zuluaga (2001), the Ospina's law of 1840 also modified the textbooks for primary education towards the Neo-Bourbon ideas of practical/moral education. Ospina named Philologist and politician José María Triana Director of the Normal Schools (*Escuelas Normales*), the institutions that trained primary school teachers. As Director, Triana included the pedagogical ideas of one of the two key figures I look at in this chapter: Johann Heinrich Pestalozzi. Although not a pedagogue in a strict sense, he was highly influential in Europe and the Americas for the establishment of the modern public school (Saldarriaga 2001; Tröhler 2013). Pestalozzi's work emerged in the aftermath of the US and French Revolutions. He also incorporated the Enlightenment idea that scientific knowledge was achieved empirically when the individual experiences the world with their senses and generates rational ideas based on those (Saldarriaga 2020). Thus, in one way, Pestalozzi's ideas were seen as the practical side of those abstract notions: he argued that children can develop "inner strength" through their controlled and gradual exposure to elements of the world through classroom activities. Pestalozzi claimed that education could improve children to make them "active

citizens" (Tröhler 2013, 9), and this resonated with ideas of enlightened conservatives such as Ospina Rodríguez and Triana. Although Pestalozzi was not talking about industrial education specifically, he did talk about practice and its importance in the development of children. It gave a pedagogical solution to the Neo-Bourbon's problem of vicious non-white populations and elite lawyers with an obfuscated mind.

However, as Tröhler also shows, Pestalozzi became increasingly disillusioned with revolutionary France, which made him turn towards German idealism and Swiss reformed Protestantism (2013, 50-61). His disillusion reveals the importance of (religious) morality as another facet of Pestalozzi's ideas. According to Tröhler (2013), another emerging idea during the Enlightenment period in North and West Europe has gone understudied in social analysis: the increasingly blurring boundaries between public virtue and private profit. In a context of governments increasingly using private parties to fund state action, radical republicans such as Puritans in the USA and Tories in England argued that industrial capitalism was corrupting the idea of public service, in which people acted for the good of the collective. They pictured farmers as the archetype of such ethics of virtue – connected to the soil and sacrificing their bodies to provide collective prosperity – whereas the merchants and traders were the opposite – selfish capitalists only working for their own good. But Swiss and German Protestants argued that neither farmers nor merchants were bad as such. Pestalozzi's ideas were powerful because they mimicked such Protestant views to solve the conundrum of the time.

For Pestalozzi, the purpose of the child's "inner strength" pointed less to acquiring knowledge and more to forging a strong moral sense of correct, virtuous behaviour. Whereas his method was based on subjective empiricism, the end goal was that the children could understand and conform to the norms of a higher power: the Republic and, ultimately, God. Saldarriaga (2001) gives a wonderful example of a Pestalozzian school lesson about corn contained in a Pestalozzian textbook: "Through a corn cob, the children were engaged in 'an ascendent movement that took them first to the botanical classification, the physical description, and the pollination process; then towards the fabrication of wheat flour, passing through the etymology of the word, which implied

talking about Greek mythology, paganism, and the true religion, to finally arrive to the existence of God, invisible author of every visible object (...)” (Saldarriaga 2001, 50). This is why Pestalozzi’s methods became known as “objective teaching.” Through the mundane, children could understand the sacred. In that way, people could exercise any type of work (or be from any social class) and still be good citizens.

I suggest that Pestalozzi’s ideas were well received in nineteenth-century Colombia because of his emphasis on practice and morality as the ultimate goal of his method. He acted as a pedagogical hinge between the positive value posed on the 'practical sciences' and the importance of morality to achieve civilisation. But it is also interesting to see how each faction – conservatives and liberals – appropriated Pestalozzi differently. On the side of conservatives, in 1853, Triana added the Pestalozzian methods for languages and science to the already existing Lancasterian⁷ textbook and complemented both with texts on Catholic instruction (Zuluaga 2001). The educational texts combined Catholicism and science. However, as mentioned before, in those same years, the Radical Liberals took power and tried as much as possible to reverse everything that conservatives such as Triana and Ospina did. Radical Liberals reformed the country's Constitution and made Colombia a secular and Federalist state⁸. Interestingly, though, radical liberals agreed with conservatives like Ospina Rodríguez about Pestalozzi’s pedagogical ideas. In 1872, liberal president Eustorio Salgar ordered recruiting a group of pedagogical experts. That group was later known as the First German Pedagogical Mission, a group of nine Protestant Germans that arrived in the country. They reformed Normal Schools and closely collaborated with the Office of Public Instruction. Historians agree that choosing German educators had to do with Prussia winning the war against France in 1870, as well as the popularity of Pestalozzi’s theories (Loy 1979; Helg 2022; Safford 1976) . As Directors of the Normal Schools, they instructed new teachers in the Natural Sciences. What is more crucial for this chapter is that they introduced and disseminated new educational texts that were nonetheless written and printed by two Pestalozzians – North Americans H. Wilson and N. Calkins (Saldarriaga 2001, 47).

Thus, Pestalozzi's ideas were adopted by two apparently opposite political regimes through pedagogical textbooks: Catholic conservatives and anti-clerical liberals. In what follows, I will suggest that morality understood in relation to practical education and industrial production did not disappear—rather, it oscillated between Catholic and secular.

Regeneration, Escuela Activa, and socialism (1920s and 1930s)

After almost 40 years of rule, radical liberals were replaced by a coalition of conservatives and moderate liberals in the 1880s known as the Regeneration (*La Regeneración*)⁹. Amongst liberals, there had been a debate – since at least the 1850s – about how to deal with the apparent fact that most of the country's population professed Catholicism (Varela Yepes 2019) . This debate split the liberal party into two: radical anti-clerical liberals and Catholic moderates – who called themselves Independents. The moderate liberal government of Rafael Núñez, who reformed the country's Constitution in 1886 to make Colombia a Centralist and Catholic state, was followed by conservative governments until the 1930s. These governments followed similar ideas to the mid-nineteenth century enlightened conservatives in that they reinstated the importance of the Catholic dogma in public education while privileging industrial growth and technical education. In 1887, the Colombian government signed an agreement with the Vatican known as *El Concordato*. This agreement gave religious orders, especially French ones such as Lasallians and Eudists, the right to manage educational institutions and decide which textbooks to use (Andrade Álvarez 2011) . According to Safford (1976), within the Technical Institutes, the priests undertook a strict work regime in which the students had to study the usual academic modules (languages, basic math) and religious catechism in the morning and technical skills in the afternoon.

Furthermore, in 1923, Conservative President Pedro Nel Ospina (son of Mariano Ospina, the 1840s Neo-Bourbon) accepted a first foreign mission towards the modernisation of the financial system in the country, led by US economist Edwin

Kemmerer. The Mission sought to align the nation's monetary policies, central banking, tax regulations, and import/export priorities with US investor interests (Seidel 1972) . The Kemmerer mission's reforms allowed the conservative government to position the industrial sector (instead of the agricultural one) as the country's investment priority¹⁰. Thus, by keeping themselves in power, conservatives reproduced the science-plus-Catholicism logic emerging decades before, entangling it with new discourses of economic development.

Nonetheless, what is interesting is that after the 1930s, a new liberal government took place. In 1934, Alfonso López Pumarejo became president. His government programme tilted towards socialism, proposing agrarian reforms and using terminologies such as 'the people' and 'revolution' (Silva 2000) . Educational reforms under his government emphasised education as a universal right and aimed to build new public schools and renew the national curriculum. If anything, his government would fit the description of the modernist and secular liberal who would not care about Catholic principles. How, then, did the practice-and-morality logic endure? Here, another key figure appears: Colombian pedagogist Agustín Nieto-Caballero.

A moderate liberal and devoted Catholic, Nieto-Caballero became well known for proposing the theories of the Active School (*Escuela Activa*) in Colombia¹¹. Authors such as Maria Montessori, John Dewey, and Olive Decroly influenced the Active School. *Escuela Activa* proponents highlighted practice and autonomous work by students, relying on psychological rather than pedagogical theories. For decades, Nieto-Caballero promoted these ideas as a long-needed update to Pestalozzian pedagogies, which he viewed as obscurantist and repetitive (Saldarriaga 2001). Nieto-Caballero and other Colombian pedagogues saw *Escuela Activa*'s theories as more scientific and directed toward practice and autonomy. Thus, according to sociologists Alfredo Molano and César Vera (1983, 13) , when defending practice and activity, Nieto-Caballero was following new ideas of rationality and modernity that saw individuals as having to move and produce to achieve progress. Simultaneously, according to Molano and Vera (1983), Nieto-Caballero presented the new pedagogical movement as having a moral end. He did not

see practical sciences and religion¹² as opposed, “except when religion becomes a material force that blocks progress” (Nieto-Caballero 1937, 102 in Molano and Vera 1983, 13). If, to his eyes, Colombia was “a country where most of the population professed the same religion (...), [then] religious instruction must be provided” (Ibid.). In that way, the Active School aimed to “wisely combine practical instruction with moral education to produce an integral citizen, a Man of the future” (*Idem* 1983, 15). Thus, even if Nieto-Caballero explicitly positioned himself against Pestalozzi, both shared the same aim of promoting practice, science, and Catholic morality together.

Furthermore, I suggest that Nieto-Caballero acted as a hinge like Pestalozzi did in bridging the moral ends of Catholic and secular-liberal political regimes. In the 1920s, when the Kemmerer mission arrived in the country to ‘modernise’ its financial policy, Nieto-Caballero wrote to the then president Pedro Nel Ospina to ask for a “Kemmerer mission of education,” arguing that “neither the aeroplane nor the electric train (...) would shake the gut (*sacudir la entraña*) of this sad people in the same ways as the substantial reform of the school we have nowadays would do” (Nieto-Caballero 1937 in Molano and Vera 1983, 10). Added to Nieto-Caballero's views on religious instruction sketched above, this letter is evidence of how he communicated with the conservatives who shared a view of Catholicism and modernisation. These views allowed Nieto-Caballero to establish the first secular private school in the country, the *Gimnasio Moderno*, without any major reaction from the Catholic Church. Then, when socialist liberals took office in the 1930s, Nieto-Caballero did not disappear with the conservative regime. Instead, he became even more noticeable. Following the government's new emphasis on universalising education as a right for the people, Nieto-Caballero became part of the Ministry of Education. Alongside other intellectuals such as Luis López Mesa, a psychiatrist and sociologist acting as the Minister of Education, Nieto-Caballero was tasked with implementing the Active School pedagogical theories in primary public schools (Guichot Reina 2007) .

Nieto-Caballero's task did not last a few years, and his project of disseminating the Active School did not go further than the pilot stage. However, he managed to influence the Normal Schools and included Active School theories amongst other pedagogical tools

for teacher's instruction. Moreover, his role in the Ministry of Education shows his conviction in making an 'integral' – practical and moral – citizen lies between a Neo-Bourbon and a secular social logic. In addition to his views on religious education and technical development, he also held the conviction that "values and attitudes made [individuals] feel part of the nation" (Guichot Reina 2007, 97). Like Pestalozzi, Nieto-Caballero advocated for students to learn through and about their immediate environments: both the natural world – as scientists – and the cultural values of their nation – as citizens. Thus, Pestalozzi and Nieto-Caballero had another point in common. Apart from combining scientific means and moral ends, the moral framework of such ends was double: towards God and the nation.

In short, the Colombian appropriation of Pestalozzian ideas, and later of the Active School, combined practical/scientific and moral practice in what could be defined as a logic of the 'not only:' welcoming economic exchange and industrial production, yes, but always highlighting the importance of other elements exceeding these frameworks, that is, morality and (Republican-cum-Catholic) values. So far, this logic of the 'not only' was not indexed through the notion of the integral, but instead with words such as 'civilisation' in the early nineteenth century and, in the advent of the twentieth century, with the notion of humanism. It was in the 1940s that the word 'integral' became popularised. The next section will focus on how the logic of the 'not only' (i.e., industrial production plus morality) became linked with the word 'integral' in education and beyond.

Encountering the 'integral' (1940 – 1970)

Even though economic missions were coming from the US to 'help' Colombia in its modernisation decades before (the Kemmerer mission being one example), it was after the Second World War that the US government solidified its commitment to intervening in its neighbouring countries. Arturo Escobar's *Encountering Development* (2011) illustrates how, following World War II, the United States constructed its image as both the

pinnacle of development and a model for other underdeveloped nations to emulate. Key discursive elements underpinned this narrative. First, it acknowledged a global hierarchy, distinguishing between developed and underdeveloped countries. Second, this hierarchy was legitimised through the lens of 'poverty.' Third, the cause of poverty was attributed to the presence or absence of financial income. Lastly, poverty was to be tackled through scientific and technical planning tools. Escobar argues that the United States, along with 'First World' nations and transnational organisations, invented the concept of the Third World, which included Colombia, as a target for intervention. These Third World countries were expected to follow the path of their more 'advanced' counterparts to overcome their 'backwardness,' requiring economic growth, planning, technological innovation, and public investment to achieve development.

The entry of this new developmental paradigm and the international forces that supported it coincided with a historical moment that marked Colombia profoundly. On the 9th of April 1948, Jorge Elieser Gaitán, a liberal and socialist presidential candidate who was going to win the elections, was murdered in Bogotá for reasons that are still unclear. Gaitán's death triggered several days of riots and inter-party armed violence. Furthermore, it started what later became known as *La Violencia*, 10 years of bloodshed all over the country (1948-1958). The IX Pan-American Conference, a meeting of states organised by the US – that later became the Organisation of American States – was happening at the same time¹³. Shocked by what they were witnessing and using *La Violencia* as proof of the need for intervention, the US government approved a financial aid package for Colombia and sent (alongside other organisations like the World Bank) several economic 'missions' in the following years (Roldán 2016, 252). These missions aimed to transform the education system, too, and the reforms that they triggered were fuelled by an emphasis on two elements: technical education as the focus of what students should learn and the renovation of the MEN to provide a planned, systematic, and total intervention.

From the side of technical education, in 1950, Gabriel Betancur Mejía, an officer of the MEN, created the Institute of Technical Specialization Abroad (in Spanish, ICETEX), an office dedicated to funding students to conduct their technical post-graduate studies

outside the country. ICETEX's other aim was "to define the needs of the Colombian economy in terms of qualified personnel" (Helg 2022, 326). A few years later, between 1954 and 1957, a conversation between Industrialists from Medellín, the Catholic Union of Workers, and the MEN sparked the creation of the National Learning Service (in Spanish, SENA), which was a recommendation from one of the missions that arrived in the country. SENA became the institution in charge of teaching occupational and technical professions for the most impoverished populations. Learning became valuable as much as it pointed to industrial labour and economic growth.

From the side of systemic planning, in 1958, Gabriel Betancur Mejía, founder of ICETEX, became the Director of the MEN. Following one of the missions' recommendations (which I will describe in the next section), Betancur formed the Unit of Education Planning and gathered a team of international experts to create Colombia's first Five-Year Plan of Education (*Plan Quinquenal de Educación*). The Plan was broader in scope than the specific policies of ICETEX and SENA. It aimed to approach education rationally, seeing education as a system of interconnected elements. Amongst other accomplishments, the Five-Year Plan reformed the educational structure to conceive it as a cycle. Primary education made sense about secondary and higher education, so the student was learning what would be needed for a productive workforce. Furthermore, in the Five-Year Plan, the state was a key actor in the planning process. The focus on planning became even more explicit around 1960. After finishing his time as Minister of Education, Betancur Mejía and one of his collaborators, Spanish Ricardo Díez Hochleitner, became expert advisors for UNESCO (Ossenbach and Martínez Boom 2011). They coined the term "integral planning" to generate "economic and cultural development" in education (in Ossenbach and Martínez Boom 2011, 692). For Mejía and Hochleitner, neutral, totalising, and technocratic planning coming from the state became vital for developing the education system.

In sum, the emergence of the word 'integral' was directly linked to the hopes towards systemic thinking, technical solutions, and economic rationality that formed the basis of the international development industry. However, the word integral entailed more

than that. As I will show, the word 'integral' followed the 'not only' logic I sketched earlier in the chapter.

The Catholic Church's notion of 'integral'

Historian Mary Roldán (2016) has shown how the link between US development organisations intervening in Colombia and the US Catholic church was much stronger in the mid-twentieth century than usually recognised. The alliance began during the Second World War when the US government saw the Catholic Church as a potential ambassador in “the predominantly Catholic countries to the south of its border” to impede the arrival of the Axis countries to the region (Roldán 2016, 257). In Colombia and other Latin American countries, the Catholic Church became an important actor in generating intellectual dialogue between local governmental and non-governmental agencies, the local Church, and international development agencies. They did so by producing radio talks, organising conferences, and facilitating knowledge exchange programmes, among other forms of mediation. Their efforts proved fruitful in influencing local public servants to implement rural development programmes à la US – i.e., that could reproduce the "Jeffersonian ideal of the sturdy yeoman or rural 'middle-class' farmer" by making available "credit, technical assistance, and education" (*Idem* 2016, 259). But more importantly, they also allowed the introduction of the notion of 'the integral' from the side of Catholic social thinking.

Roldán (2016, 260) notes that in 1941, Rockefeller's Office of Inter-American Affairs funded an event organised by the US Bishops Conference titled 'The Americas and the Crisis of Civilization.' A French Catholic philosopher called Jacques Maritain gave the keynote presentation. Maritain was one of Henri Bergson's mentees, mainly interested in St. Thomas de Aquinas' work. Although usually engaged in abstract debates on logic and reason, Maritain was also interested in politics and social thinking (Dougherty 2010). He published a book called *Humanisme Intégral* in 1936 (Translated into English as *True*

Humanism). He continued his ideas up to 1949 with a series of seminars given at the University of Chicago. Manuel López-Casquete (2013) summarises Maritain's thesis as defending "culture and education" as "the main road towards the humanisation of mankind" (López-Casquete 2013, 418). Maritain was a personalist who saw "human persons as free and transcendental beings with value in themselves, which demands their non-instrumentalisation" (Idem). In other words, as members of a national community, people cannot be reduced to members of a body politic or the market because "they each have a spiritual soul and a supra-temporal destiny" (Dougherty 2003, 7). Maritain was not the only Catholic thinker talking about the 'integral' as related to something that exceeds the state or the market, though. Contemporary to Maritain were Louis Joseph Lebret and Francois Perroux, two economists who 1941 founded the Economy and Humanism Research Centre. According to Eloy Mealla (2019) , in his published work, Perroux proposed the term 'integral development,' and Lebret used this term as the basis for his view of development as a process that needs to go beyond mere economism and seek the "integral and harmonised development of all mankind" (2019, 239). For Catholic thinkers and activists, the 'integral' was not only systemic planning.

The cases of Maritain and Lebret are useful not only for seeing how 'the integral' had a second inflexion. These intellectuals were also highly influential in the development world and education specifically. Let me start with Maritain. For Roldán (2016), the presence of Maritain at the US Catholic Church's conference is telling of how Maritain's concept of "integral humanism" disseminated among key priests and members of the Colombian Catholic Church that were involved in activism and humanitarianism in what was called the *Acción Social Católica* (Catholic Social Action - ASC). The ASC was a Catholic organisation that, following Leo XIII's *Rerum Novarum*, addressed the social problems product of urbanisation and industrialisation. Some of these priests attended the 1941 conference, and Roldán focuses on one of them: Father José Joaquin Salcedo. Firstly, as the auxiliary priest of a parish in a small town called Sutatenza, Salcedo used his experience in catechism to come up with a way to "'seduce' his congregants into becoming better Christians and neighbours by introducing them to the wonders of cinema

and radio” (Roldán 2016, 249). Using a hundred-watt radio transmitter, he created what was later known as *Escuelas Radiofónicas Sutatenza* (Sutatenza Radio Schools), or *Radio Sutatenza*. Even though Father Salcedo started only on the local scale of Sutatenza town, he formed an organisation called Popular Cultural Action (*Acción Cultural Popular*, ACPO) over the years. The project grew exponentially and became one of the most renowned Catholic radio projects on the continent – to a great extent because the US Catholic church quickly found donors and aid for ACPO to keep growing.

Parallel to the radio transmissions, ACPO also “distributed more than six million cartillas (illustrated instructional manuals) for its five-point ‘Fundamental Integral Education’ (EFI) program.” These included “Alphabet, Numbers, Health, Economy and Work, and Practical Spirituality” (Roldán 2016, 245). Of this educational approach, Hernando Bernal Bejarano, a sociologist who also worked at the ACPO, defined it in his book *Fundamental Integral Education* as transcending “financial education; on the contrary, the fundamental thing is that people understand that the educational process is a cultural one, a process of world recreation” (in Sarmiento Moreno and Lima Jardilino 2007, 422) . With his concept of integral humanism, Maritain influenced ACPO's approach to education, which passed on to history as the quintessential example of pioneering community development and popular education in Colombia.

The influence of Le Bret is no less important. In 1954, Le Bret was the leader of one of the economic missions that I described above. His Mission, also known as “Economy and Humanism (*Economía y Humanismo*),” advocated a more socially oriented approach, emphasising the need for the Colombian state to prioritise social improvements over economic conditions. Nonetheless, his Mission also recommended more planning and highlighted the importance of technical improvement in the productive sector (Helg 2022, 334). Le Bret recommended the creation of SENA and probably influenced Betancur Mejía and Díez Hochleitner in their proposal of the term “integral planning” acting as UNESCO consultants. Interestingly, Mealla (2019) also traces Le Bret’s thinking to Latin American priests who formed what later became known as the Third World Priests and then the Liberation Theology. Father Camilo Torres, a sociologist in the Economy and Humanism

movement, is the most notable example of such a trend. After the publication of Vatican II, he distanced himself from this discourse and, approaching Marxist revolutionary movements, wrote a short essay called *The Integral Man* (1963). He later co-founded the guerrilla group National Liberation Army (Ejército de Liberación Nacional, or ELN) and died in a combat against the Colombian army.

In sum, when the word 'integral' became popular in the 1940s with the emergence of the international development apparatus, another inflexion of the word was present and enmeshing with the technical notion of integral planning as a system. This inflexion was closer to the 'not only' industry-plus-morality logic from the XIX century Colombia. It is worth noting that in both times (XIX c. and 1940s), the idea was proposed and defended by thinkers of the Catholic Church, and also interestingly, they influenced both conservatives and radicals alike. In the final section of this chapter, I will turn to the presence of the 'not only' logic of the integral in its most current manifestation.

The integral in neoliberal times (1980 – XXI c.)

As I said above, there were similarities between how Catholic social thinkers defined the integral and how elites approached education in nineteenth-century Colombia. But I would like to highlight one difference between the two epochs because it is important to what I will describe next: in the 1940s, the Christian idea of humans having a transcendental dimension beyond economic determinations intermingled with words such as culture and humanism. Maritain's concept of 'integral humanism,' Le Bret using Fracois Perraux's concept of integral development to define his emphasis on Economy and Humanism, and Bejarano's (ACPO) definition of integral education as cultural work are examples of this. Rather than their explicit reference to God, the emphasis on cultural transformation and human liberation became the source of inspiration for pedagogists reading Liberation Theology thinkers. One of them was Paulo Freire, considered a perennial source for the Popular Education movement through his work on the *Pedagogy of the Oppressed* (Arcila

et al. 2015) . Paulo Freire and other popular education educators, in turn, influenced public schoolteachers in the 1970s and 1980s (Forero-Medina et al. 2019, 349) , who used this perspective to counter and fight what they saw as the opposite of humanism: the neoliberal policies that the MEN was developing at the time.

During the 1970s, the Organization of American States (in Spanish, OEA), an international organisation created and funded by the United States, partnered with the MEN to do a 'knowledge transfer' of what they termed educational technology (*tecnología educativa*). Alberto Martínez Boom *et al.* (1988) note that the concept was ambivalent. On the one hand, and especially at the beginning of the transfer, educational technology meant using electronic objects and media – television and computers – to improve the teaching methods and increase the effectiveness of the teacher's lessons. On the other hand, educational technology also started to mean a set of planning techniques to improve education as a system. One document from the OEA that the authors unearthed states that “educational technology was constituted as

‘...the application of scientific knowledge through a systemic, interdisciplinary, and social approach, which aims to optimise, and even qualitatively and quantitatively transform, the workings of each and every part of an educational system’” (in Martínez Boom *et al.* 1988, 17).

The knowledge-transfer process evolved in a series of state programmes, and a national law to implement this approach to pedagogy was proposed.

According to Alejandro Casas Nova (2021) , Unionised public schoolteachers and academics working in critical and popular education became alarmed by this new approach and the possibility of it becoming law, so they joined to form what was known as the *Movimiento Pedagógico* (Pedagogical Movement, henceforth MP). They interpreted *Tecnología Educativa* as another step towards making teachers the mere repeaters of standardised teachings designed by psychologists and other "experts" of the MEN. Moved by the rejection of this conception of the teaching process, a faction of the Colombian Federation of Educators (*Federación Colombiana de Educadores*, henceforth

FECODE), the biggest teacher union in the country, opened the space for rethinking the Union's field of action. These younger Union leaders proposed that FECODE did not have to limit itself to what was known as "politics," that is, the defence and advancement of teacher's labour rights. According to their view, FECODE could also focus on the pedagogical side of the teachers' struggle. This realisation came together with making unions more pluralistic and participatory. It opened the door to a dialogue with academics and research groups interested in giving a more critical perspective to the pedagogy practices in Colombia. These academics came from different disciplinary backgrounds – history, geography, sociology, anthropology, philosophy, maths, and physics. The dialogues materialised in national pedagogical conferences and creating mixed research groups between academics and teachers called Teaching Research and Study Centres (*Centros de Estudio e Investigación Docente*, or CEID).

Alfonso Tamayo (2006) notes how the dialogues at the CEIDs propitiated the adoption of critical theories and notions from the social sciences into the teachers' understanding of their profession. Foucault's theory of subject making, Bourdieu's notion of intellectual field, and Bernstein's ideas of symbolic control were seen by teachers as important approaches to reveal their value as actors that impacted the social world. I want to focus on one of the research groups that participated in this pedagogical movement, the Federici Group. Carlo Federici was an Italian Mathematician and professor at the National University of Colombia (UNAL). José Granés, one of the members of that research group, recounts how Federici created the group when he was the Director of the university's Institute of Pedagogy (Arango and Guerrero 1997) . Amongst the group participants were also other prominent academic figures, such as mathematician and philosopher Antanas Mockus – who later became a famous political figure. At first, their interest revolved around the teaching of maths and sciences. However, the intellectual sources they read together (Gouldner, Bernstein, and Habermas) opened the group's scope towards the pedagogical process as communicative action.

By the time the Federici Group participated in the National Pedagogical Conferences in the 1980s, they had developed two interrelated notions shared with the

teachers. The first was the critical view of the state's educational proposal of *Tecnología Educativa*. They saw this state programme as a form of Taylorism that reduced science and technology to productivity and efficiency. They called this an ascetic approach to science or scientism. The second related notion was of the hedonistic approach (Tamayo 2006, 108), which they argued included other dimensions of persons – the cultural, social, affective, and intellectual side – when the person engaged with any scientific method or content. The process that pedagogy ignited when teaching science and technology to students, and the ultimate end of what science education should aim at, was to generate what they termed "the scientific spirit" (Tamayo 2006, 108). The research group was thus advocating a 'not only,' or integral, approach to science education, in which the content of it could not be reduced to the Taylorist and reductionist view of science and technology.

Years later, Antanas Mockus became Bogotá's mayor. Interestingly, he carried these ideas forward into his political approach. His government coined the concept of *cultura ciudadana* (citizen culture), a pedagogical way of changing how people understood their relationship with each other and the city. *Cultura ciudadana* became part of Colombians' lexicon, and governments from other cities (such as Medellín) started replicating it as a model for inclusive urbanism (Pérez 2010). Beyond its actual impact, I want to highlight with the Federici group a wider trend within the Pedagogical Movement in the 1980s that related to the logic of the integral (although the word was not as present then). This trend consisted of two movements: firstly, to link humanism and culture as central to the definition of what it means to be a teacher in Colombia. Casas Nova (2021) also shows that, among many other forms of self-representation, since the 1980s and thanks to the MP, teachers began to see themselves as "culture workers" and "knowledge producers." The second movement of this trend consisted of opposing this cultural, more transcendental work with the reductionist, Taylorist, and neoliberal approach of the MEN and the Colombian state in general. Even though, and not without any irony, these approaches were also inspired to some extent by the same Catholic humanists that originally fed the MP's view. This latter neoliberal approach became the 'political enemy' of the MP, and teachers fought inside and outside the classroom against this view. The

MP's struggle culminated with their active participation in writing the 1994 Law of Education. However, a few years later, FECODE withdrew its participation, and the actions of the MP as an organised political community stopped. I now want to focus on what happened during the 1990s and early 2000s, as these years tell a final movement: the relation between 'the integral' and STEM.

Technology, when neoliberalism contains its integral opposite

The 1980s and 1990s witnessed a transformation in educational policy. Critical authors such as Martínez-Boom (2019; 2004) have highlighted how, in the educational sector, these changes had to do with processes of marketisation that condensed into the notion of 'skills.' Policymakers highlighted the primacy of a global market force that must be considered to reform education. From this narrative, the global market became a transcendental force that dictated the shape and destiny of state interventions; in the case of education, Martínez-Boom (2019) calls this a form of neo-realism: education only made sense in as much as it responded to, and imitated the global market. In pedagogical terms, this meant that (from the point of view of the neoliberal policies) students were only valued about their capacity to fulfil the labour market. As a set of specific capacities and potentials, 'skills' became the term for translating students as human capital. Martínez-Boom (2019) calls this a "reduction of life:" neoliberalism treated education as synonymous with providing the 'basic' tools for someone to survive (skills), but what the individuals needed was only what helped them to be competitive in the global market (2019, 295). For these critical authors, the 1994 Education Law and other smaller state reforms in education made part of this neoliberal trend.

However, it is worth noting what I described in the last section: mainly that this law was a co-creation between the Colombian government and the MP, who positioned itself against these neoliberal currents. What happened with MP's opposition and critique, and therefore, with the integral view of pedagogy? I contend that a 'cross-pollination'

happened by the late 1990s and late 2000s when the word technology became associated with electronic objects like computers and networked infrastructures like the Internet. On the one hand, the Colombian state adopted and institutionalised the 'hedonistic' view of science and technology (see above). As noted earlier, the term integral was already part of the development industry and the MEN, for example, when Betancur Mejía coined the term Integral Planning in the 1960s. But this time, the humanistic side of the integral became explicit – although mixing with the neoliberal discourses of productivity and global market integration. On the other hand, teachers – including unionised ones in the FECODE – became closer to the discourses of experience, innovation, and creativity as valuable skills, creating a common ground with the state on what should be taught through pedagogy (i.e., skills) and how (through “pedagogical experiences”).

In 1993, in the context of the new 1991 political Constitution, then President César Gaviria commissioned a Mission of the Wise (Misión de Sabios), in which public figures such as Gabriel García Márquez and scientists/intellectuals such as Carlos Eduardo Vasco and Rodolfo Llinás participated. In the opening speech for the Mission, which was later transcribed as a prologue for the published report (1996), mathematician and pedagogue Carlos Eduardo Vasco stated:

Those who believe it is a question of subordinating education to the needs of international economic competition are mistaken. Nothing could be further from the truth. We want education, science and technology to help us increase our competitiveness (...). But we also intend to promote science and creativity for their own sake, for their contribution to social and cultural development, and to the development of the higher powers of the personality of individuals (Vasco 1996, 16 in Aldana et al. 1996).

Vasco's discourse resembles the one from Federici Group, emphasising technology as going beyond the economic and taking into account the cultural and even the transcendental parts of people. In fact, Vasco and Mockus participated in several edited collections regarding science and technology education. Furthermore, without saying the

word 'integral,' his view related to Maritain's Integral Humanism. Technology education is about international economic competition, but not only that. This time, however, Vasco was not talking as a critical scholar. He was talking in the name of the state – as the representative of the forces that created the Constitution, which dictated what was coming next.

Vasco's speech was not the only proof that the Colombian state had coopted the humanist view of science and technology education. Years before, José Granés, one of the members of the Federici Group, started working with the Colombian Council of Science and Technology (Colciencias) to create the project *Cuclí-Cuclí*, a series of publications to teach science and technology to children. The project condensed the idea that science had to be 'hedonistic' and transform the full existence of people. Furthermore, that influence went beyond one single project. Granés was one of the academics involved in the coinage of the term Social Appropriation of Science and Technology (ASCyT – see Chapter 2). The presence of the integral and its 'not only' logic were now part of the state's policies and projects to mix science and technology with education.

Conclusion

In Colombia, the term 'integral' not only denotes systemic state planning and intervention. An integral intervention combines productive (technical) and moral, economic and human because it needs to match the society in which it is intervening, one made out of individuals that are not just productive machines but also sentient, cultural, and spiritual human beings. I called that the 'not only' logic: a state intervention can be as systematic and technical as possible, but if it does not point to both economic and human, then it is not a complete intervention – it is leaving too many desirable elements of society out of its view. The chapter traced this logic or philosophy from the conflicts between the conservative and liberal factions of the white ruling elite in the nineteenth century until now. Back then, Christian morality was different but complementary to the industrial

production of wealth. Education was central for these elites because it gathered both elements together: it could teach citizens the mechanical arts and join the productive sector, as well as the necessary customs for a pacific and virtuous social life. The importance of this holistic approach to education was rooted in the shared idea that Indigenous and Black populations were not just ignorant of modern processes of production but also morally inferior. Industrialist conservatives and Catholic liberals of the ruling elite made this logic endure in the educational sector through the institutionalisation of textbooks and pedagogical approaches as state projects. However, the emphasis on Christian theology intermingled with (and ended up replaced by) national belonging and good citizenship.

The chapter also showed that although the 'not only' logic endured in time, such a view of technical education as a state project was in direct confrontation with what Rojas (2002) calls the *laissez-faire*, which transformed in what one could call developmental economism – that is, the primacy of market relations and economic production. Such a view placed 'the market' (i.e., the place of economic exchange) as the principle that guides all social life. It changed the terms of the regime of representation: superiority was measured entirely on economic growth, economic growth was achieved by and through technology or technocratic planning (Schatzberg 2006), and the Third World populations changed from 'savages' to 'poor' (Escobar 2011). The emphasis was not on making the population good citizens but on making them wealthy producers – thus, technical education changed towards industry skills. Such a shift did not mean that developmental economism was amoral. What changed was the shape of the moral order: the more-than-the-individual whole was not civilisation anymore but the market, so people's actions became valued in terms of how much they adhered to the market's norms and participated in its reproduction. This is important because those terms became popular in state education reforms under the emergence of neoliberal policies in the 1980s. But because the 'not only' logic of the integral never fully disappeared (it endured with notions such as culture and humanism), the most recent form of 'integral intervention' in technical education was really trying to bring together those two moral orders – forging economic

competitiveness and human improvement in students. As I will show in the next chapters, by rendering STEM an 'integral intervention', STEM acquires that 'not only' logic of the technomoral.

The appearance of the 'integral intervention' as a techno-moral regime of representation brings forth two important points for the overall argument of this thesis. Firstly, the chapter foregrounds the primacy of 'the moral' in technical education. It shows how the moral order is a guiding principle in education (forging people to do what is 'right' in terms of a wider-than-the-individual whole) and how those transcendental wholes have changed, opposed, and hybridised over the decades (Collier 2011; Muehlebach 2012). That insight becomes the basis for the different ways STEM will appear as an integral intervention in the following chapters. The chapter considers neoliberal morality and humanist morality as entangling and mixing in both the state and teachers (rather than being a simple oppositional field of neoliberal state and humanist teachers). Technology education becomes moral *not only* for its promises to bring progress and economic growth but also to improve people's ability to improve culture and society.

Secondly, the chapter shows how the desirability of public actors (policymakers, state officials, academics, and public schoolteachers) to participate in the construction of a specific moral order is based on the idea of the lack or absence. As Rojas (2002) notes, regimes of representation are based on desire, and desire is based on the realisation that the thing that one desires is not part of one's identity (as a nation or as an individual). One desires what one (supposedly) does not have. If what generates desire is completeness and wholeness (the 'not only' logic of technical skills and moral behaviour), then what we are facing is the perception of a holographic lack – the impossibility of being whole. Populations that are not holistic (integral) need a state intervention that is holistic (integral). However, the intervention also suffers from that holographic lack – an impossibility of being as fully integral as the developed states. This insight is helpful to identify a pattern that will appear in the next chapters and that will be vital in understanding how the entanglements of different moralisations of technology education end up working together to establish it as a recurring and expansive form of governance.

Although most of the ethnographic chapters that follow will touch on techno-moral politics in relation to the state and how that imagination is in tandem with holographic limitations, I will start with the theme of the multiplicity of moral justifications within the techno-moral regime of the 'not only' by asking how STEM (understood as an integral intervention) 'works' among different types of public servants – especially in an era of marketing, policy buzzwords, and political spectacle. Based on the insight in this chapter on the historical differences between the Colombian state and schoolteachers, the next two chapters will approach those two different points of view. On the one hand, managers, politicians, and other roles that we conventionally associate with being a state official (Chapter 2); and on the other hand, public schoolteachers (Chapter 3), as they both represent and enact the state at different moments and in different ways.

Chapter 2

Magic concepts, virtuous state

This chapter continues the thesis' enquiry of how moralisation appears in a context of heterarchical and heterogeneous technology education policy. Chapter 1 contextualised the notion of the integral intervention in technical education as part of a neoliberal movement towards establishing 'the market' as a moral order without excluding other humanist and socialist forms of morality. If Chapter 1 showed the desires and expectations towards an 'integral intervention', this chapter examines the specific case of STEM education and how it becomes 'integral.'

As with other parts of the world, the policy process involves stages such as formulation, planning, deployment, and evaluation. In theory, the formulation and planning stages would involve policy experts mainly, and the deployment process would be more participatory. However, in Colombia, all the stages need to include policy experts and other stakeholders of the new policy. In the case of education, that means schools and the educational community in general. I examine the spaces in which high-level decision-makers (politicians), mid-level managers, private contractors, and schoolteachers interacted to enact STEM as a public education policy. Empirically, I will base my observations on two neighbouring cities: Medellín and San Carlos. Medellín became famous as a 'pioneer' in implementing STEM as a city-level educational policy. On the other hand, San Carlos was new to STEM, and the city was starting to implement the policy. By focusing on both the spectacles that cast STEM as a finished product and the policymaking processes that cast STEM as a 'work in progress', this chapter asks what types of moral 'work' are behind the making of STEM as a policy project.

This chapter examines how state officials enact and refer to STEM education. Following the discussion made in the Introduction chapter about how moralisation is tied to processes of 'branding,' 'enchantment,' and 'persuasion' (c.f. Peruzzo et al. 2022), this chapter starts with an assumption. Mainly, that enchantment does not happen automatically when something like a STEM policy promises to materialise a normative transcendental order. Enchantment indeed entails the enunciation of a promise, but it is also a process that involves several human and non-human actors, as well as methods and knowledge on how to enchant (Gell 1988; 1992; Seaver 2019). This assumption aligns with anthropological studies exploring fashion, marketing, and spectacle as integral to how political and social regimes reproduce in contemporary capitalism (Arnould, Cayla, and Dion 2017; Fernandez and Lastovicka 2011; Löfgren and Willim 2005; Garsten and Sörbom 2016; Salamon 2005) . These studies have shown how enchantment, magic, spells, possession, and other social constructs usually associated with non-modern societies are present in Western, modern societies (c.f. Favret-Saada 1980) . Magic and enchantment are integral to modernity's infrastructures and technological innovations (Harvey and Knox 2015; Larkin 2013).

I argue that there is magic 'work' in making STEM enchanting for policymakers, mid-level public managers, politicians, and public teachers. However, as much as this magic and spectacular work is important, the enchantment of STEM also works through the appeal for an *ethics of public service*. I bring Juana Dávila's (2017) notion of the 'virtuous state-idea' to interpret my ethnographic findings. In her ethnography of public servants working at a Victim Reparation institution in Colombia, Dávila notes how her interlocutors talked about the state in specific ideal or abstract forms. She categorises two primary forms the state takes in those narratives: the pathological and the virtuous. On the one hand, the pathological state idea represents how the state works in the present tense. For these public servants, the pathological state is how the state has behaved historically and in the present through the actions of corrupt politicians, violent police, and inefficient bureaucrats occupying state positions just for the salary. As I will show, the latter category was especially salient in my ethnographic material, and this representation

of bureaucrats becomes what state-related workers do not want to be – and do not want others to be either.

On the other hand, the virtuous state condenses the ideal or desired form that the state should take. That state is impartial, non-violent, inclusive in terms of providing state services to everyone, and efficient in public expenses. Of course, this ideal does not come out of nowhere. Following Rojas' (2002) term of regimes of representation from Chapter 1, we could say that this normative ideal of the virtuous state makes part of a regime of representation in which Global North countries have technocratic and efficient bureaucracies while Global South countries have inefficient, corrupt and violent state apparatuses. I will explore the implications of this regime of representation at the end of this chapter. In the meantime, I find Dávila's (2017) distinction important because it gives words to the relationship between moralisation and the fetishisations of 'the state' that I sketched in the introduction of this thesis. If the virtuous state is the ideal moral order that state-related actors desire to achieve, this desire calls them into action following a specific ethos of hard work to serve the public.

To substantiate my argument, I divide this chapter into three parts. The first part will describe STEM as a magic concept (Pollitt and Hupe 2011) and explain how politicians, state managers, and teachers see STEM as having magic efficacy in multiple ways. The second part will show how these actors also recognise that STEM's magic efficacy does not depend on the branding of STEM alone but on the political milieu in which it performs as holding the promise of transformation. State-related workers judge this political milieu as shallow and STEM in this context as failing to transform education. Finally, the third part gives a description of how, within policymaking meetings, public servants appeal to both STEM's magic efficacy and the virtuous ethics of public service to persuade everyone to support the policy. The magic and the virtuous come together in techno-moral enchantment, making STEM the preferred form of state intervention.

This chapter advances the overall point of this thesis by highlighting how there is more than branding and marketing when giving a techno-moral (integral) value to

technology education policy like STEM. The integral intervention is not only the *end product* that the state should provide to fulfil the ideal of the nation's development. The integral intervention is also the *means* through which that state service must happen. The technomoral appeal is encompassing in the sense that every relation must look like it (Jensen and Winthereik 2013), and it is recursive in the sense that the values of public servants materialise in specific STEM policies. However, those STEM policies also influence the values of those public servants (Kelty 2020).

A history of magic concepts

Two other policy terms predate the appearance of STEM in Medellín. The first is 'Social Appropriation of Science and Technology' (*Apropiación Social de la Ciencia y la Tecnología*, ASCyT); the second is 'Digital Education.' Both concepts have their roots in the history of technical education, as I already described in Chapter 1. Establishing this history will allow me to make my first point: these terminologies are more than technical jargon of policies and 'do work' in themselves – in other words, they affect social life. For that, anthropologists, STS scholars, and other social scientists have used notions such as 'buzzwords' (Godin 2006; Bensaude Vincent 2014), 'keywords' (Shore and Wright 1997) and 'magic concepts' (Pollitt and Hupe 2011; Carey and Malbon 2018) to describe policy terms such as *sustainability*, *accountability*, *social innovation*, the *knowledge economy*, or *participation*. I choose 'magic concepts' as a term to describe ASCyT, Digital Education, and STEM here. Magic concepts are usually related to international organisations and think tanks such as the Organisation for Economic Co-operation and Development (OECD), the World Bank (WB), the World Health Organisation (WHO), and the World Economic Forum (WEF), among many others. Magic concepts are terms whose value does not reside in their capacity to point to a problem accurately. Instead, these concepts are ambiguous and fashionable words that can move from context to context and attract as many actors as possible to a topic or issue, such as the environment, market

investment, or public health. They have a “rhetorical role” (Godin 2006, 20) or serve as “linguistic technologies” (Bensaude Vincent 2014, 245) to influence NGOs, policymakers, politicians, tech entrepreneurs, and Chief Executive Officers (CEOs) of large corporations, among others. Finally, these terms have a positive “normative charge” (it is hard to be against them) and claim to be the solution to old divisions and problems – thus acquiring the adjective 'magic' (Pollitt and Hupe 2011, 643). In short, buzzwords – or magic concepts – are political tools of enchantment.

Social Appropriation of Science and Technology (ASCyT)

The history of these specific buzzwords – ASCyT and Digital Education – happened between different public and private Medellín institutions, although they sometimes shared programmes and projects. ASCyT is the oldest buzzword. Historian Manuel Escobar (2017) traced its appearance around the 1990s in Bogotá, among a group of scientists and technocrats working at, or collaborating with, the Colombian Council of Sciences (Colciencias, nowadays renamed Ministry of Science) – including science museums. At that time, these actors thought of this process under “popularisation” and “endogenisation.” However, two reports emerged in which the term “appropriation” became the preferred way to express the theory behind science communication projects at the time. The first one was the Mission of the Wise (*Misión de Sabios*), a group of intellectuals giving recommendations to Colombia’s then President after the new 1991 Political Constitution. Luis Guillermo Vasco, who appeared in Chapter 1, was part of this mission. The second one was the Mission of Science and Technology, another group of experts gathered by the Colombian state to give recommendations for the creation of the national policy of science and technology. Escobar argues that although it is impossible to know for sure, these experts and technocrats were reading each other’s reports, as well as other older essays from influential scientists in the country, including José Granés and other members of the Federici Group – who popularised among the *Movimiento*

Pedagógico the idea of science as ‘integral’ to life (see Chapter 1). Escobar suggests that the word “appropriation” could have come from a long line of terms that tried to depart from the conventional definition of science communication, that is, to see it as the process of translation from the side of the state and the passive reception by the population. Among these terms, one can find 'Appropriation of Scientific Culture', 'Mass Appropriation of Science and Technology,' and 'Cultural Appropriation of Scientific Knowledge,' among others. Despite not being the first one, ASCyT sedimented in the lexicon of these technocrats, and in a matter of years, it “became ubiquitous in the sphere of scientific policy, to the point of dominating it completely” (Escobar 2017, 148).

A few years later, the notion of ASCyT arrived in Medellín. Several institutions embraced the concept, but two of them became its biggest promoters: Antioquia's Science and Technology Centre (*Centro de Ciencia y Tecnología de Antioquia, CTA*), which will appear again in Chapter 4, and *Parque Explora*, Medellín's science museum. They acted as contractors to execute Colciencias' programmes and projects, especially the "scientific fairs" programme made with public schools to encourage science amongst students by making them do science projects and present them publicly. However, according to members of these organisations I interviewed, ASCyT and the science fairs had lost steam as a buzzword by the mid-2010s. It did not mean that, as a word, ASCyT disappeared. It meant that people started losing interest in it, which resulted in ASCyT proponents having difficulties funding their projects under the term of ASCyT. It was around 2015 when the word STEM became known to these institutions. According to my interlocutors, staff from *Parque Explora* heard that STEM was a new approach to science and technology appropriation happening in the United States and travelled there to learn more about it¹. They were probably not the first ones – many other organisations found out about STEM simultaneously. However, they exemplify how policy terms become noticeable and generate enough interest in people so that they move around and change their projects. When they returned, *Parque Explora* proposed a pilot project with the city's Secretariat of Education to involve teachers interested in the topic and experiment with

STEM's 'integral' approach. Here is when a second genealogy of buzzwords becomes relevant.

Digital Education

By the early 2000s, Medellín's local government allied with software development companies to increase the labour force the nascent digital market supposedly needed. This plan, called *Medellín Alianza Digital* (Medellín Digital Alliance), included the educational sector, so the Secretariat of Education created a new office, *Vivero del Software* (the Software Greenhouse – I will focus on this office in Chapters 5 and 6) to convince Medellín's public schools to focus on technical education, and software development in specific. However, it also went beyond education. Since the 2010s, Medellín made "science, technology and innovation" an essential element of urban policies. In 2016, the city renamed one of the neighbourhoods in the city centre the 'innovation district.' The renaming came with an ambitious infrastructural project to undertake a so-called development plan. Among other things, they constructed several modern buildings in the area, which were thought of as sophisticated co-working spaces for giant tech companies – such as HP and Amazon – so that they could make the city their new headquarters.

Furthermore, in 2020, Medellín became the first city in Latin America to host a “4th Industrial Revolution Centre” in the city. This buzzword, coined by the World Economic Forum in its famous annual conference in Davos, carried with it the idea that ‘new’ technologies, such as Blockchain and Artificial Intelligence, were going to transform the global economy, and governments needed to implement policies to integrate their countries to this new market. Finally, in 2020, a new local government made the focus on science and technology its main focus by proclaiming that the city would become Latin America's Software Valley. By the time I left the field, Medellín was officialising a new national decree that would turn it into Colombia's ‘Science, Technology, and Innovation

Special District,' which meant special tax treatment and national resources to encourage more science and technology development in the city. In short, Medellín was noticeable for treating words such as 'software,' 'digital,' 'science and technology,' and '4IR' as city brands to attract local and foreign investment.

In this context of city branding through 'the digital economy '-related buzzwords, the city's Secretariat of Education became interested in STEM, too. Because they were already working with technical education, the director of the Secretariat at the time commissioned *Vivero del Software* to get involved in the STEM pilot project that *Parque Explora* was developing with public school teachers in 2015 (see above)². After the pilot project, VS worked with a local university to develop a research study that mapped public schools, collectives, and individual schoolteachers working with anything considered science, technology, and maths (Cano 2020). However, another interviewee who worked in the research said that, in reality, "they wanted to map everything, and it doesn't matter if it was really STEM or not." The map had no public recognition, but it led to the realisation that many schoolteachers were more interested in ethics, reading, social sciences, and humanities. This insight allowed VS and the Secretariat of Education to name their technical education policy STEM+H, which included "the humanities" and other disciplines to help students be more ethical and well-behaved. STEM+H became the flag of Medellín's education. It helped promote Medellín as a cutting-edge city regarding Science and Technology Education. Finally, when the new government took office in 2020, it renamed the STEM+H policy into *Ser+STEM* (which translates both as "Self plus STEM" or as "Being More STEM"). The new policy maintained the basic premise of mixing science-related disciplines and teaching methods with ethics and humanities. However, the name sounded more powerful and, most importantly, unique.

The shoe that fits well

In sum, Medellín's use of technology-related buzzwords as city branding catapulted STEM as the dominant buzzword in the area. The term was now part of a marketing effort to attract foreign investment and support from citizens and relevant state actors – such as teachers. STEM worked similarly to a company or commodity brand. The term magic has been helpful for recent anthropological research to analyse the enchantment that brands produce. Tim de Waal Malefyt (2021) notes that magic sits between efficacy and uncertainty. On the one hand, magic is all about efficacy because those magic actions point towards achieving an outcome. On the other hand, magic is also about uncertainty because the means through which a magical action achieves its outcome is not fully known or understood. These characteristics of magic condensed in classical theories, such as Frazer's theory of magical contagion, are still relevant to understanding phenomena such as branding. Malefyt uses the example of an advertisement for Tiger Woods' brand of golf sticks (2021, 13-14). The stick is presented as transporting the power of Woods to whoever buys the product, using a logic in which the object fetishises the ability of Woods and spreads it to the buyer. However, this is not only a characteristic of commodities. Nicolette Makovicky and co-authors (2019) have noted that these marketing processes are among the “political technologies” that neoliberal states use to “affect and persuade the public” *vis-à-vis* the marketisation of state welfare (2021, 1). I interpret STEM as undergoing those same magical processes of governmental branding. STEM spreads and seems to fetishise the power that the US has in the regime of representation (see Chapter 1). However, STEM also adapts to local contexts and integrates the specific priorities and values of the place to increase desirability, as in the case of Ser+STEM. Seeing STEM as a magic word helps to understand how a technomoral promise to improve the education system through science and technology becomes so enchanting in a policy context such as Medellín.

STEM's magical powers enchanted public servants – policymakers, public schoolteachers, and managers alike – enough to consider themselves ‘in love’ with STEM. When explaining why STEM enchanted them, they brought up testimonies of a profound transformation inside schools or showed evidence that the introduction of STEM in some

schools improved students' performance in the state graduation exam. They saw STEM as the remedy for problems that have been around in education for decades, to the point that I heard them use the word 'magic' to describe this transformation. Nevertheless, other public servants were aware, in a more cynical fashion, of STEM's magical powers. During an online interview we had with Jacobo, working as a manager at CTA, he used the analogy of a "shoe with the right fit":

Many institutions have been doing science, technology and innovation [projects]. They had been working on robotics, integrating knowledge areas, and integrating software development into their curriculum. However, when entities like the OECD and the OAS began to talk about STEM, many of us said, "Hey, STEM is what we do. It is useful. We are going to name ourselves that way." It served to access resources and make different visibility of our actions. (...) Then we knew the concept because of our international financing: "We also do STEM! Let's name us like this and see if it fits our feet. Does the shoe fit our foot? Then we keep calling ourselves this: STEM.

Jacobo had an instrumental view of STEM. His analogy of the 'shoe that fits' is similar to Daniel Greene's (2021, 144) concept of "bootstrapping": new technologies and new buzzwords force public servants to shift shape in organisational terms and change their discourses to fit the new demands of the global market. However, Jacobo did not see STEM as 'forcing' anyone. For him, the power of STEM to boost funding was a valuable opportunity for his organisation precisely *because they were aware* of the enchanting powers of STEM.

Thus, the first point of this chapter is that STEM (and cognate terms) enchant because they 'do' things in a way that seems to be magically advancing the promise of a better education system – either by directly improving it or by attracting the funding to do so. However, the second point of this chapter will be that there is more to this assertion than meets the eye. The second point signals how the promise of science and technology comes hand-in-hand with the explicit moral aim of advancing the public good. Public

servants evaluate STEM education for its magic capacities and capacity to carry normative ideals of what the state should be. They see in the spectacle of STEM something that is missing (ethics of public service) and something that should not be there (the politics machine). Let me start by describing the political machine – and its configuration of magic – that public servants judge as lacking morality.

Political spectacles

Malefyt (2021, 3) notes that anthropologists have emphasised the impossibility of understanding the logic of magic without the social and institutional milieu in which the magical action happens. For example, Stanley Tambiah (2013) argues that magic cannot be understood as a tool of efficacious action because the power of such magical objects – in his case, words used in religious rituals – relies on a system of meaning. He proposes a model of "three postulates in mutual tension" (2013, 27):

- 1. the domain of myth, which relates stories about the doings of saviours or prophets or ancestors and the arrival of the message, be it doctrine or magic;*
- 2. the ritual or magical system itself—that is, the linguistic structure of the sacred words and the grammar of the non-verbal acts that go with them;*
- 3. the present-day human priests or magicians, their sacred status, their links with the saviors or ancestors, and their special behavior and preparations which make their ritual practices effective. (Tambiah 2013, 29).*

More than proving or defending Tambiah's model, I want to highlight the other elements that help words be considered magical: specific people and their behaviour (magicians), the objects and rituals around them, and the transcendental realm in which the other two find legitimacy. The ethnographic descriptions below will follow this wider view of how

buzzwords achieve their ‘magic’ power. I will focus on the inauguration of a building named after the buzzword ‘4IR.’

The C4TA

On a rainy morning at 7 a.m., I found myself among dozens of public school students, teachers, parents, and university students. We were at the entrance of a big, grey concrete building in the middle of *Comuna 13*, a famous working-class Borough in Medellín known for its colourful streets and violent past. The small crowd spread in small groups of people. All of them were talking, laughing, or distracted on their smartphones. The stairs in which some of them were sitting led to a glassed reception desk, and on top of it, I could see the name of the building in massive, black and blue letters: the Citadel for the Fourth Industrial Revolution, Transformation, and Learning (*Ciudadela de la 4RI, la Transformación y el Aprendizaje – C4TA*). The grandiosity of the name reflected the grandiosity of the building’s size. The "citadel" was a 60,000 square-metre building designed to receive 8,000 students from three different local public universities and teach them non-conventional undergraduate programmes related to the Fourth Industrial Revolution (4IR) – such as IA development, information security, and web design (Calle 2021) .



Illustration 2 – Facade of the C4TA. Photo by the author

The small crowd and I were waiting outside C4TA because that day was its official opening. The public school and public university students were there because either the schools sent them as a mandatory activity or because they were interested in knowing more about how to enrol in the programmes and scholarships they offered. However, after more than half an hour of waiting outside, the C4TA staff had not let anyone in yet. They told us the reason later: we were waiting for the Mayor of Medellín because he wanted to be the one giving a speech to open the Citadel. I knew that the inauguration event would have some political message and protocol, but the atmosphere changed now that it was public and the Mayor would be there. Some students took the news positively, excitedly commenting that they would appear on TV. Others, however, took the news with less enthusiasm. There were also laughs, but the other students (mainly the university ones) made sarcastic

comments about it. "Why did he have to come to this shitty opening? He must be desperate for votes," – said one young man to another. Another said, "That's why they told us to come here! To fill empty chairs for the Mayor." Beyond the different reactions, I took them as indicators that the event was not just a public intervention of the state but a *political* performance of the state.

The 'magician' and his ritual

Medellín's mayor at the time was called Daniel Quintero. He was a tall, slim and young-looking engineer in his early 40s. He had a calm and highly confident demeanour when speaking in public. He was one of the few who spoke against the industrialist class in Medellín, something that more conservative citizens and politicians considered sacrilege. The fact that he was young and an engineer was not surprising in Medellín. The previous mayors that preceded him were also young, charismatic, and somewhat related to science and technology. Federico Gutiérrez, his predecessor, was also an engineer, and Sergio Fajardo, even before, was a Mathematics professor turned technocrat. However, Quintero had specific experience with science and technology regarding innovation. Before becoming Mayor, Quintero worked at the Ministry of ICTs in Bogotá and created the Digital Transformation Office, which engaged with the private sector to adopt digital technologies in their productive processes. Moreover, he usually represented himself in his speeches as a working-class young man who got to be Mayor by his own effort and initiative, away from the traditional parties and the patrons from the political elite. He had the authority to talk about the benefits of technology and could claim to be the embodiment of the youth that he would address with his political speech.

Of course, authority was not the only thing on which Quintero relied. There was a carefully crafted protocol that would accompany his speech, and a big team of people made that happen. We could not get inside the C4TA and wait for his arrival because Quintero had prepared a heroic entrance for him. Moments before his arrival at C4TA, we

were told to make a line by the door so that he could walk by the line and shake the hands of every one of us. The act, of course, was filmed, and one staff member of Quintero's team carefully organised us according to our age. He gave each of us a warm smile and welcomed us to the event.

After that, we were taken inside the building and guided towards the open and spacious central patio of C4TA. They had put a red carpet in the centre and several rows of black plastic chairs around it. Behind the carpet, where Quintero was going to give his speech, C4TA staff installed a big white screen in which they projected the slogan of Quintero's mayorship: *Medellín Futuro* (Future Medellín). While the event officially started, I saw other elements complementing Quintero's speech. In the background, I could hear a short jingle, put in a loop, that sang about *Medellín Futuro*:

(...) I come from arrieros (muleteers) that worked hard/

And today I have my mind thinking about the future/

An eco-city in a digital world/

To always progress with technology (...)

A few minutes later, the person in charge of the sound paused the jingle, and another man, acting as the event host, greeted the attendants and, with a loud voice, asked us to scream about how we were feeling. After a few words to thank the directors of C4TA, the host enthusiastically introduced the Mayor. An AC/DC (hard rock) song blasted in the background while Quintero entered the stage, lifting his arms to give the audience a triumphal greeting. The speech was finally going to start.

Medellín's myth

A short video accompanied Quintero's speech, projected on the white screen. The video started with a black background and then a black-and-white scene of a wrecking ball

demolishing a colonial architecture building. At the same time, a male voice-over narrated with a severe tone: "In this place [C4TA], darkness and pain reigned. But now, hope and future prevail." The video was referencing the history of C4TA. Before the massive new building, the space hosted a women's prison called *El Buen Pastor* (The Good Shepherd). A religious order of nuns owned the prison, which operated from 1889 to the first decade of the 2000s. According to the neighbourhood's local library, which developed an oral history project with the prison's neighbours in 2020, the jail operated harmoniously with the surrounding community. In a YouTube video from the project, a neighbour narrated that the inmates could exit the jail and visit their children in a local kindergarten called *El Pastorcito* (The Little Shepherd). In another video, a neighbour remembered how the neighbours felt sad when the state reallocated the inmates into a bigger jail in north Medellín.³ Although the City Hall also commissioned the history project, and they probably knew about these testimonies of the jail, Quintero's speech and the video cast the prison as "dark" and "pain." The prison stood as a symbol of Medellín's violent past.



Illustration 3 - 3D simulation of the C4TA (above) and El Buen Pastor prison (below).

Source: Las2Orillas

Medellín's history is indeed tainted with violence. A combination of modernist projects segregating poor populations into the margins, industrial decay, paternalist policies, and drug-related businesses generated an exponential increase in violent crimes from the 1980s until the first few years of the 2000s (Maclean 2015; Pérez 2010) . During the 1980s, unemployment soared, and Medellin became the headquarters of Pablo Escobar and his "Medellin Cartel". Then, after Escobar's killing in 1993, guerrilla and paramilitary groups ignited an urban war between them to control drug flow and finance their operations. Finally, Alvaro Uribe became Colombia's President in 2002. He gave a firm military response to guerrilla groups –sometimes helped by secret alliances with illegal paramilitary organisations and producing the killing, disappearance, or displacement of innocent civilians (Cívico 2012) . The neighbourhood where the prison sat (*San Javier*) became famous because of one of those military-allied-with-paramilitary operatives – *Operación Orión*. This was the past that the video was invoking when referencing C4TA's previous role as a jail.

After the black and white images invoking the apparent original "darkness" of the place, the video made a complete turn in narrative terms. The scenes suddenly were colourful, filled with young people smiling and laughing, playing football in the building's gardens, and using laptops while talking amongst them. The male voice-over said, "but now, it is a place of hope and future opportunities for Medellín's inhabitants." The video finished, and Quintero started speaking.

I once was a student with many dreams, like you are, and today, we want you to make your dreams a reality here at C4TA, the heart of the Software Valley. (...) Cities that invest in technology will become the new leaders because technology's transformative power is huge. (...) But for that, we need to transform education. If Medellín has progressed in the way it has, it has been because of our education. What will happen, then, if we transform education with technology?

Quintero filled his speech with allusions to technology and claimed that technology had a "transformative power." He took a long time to show how he and his government team were bringing that power to education, making them the originators of that transformation process. Technology had power, and they had the agency of disseminating that power, making them powerful. They were the creators of the future.

However, in between the "dark" origins and the dreamful future, there was a less distant past that he implicitly acknowledged when he stated that Medellín had already "progressed" before him. Quintero and his team were not the only or the first ones; instead, they were 'descending', so to speak, from previous efforts. He referred to a public policy tradition that started in the early 2000s when Sergio Fajardo (the mathematician and university professor) became Medellín's Mayor. Fajardo's government team developed an umbrella term for their policy interventions: Social Urbanism (*Urbanismo Social*). The main point of Social Urbanism was to intervene in the space by generating Integral Urban Projects (PIUs) – usually shaped as large-scale and architecturally experimental buildings. There, inhabitants of slums (*comunas*) accessed social services such as parks and libraries, leisure activities, ICTs, and entrepreneurial capacity-building workshops. I later discovered that C4TA's building itself predated Quintero's administration. After the *Buen Pastor* prison was demolished, Medellín's government built what is now called C4TA. At that time, however, it did not have that name. The then-mayor Anibal Gaviria (2012-2015) originally named the Citadel the Peace and non-Violence Citadel (*La Ciudadela de la Paz y la No Violencia*), following the relation between violence decrease and infrastructural interventions that Fajardo and subsequent administrations established. However, as the local newspaper *El Mundo* (2018) reported, *Comuna 13* inhabitants (where the Citadel is located) rejected the name. They understood the name as a way of bringing up their painful past with *Operación Orión* and felt re-victimised by the project. The Citadel, then, became known as the Arts and Humanities Citadel. That name lasted only for a few years because when Quintero arrived, he took the opportunity to rename the Citadel as C4TA just before the building's construction was fully finished.

Quintero did not explicitly mention this past with the Arts and Humanities Citadel. Although I do not know the specific reason for this, I suspect it was because Quintero's government presented itself as different even from these urban policies – which, in some speeches, he depicted as corrupt and ineffective. So, although he implicitly recognised improvements in the city (abstractly, not naming any other previous government), he adhered to this genealogy of improvement while stating that he had a better solution than his predecessors: science and technology. In short, Quintero interlinked his agency and power with the agency and power of a buzzword such as the 4IR. He did so by crafting his political speech to a recurrent myth in Medellín: a “dark” origin of violence in which a ‘new’ group of urbanists (technocrats, not politicians) generated a transformative change but did not do it thoroughly; now, he had the chance to finish the work by bringing technology into the equation of Social Urbanism. This rooting with a narrative of transcendence was possible not only through speech but also through crafting ritual moments and the materialisation of technology and the future through infrastructure, jingles, logos, slogans, and other media. Of course, Quintero was not the only one doing this, nor was the process exclusive of the 4IR buzzword. I saw parts of the process in different events, also happening with STEM. Quintero's opening of C4TA illustrated all the elements that entangled buzzwords in political processes. I will now turn to how my interlocutors understood these power performances.

Political will and the virtuous side of STEM

I was one of many who identified the power-investing process of politicians described above. For the local state officials and public school teachers I talked to who were involved in policy, the effect of this process was called “political will” (*voluntad política*). I heard this term several times in conversations with different people. However, I understood the term more clearly during a visit to another suboffice of the Secretariat of Education, called the Teachers’ Innovation Centre (*Centro de Innovación del Maestro*), although everyone

called it *Mova*. Similarly to VS, Mova was both a public policy and a place to develop that policy. Mova emerged as the continuation of a Secretariat of Education project called the Teacher's School (*La Escuela del Maestro*). In this small room, the Secretariat's staff did capacity-building workshops and research groups with public school teachers. During Aníbal Gaviria's mayorship at the beginning of the 2010s, Medellín built a big, contemporary-style concrete building to hold the teachers' workshops and research groups. On the days I went to visit the space, I met Jessica, one of the staff members in charge of Mova. We did a tour, and she showed me the various rooms of the place. Mova did not only focus on science and technology. According to Jessica, Mova had an 'active teaching methodology' room, a 'culinary culture' room, a 'dance and arts' room, and a 'bricolage' room, among others. However, the last room we visited was related to science and technology: a lab with microscopes and other scientific artefacts.

Jessica told me that Mova was struggling to find funding to keep using all the rooms, but the science lab had an especially tragic story. The lab was conceived around the 2010s when ASCyT was the dominant buzzword, and the 4IR or STEM buzzwords were unknown. ASCyT placed more emphasis on science than technology, so Mova's staff bought 'scientific' rather than 'technological' devices – such as microscopes – for the lab. When Mova finally assembled the science lab's equipment, Aníbal Gaviria finished his period as Mayor and was not re-elected. Jessica told me Gaviria was especially fond of Mova, and his team worked closely with Parque Explora and CTA (the institutions working with ASCyT). However, the Mayor who replaced him, Federico Gutiérrez, was highly invested in the 4IR buzzword, not ASCyT. He travelled to Davos twice (where the buzzword was coined and promoted) and made Medellín host the World Economic Forum's Latin America gathering. Because VS focused on software development and capacity building with other digital technologies (see Chapter 4), Gutiérrez directed funds to this last office of the Secretariat of Education, not Mova. Suddenly, Mova had no funds to develop capacity-building workshops inside the lab, and the microscopes were left untouched inside their boxes without being used even once. Mova was unlucky in investing funds in the precepts of a 'magic concept' (ASCyT) that lost its magic soon after.

In recent years, Jessica told me they were interested in adopting STEM as their new science and technology-related methodology, hoping to reactivate the science lab through this buzzword. Here is when Jessica used the term "political will". When I asked her about Mova's funding situation with Daniel Quintero, the Mayor at that time, she told me:

We won't receive the Secretariat of Education's resources anytime soon. Right now, the Mayor [Daniel Quintero] is focusing on Computadores Futuro [a programme to give one laptop to every final-year high school student in the city] and the free tuition fees programme. So, to be honest, I think it's going to be difficult.

Mova's fate depended on choosing the right buzzword to follow and the will and agency of the politician who held the power to direct funds towards them. For these local officers, buzzwords such as STEM were powerful in that they attracted investment and attention. Moreover, they also saw this process happening within a political context in which such buzzwords circulated through specific actors and within a particular institutional context of precarity.

After talking to Jessica about STEM and political will, she recommended I talk to Jorge. He was a headteacher from a school in east Medellin. Everyone considered him a "pioneer" in STEM Education, which means he was involved in the science fairs from Parque Explora that I talked about before. I wrote him a WhatsApp message asking if I could interview him at his school. A few minutes later, he called me. Without stopping to say hi, he told me: "look, Juan, I'm calling because I think I have nothing to tell you about STEM. Why? Because we don't do STEM in Medellín." Intrigued by his assertion, I was about to ask him why, but he anticipated my question with his soft but resolute voice:

STEM is a proposal that the Town Hall made fashionable. It is political propaganda. Federico [Gutierrez, Medellin's former Mayor] declared Medellin a STEM territory, but he did it only because they hosted a big event with a few international experts. Apart from that, there are only some pedagogical activities at schools, but no

impact. You see what I mean? After realising that, I didn't want anything to do with STEM. So, no. I have nothing to say.

Jorge finished the call. However, his words resonated with other instances where I heard a similar negative interpretation of the 'political will' behind buzzwords like STEM. The critical comments from the attendants of the C4TA inauguration are also examples of that. If some local state representatives like Jacobo and Jessica approached the political dynamic of buzzwords with pragmatism, others saw the entanglement between buzzwords and politics as something negative. Jorge's critique of politics took a specific set of terminologies. Jorge criticised the politics of STEM in Medellín in terms of 'spectacle' – that the only valuable aspect of STEM that politicians were considering was its dazzling power. Jorge saw the political uses of STEM as emptying it of its real power: to contribute to education and students. There was, then, another way of using buzzwords different from the emptiness of showing them in public events as tools of social transformation.

In this case, the distinction between the spectacle of politics and the transcendence of education was assigned differently according to the type of person. There is an 'other' (in this case, politicians) using STEM immorally and an 'us' (in this case, teachers) that uses it positively. This differentiation does not only belong to public school teachers. In her ethnography of state officials in charge of enforcing land restitution laws, Juana Dávila (2017) also notes forms of criticism towards the working of the Colombian state, and in order to understand it, she uses the concepts of "virtuous" and "pathological state-ideas." She shows a moment when a think tank published a report criticising the Victims Unit – the state office she was focusing on – as "a sophisticated *mise-en-scene*, a performance, meant to produce the illusion of restitution" (2017, 402). For Dávila (2017), these sorts of remarks point to a specific conceptualisation that Colombians – and public servants in particular – have about the state and its workings. She terms this "the pathological state-idea" (*Ibid.*). The idea of a pathological state conceives it as made of indifferent officials, pointless bureaucratic procedures, institutions with big budgets that do not fulfil their promises, and politicians "dedicated to distributing bureaucratic quotas in order to fulfil campaign promises" (McFee 2019, 167) . Moreover, the idea of the pathological state

does not come alone. Dávila (2017) argues that the “pathological” state comes hand in hand with an aspirational idea of a “virtuous” state they want to enact, that is, “technocratic, meritocratic,” and “correct” in general terms (2017, 393).

The vernacular distinction between ethical and political relates to a shared conceptualisation among public servants that there could be two mutually opposed enactments of the state: the virtuous and the pathological. The virtuous follows an ethics of technocracy. As a type of bureaucrat, technocrats are (supposed to be) impartial because they should not work for any group or faction in particular, nor for their benefit (Du Gay 2008). Technocrats are also characterised by their focus on objective, expert knowledge in a technical topic (Mitchell 2002). Thus, the ideal of a virtuous state follows a specific moral order in which the sum of impartial, disinterested technocrats would create an impartial, good-for-all state – instead of the sectarian, corrupt and inefficient (pathological) idea of the state (c.f. Boltanski and Thévenaut 2006). The distinction signals the presence of a techno-moral order in the specific shape of impartial public service. It follows the 'not only' logic in Chapter 1: STEM (or other technology-related buzzword) can promise to improve the city as long as the policy follows a moral order. Because these vernacular distinctions frame how teachers, local state officials, and politicians interact with each other in the process of making a STEM policy, the rest of the chapter will examine how the ‘ethical’ and the ‘political’ mix in the process of making other state officials enchanted by STEM. I will do so through an ethnographic case outside (although quite close to) Medellín.

Locating the anti-virtuous other and the virtuous self

I will describe the ethnographic situation in San Carlos, which was so close to Medellín that many people considered it a “commuter town.” However, and importantly for what I will describe, San Carlos was separate from Medellín in an administrative sense, so each Town Hall managed budgets and policies independently – 4IR and STEM-related projects

included. Medellín had deployed its STEM policy for years, whereas San Carlos was just about to start designing it. Hence, the latter became an ideal place to observe STEM in policymaking. After visiting one of San Carlos' public schools for a few months (I will talk about this school in the next chapter), Rosario, the school's headteacher, invited me to attend a series of meetings with the MEN to declare San Carlos, and other 21 cities and municipalities a "STEM+ territory." In the MEN jargon, 'declare' meant that a committee of key actors from the territories – representatives from the local Secretariat of Education, public schools, local universities, and science and technology-related businesses – gathered to prepare a policy document and publicly state their commitment to the policy's continuity in time. The declaration initiative was created and supported by Siemens Stiftung, a German Foundation advocating for collaborative action through STEM Education. Medellín was Colombia's first city to declare itself a STEM territory in 2017. Advised by Medellín and Siemens Stiftung, the MEN developed a programme to scale the initiative up and entice 21 cities and regions – through capacity-building – to declare themselves STEM territories, too. However, it was not only STEM: following Medellín and other international examples, MEN branded the project as *Territorios STEM+* to symbolise the importance of other disciplines by including the "+" symbol.

The programme's introductory session happened through a Zoom conference with almost one hundred attendees. Amparo, a woman in her mid-thirties, led the meeting. She worked at a local university called Uniminuto, which the MEN hired to work as a contractor (*operador*) to develop the programme. Amparo and the MEN conceived the programme through Knowledge Transfer: a national institution – the MEN – providing local committees with policy "tools" to improve their territories. As Erin McFee (2019) notes about the case of post-conflict policies in Colombia, Knowledge Transfer is locally related to Inter-Institutional Articulation (IIA), another buzzword that international organisations "evangelised" in the 2000s. They conceived IIA to solve inefficient Global South state interventions through multi-institutional and coordinated action. Due to Colombia's history of decentralisation and centralisation laws, IIA sat in a specific power dynamic between national-scale institutions (ministries) and local-scale government offices (secretariats and

Town Halls). The dynamic traverses the virtuous/anti-virtuous state distinction I described above: national-scale institutions define local-scale officials as lazy and corrupt bureaucrats that landed into their roles as favours from a local *gamonal* (political boss). On the other hand, local-scale officials saw national officials as patronising and bourgeois city people, wholly disconnected from the rest of the country's realities and never fulfilling their promises.

Amparo's accent evidenced her coming from Bogotá, and her tone sounded hopeful to the point that it also felt condescending – as if she was talking to students or children. "I have had the chance to work on many STEM projects since 2014. We have compiled loads of information about STEM for you, so let me say, you are in front of a precious opportunity," she began saying. "Other countries have declared themselves STEM territories through a long process, but fortunately, the MEN is helping you not to reinvent the wheel." Then, with a smile, she began talking about the importance of 'we', the MEN and the attendants, using the tools brought by the MEN.

If we know how to use what is offered, we can take what teachers from our territories have done in the past and motivate those teachers who still need to. We can break those walls that others have helped to crack. But don't worry if this is your first time hearing about all this. You are the pioneers in the process.

The 'we' she used seemed rhetorical to me. Ultimately, the task was on the attendants' backs, not Uniminuto or the MEN. Her speech was inspirational, but the importance of inspiring came from Amparo's positionality: the national level, which already possessed the knowledge and the solution to the problem, towards the local level, which Amparo (and I suspect, others too) assumed as not knowing or making previous but insufficient efforts.

Later, during the subsequent sessions, I noticed a sense of distrust towards (and amongst) the committee's participants. Contrary to the introductory session with Amparo, which gathered representatives from all over the 21 soon-to-be STEM Territories, the second session was in person, and only the San Carlos committee attended. The meeting

happened on a cloudy morning, 8 a.m., in San Carlos' public library. They assigned us a small but newly refurbished room with white walls, a whiteboard, a giant TV screen, and no windows. The library's staff arranged the white wooden tables and black chairs in rows like a classroom. No one changed the arrangement during the meeting.

I sat beside Rosario and saw the other attendants slowly arrive. Most of them were teachers and headteachers. There were also two representatives from San Carlos' Secretariat of Education and two representatives from the Town Hall's private contractors. Finally, Natalia – the mediator assigned by the MEN – arrived. Natalia was a woman in her early thirties, wearing a smart black outfit and glasses. She opened the session with a severe tone:

Today, we will prioritise the challenges and identify the STEM opportunities in this territory [San Carlos]. So, this session is not a capacity-building workshop. Because they usually send you here saying that it is training, and it is not. We are a workgroup, and we all need to participate. We must know what each of us will contribute to the process.

Natalia's remarks pointed towards the MEN's assumptions about local officials. She anticipated that everyone in the room was only sent to sit and listen passively, following a pathological rather than a virtuous enactment of the state. Natalia summarised her virtuous ethics of public service with the word 'work.' What became valuable was not the fact of 'being there' (as in sitting passively in the meeting) to comply with the attendance requirement but *working* hard for the sake of the policy – not just for personal benefit. What she wanted to trigger with her opening speech was the will to contribute to making STEM a city policy in a way that resembled the emphasis on impartial work on the ethics of the virtuous state (see section above).

I heard similar remarks during a small break in the middle of the 4-hour session, but this time, it was not following the national-local power dynamic. Some teachers commented that the contractors and the Secretariat of Education's representatives looked like they were "arriving on a parachute to the meeting." By that, teachers meant they had

no idea what STEM Education was or what to do when Natalia assigned them tasks during the meeting. “They are quotas from the major or someone else,” one said while raising their shoulders as if it was nothing new to hear. This remark led to other anecdotes about times when a representative of the Secretariat of Education asked some teachers to sign a document that proved school activities that never happened or to sign attendance records of events they did not attend. “I just asked him, ‘Are you sure I’m not going to get in trouble?’ And he replied, ‘No, no, don’t worry.’ So I gave myself the blessing (*me eché la bendición*) and signed that paper,” said one of them, half laughing, half ashamed.

The situation inside the workshop was telling of how the virtuous-pathological distinction was common between everyone involved and how that distinction was based on the opposition between political staging – showing but not doing anything – and technocratic work – doing policy work for the sake of fulfilling their roles as experts and public servants. Amparo and Natalia (representing the MEN) assumed that the local public servants of San Carlos were ignorant of STEM and that they were there to skip work rather than work hard to meet the aim of a STEM policy. However, teachers saw the other local state officers (like Cielo) as being quotas from the local political patron rather than being there by merit. In short, everyone seemed to be a potential anti-virtuous other, and everyone was enacting their virtuous, hard-working, moral self at some point. This is important to consider because it shows how each public servant values their work doing STEM in comparison to others’ forms of working with STEM. It points to the idea sketched in the previous chapter about how identifying a lack (in this case, the moral lack of other public servants) connects to an impetus of working holistically (of seeking to fulfil that lack integrally).

The paradox of STEM’s magic

After the break, the session slowly moved towards defining STEM Education and possible indicators to measure the policy’s impact. Using the MEN’s PowerPoint presentation,

Natalia defined STEM as an “integrating process” so that “the learning processes can connect to the territory's dynamics.” She added that STEM “needs a teacher that is reflexive of their role as a motivator” and must “integrate knowledge areas to generate skills for the child of the future (*el niño del futuro*).” Finally, she added, “STEM is a way to bring integral development and sustainability into the territory.”

The word ‘integral’ appeared in Natalia’s definitions, and this ‘integral’ quality was said to bring new potentials on two levels. Firstly, on the level of curricular transformation, opportunities to develop technical and non-technical skills in students are created. This level resembles the neoliberal approach to the integral that the previous chapter discussed, in which capacities and experiences get reduced to skills for the job market (although in a holistic form). Secondly, on the level of IIA, STEM “mobilises actors and local organisations to generate alliances towards educational management (*gestión escolar*).” Natalia's explanation and the PowerPoint slide put together several terms and buzzwords (sustainability, diversity and inclusion, transversal skills) that resembled Annelise Riles’ (1998) descriptions of UN technocrats in Fiji joining policy terms into documents. In her case, these officials were grouping the terms not because they made sense one after the other but because they looked and felt right. The aesthetic disposition of the terms together generated impact among the technocrats, and it was through this impact that they wanted to show how the documents they were making were global – as they joined terms and phrases from documents that they considered regional and local. I interpret Natalia’s ‘integral’ depiction of STEM as pointing to a similar practice of aesthetic enchantment, but instead of proving that STEM was global, the idea was to show how STEM was total: it joined all types of skills (first level) and joined all types of actions and organisations (second level). In those descriptions, STEM had the power to overcome knowledge disconnection and state division and held the promise of bringing everything together. STEM was again enacted as a magic word and sought to enchant because of its promises.

However, Natalia's explanation of STEM made another simultaneous point. The reference to STEM needing reflexive teachers points to a broader problem with defining

STEM's magical reach. The key word here was "needs." STEM promises to make more motivated teachers and collaborative practices, yet STEM also needs motivated teachers and collaborative practices to work. This paradox was also present hours later when Natalia asked the session attendees to delimit the reach of the future STEM+ policy. First, she stood up and gave us four post-it notes so that we could write the "challenges" that San Carlos faced as a city. After a few minutes of individual reflection, Natalia asked the post-its back and sat with the representatives of the Secretariat of Education to categorise them. They posted the yellow and orange sticky notes on the whiteboard, organising them into clusters. On top of the clusters, they wrote the "challenges" categories with a green marker: gender gap, employability, planning instruments, knowledge management, technological infrastructure, and context. One sticky note was out of the clusters in which someone wrote "STEM implementation." Natalia went over every cluster, asking if we agreed with the categorisation. After a few suggestions from other clusters, Natalia suggested that they could rename the "knowledge management" category (which included post-its such as "capacity building", "motivation", and "classroom plans") into "STEM implementation." The renaming of the post-it category implied that implementing a STEM+ policy addressed San Carlos' problem of not having implemented STEM.

Now that they identified and defined the "territorial challenges," Natalia asked: "Out of all this, what can we attend to through STEM? Can we fix all these problems?" Cielo, the Secretariat of Education representative, responded: "I think we can't solve the technological accessibility. Nor social problems such as intrafamilial violence." Rosario added, "We cannot solve the [gender and employment] gaps. We can work on that, but we can't fix it." "Exactly," Natalia said as if she was proving a point to students. "STEM is not the definite solution. It is only a way to start solving the problems." Then, Natalia asked another question. "So, what can we do with STEM?" After another round of writing new sticky notes, Natalia took them. She proposed new categories on the whiteboard. The new challenges that the STEM policy could impact were: "technological appropriation," "inter-sectorial articulation," "STEM approach," and "cultural changes." Natalia separated STEM's endless potential into a few categories. Many of these categories were related to

the appropriation of technology and STEM. In the end, there were many things that STEM could not do. But that was what Natalia highlighted in Rosario's reflection – “we *can work* on that” – by saying STEM “is only a way to start solving problems.” The appeal was that the transformative, integral promise of STEM could come together with an ethics of work towards the public good.

Ethics and magic coming together

After defining challenges and opportunities, the meetings discussed how to fund and sustain San Carlos' STEM policy in the long term. The MEN was only a facilitator, not the funding body. Without funding, the implementation of STEM would be jeopardised even before it started, as it was clear to everyone on the committee that the policy implementation would involve time and money. The teachers and headteachers complained that they already had full workloads, so the policy committee would have to find a way to take them out of their teaching responsibilities to concentrate on the policy work. The Secretariat of Education representatives also said they had several other responsibilities simultaneously. It would not be surprising if the Head of the Secretariat – a position the Mayor commonly used as a political quota – decided to transfer them to other projects (or finish the project). Finally, the contractors also said that they depended on whether the Town Hall would hire them to execute the policy activities. All those changes involved changing internal budgets and teams, and no committee member had enough power to make that change happen.

The group started discussing other policies to see if they could include STEM in the policies' deployment budgets. The Plan for Educational Innovation that Natalia suggested was too raw to know, but it was one possibility. One contractor said they were working on a policy called San Carlos Digital City. "It is about ICTs, so I think we can make STEM fit because it concerns technology." Rosario nodded and said: "yes, the same thing happens with another policy called Education, Enterprise, and State Alliance (*Alianza*

E+E+E)." Cielo complemented this by adding a more general statement: "We need to make people understand that non-STEM practices are also STEM. Digital City is indeed also STEM; it's just that we were not in that STEM logic and discourse back then." Rosario added, with a serious face: "Yes, our emphasis this year needs to be on diffusion." I took Cielo's and Rosario's words as ways to figure out how to use the promising figure of STEM as endlessly extendable (the way Natalia defined it through the PowerPoint presentation).

Who were they trying to persuade with STEM's magic? The inability of the MEN to fund the project it was so keenly promoting meant that the possibility of funding now rested on 'political will,' that is, the pathological enactment of the state by local politicians that only used buzzwords to get more votes. They needed to persuade politicians to make the new STEM policy endure in time. For this reason, the committee tasked Cielo to arrange a meeting with her boss – the Head of the Secretariat of Education – and discuss how to ensure the policy's continuity. However, a few days later, Cielo brought more important news: they booked a meeting with the Mayor – a role with considerably more power. Everyone's faces lit up, and the committee enthusiastically dedicated their last official session to preparing what they would tell the Mayor to get him to fund a permanent committee that could oversee the deployment of the STEM+ policy. Everyone voted that Natalia should attend because she would give institutional weight by being the MEN's representative. She looked at her calendar on the phone and said she was free that day. She suggested bringing two or three of the MEN's slides to show how this STEM policy makes part of a broader global effort and, secondly, to show how they had tailored the policy to fit the Town Hall's Local Development Plan to include an emphasis on entrepreneurial and business-oriented STEM. Rosario responded affirmatively, adding, "The important thing is that the slides have the MEN's and the Town Hall's icons together." Then, they asked Andrés, one of the schoolteachers, to talk just after Natalia so the Mayor could see how involved the education system was. Andrés accepted with one condition: "I will talk as long as you let me tell the mayor the importance of STEM for the city's economy." Finally, the committee unanimously tasked Rosario to finish the meeting by asking the Mayor – with her usual bluntness – to support the policy with institutional

resources. The meeting finished with an almost palpable atmosphere of hope and joy. One of the schoolteachers closed with this statement: "Politicians are slick bastards; whatever we do, we cannot let him evade their responsibility as they always do." They disapproved of how politicians worked, and yet they were planning on using similar strategies to politicians: convincing speeches, power-laden symbols, and personal persuasions. In this case, the political strategies were legitimate because they were backed up by an ethic of working towards the public good.

The meeting happened in a spacious modern meeting room in the Town Hall's building, a few blocks from the city's library. The committee members and I sat at a large wooden table, and the Mayor arrived soon after. A hefty, serious-looking man in his mid-fifties, the Mayor shook everyone's hands and sat at the table's front. The meeting went as planned. Natalia introduced the importance of the topic. Then, Andrés highlighted the benefits of STEM in the city while asking for the Mayor's support: "STEM will allow us, Mr mayor, to develop the economy, take the students out into the world, and bring the digital industry to the city. How good it would be to have a team [the committee] that could take us to the Software Valley, which is not only for Medellín but also for the whole metropolitan region?" Javier, another headteacher and part of the committee, also added with a potent and dramatic voice: "if we're not into Science and Technology here in San Carlos, we are not going to be competitive. Mr. Mayor, that's why you need to generate a permanent group to oversee the policy and hire a contractor to give this continuity." Finally, Rosario stood up and handed out a piece of paper with a graph printed in black and white. "Here, you can see what we have achieved in my school," she said energetically. Later, she explained how well the students performed in the annual state exams to access higher education. "So, we are already in it. We train the people who will make part of the enterprises developing the city. However, we now need the money to make it happen. Mr. Mayor, please give the order. Because if you do, my boss (in the Secretariat of Education) will comply."

The Mayor looked at Rosario with a smile, stared down for a few seconds, and then replied. "We need to start with the National Learning Services (SENA) because they

oversee the technical degrees in San Carlos. I have complied with my promise to renew their buildings and support the process. I have a vision as a mayor: to make San Carlos a 15-minute city such as Paris, unlike what they [previous mayors] were trying to do, which is to make the city a commuter town. My vision is to create an Enterprise City (*ciudad empresa*), so we need to change infrastructures and mentalities. We need San Carlos' youth to be entrepreneurs. So, if you need support to go to Bogotá and present [at the national STEM conference], then consider that done."

Soon after, the Mayor finished the meeting and left the room swiftly. His intervention stated many points simultaneously. First, he was in sync with the STEM policy, even if he did not say the word STEM even once. Second, he took his time to clarify that he had fulfilled his promises – that he had complied. Third, he showed he had a moral project that went beyond mere politics. Finally, he gave something – a "favour" – to his constituents and subalterns: the trip to Bogotá. When I stood up to chat with the committee members, they had a similar view. One of the schoolteachers told me later that "we lacked clarity in what we wanted and allowed the Mayor to go off by paying for a trip to Bogotá. That's nothing!" Rosario replied:

The Mayor looked quite serious as if he didn't want to be there. I think it was because he was about to finish his period as Mayor and didn't want to get in more trouble. In any case, we started something because the Mayor would talk to my boss, and maybe things would move. If not, we will keep fighting. And I will talk personally to the Mayor because I have known him since we were children, and I'll tell him: 'Mayor, you're leaving office in a few months, but please don't take away our hope of seeing that policy well established. Please, that's our illusion.'

Rosario highlighted nothing different than her will to keep working (keep fighting) to see STEM implemented. The way to keep fighting for the STEM+ policy was not through more dazzling promises, evidence, and rhetoric about STEM. She was going to keep fighting for STEM by appealing to the Mayor's moral responsibility with the STEM committee and

the city. It was a call for more work towards the public—something that he apparently lacked.

Conclusion

This chapter has explored what types of 'work' there are behind the popularisation of STEM Education in Medellín and San Carlos. I have shown how STEM acquires rhetorical powers within a political milieu to fulfil the promise of improving education and economically transforming the city. But this policy branding dynamic can be interpreted as a soulless, amoral spectacle to reproduce the state's political machine. Following a binary opposition between the idea of what the state is (pathological) and what the state *should* be (virtuous), public servants of Medellín and San Carlos made a distinction between politics (mere spectacle) and work (the ethical action to fulfil the normative ideal of a technocratic and effective state). The ethnographic material showed how, in private meetings and away from the spectacular public performances, the magic of STEM to change public education in an integral way was present, but it was not the only thing that state-related workers highlighted to entice others to 'fight' for STEM. These actors valued hard work and impartial service. If their ethics of public service were not present in the STEM policy, then STEM would not have a tangible impact on the population, and it would fail.

With this insight, the chapter advances the overall thesis argument by showing that, as a techno-moral regime, 'the integral' impacts how state-related actors define themselves and 'the state.' The emphasis on hard work and virtuosity does not take out all the processes of enchantment that entailed branding, events, speeches, symbols, promises of transformation, and myths. Many state managers and policymakers believed in STEM's capacity to transform education magically and knew the efficacy of treating STEM as a magic concept in terms of funding. But they followed the 'not only' logic I sketched in the previous chapter, so if the state officials implementing STEM were not

ethical, STEM would not be considered integral. Virtuosity and magic needed to come together to feel enchanted and enchant others.

This chapter built on the insight from Chapter 1 that we cannot understand desire without the processes of recognising lacks and insufficiencies. The ideal of the virtuous state (that state officials tried to materialise with their ethical work) came together with its opposite: the pathological state. But virtuous and pathological state ideas were ontologically different in the eyes of public servants. The virtuous state was a normative ideal, a moral order that must be followed and enacted. The pathological state idea was not normative. Rather, it was the deviation of it – it was anti-moral. The pathological state was the result of enacting what *should not* be done. In that sense, the pathological was some sort of initial quality of some actors – i.e., politicians like the mayors of Medellín and San Carlos – and the whole state. The pathological state was not holistic in a techno-moral sense, as it lacked technocratic and impartial ethical guidance. So, if the state workers and institutions that implement STEM enact the pathological state through mere spectacle, then, by extension, STEM will not be holistic. In their eyes, that specific instantiation of STEM was incomplete and would fail to fulfil its promises (even though state workers did not know that for sure).

The limitation of STEM is the start of a new chance to make ‘the state’ virtuous: with extra hard work from the side of state officials, STEM could achieve its promises. Interestingly, however, STEM kept being seen as ‘limited.’ STEM was merely a tool to keep working towards improving education and the city. To make that assertion, state officials needed to enter into what seemed a paradox: casting STEM as a powerful tool to motivate people into action, but also recognise that in order to happen, STEM needed to motivate people in the first place. This ‘integral’ approach to STEM justified the use of rhetoric, ritual, and promise to find funding and support STEM because, this time, the rhetoric and ritual were going to be guided by a virtuous ethics of public service.

The next chapter will approach a question about enchantment that Chapter 1 brought about and that this chapter did not address. It concerns the different shapes that

moralisation of STEM can take. Given that the history of 'the integral' in technical education is a contested one – i.e., teachers opposing the neoliberal state, but then the state incorporating that holistic definition –what is the enchantment of STEM about in the specific case of teachers? This question is crucial because it will point to how the moral shape of 'the technomoral' is unsettled and how ethical imperatives change according to different types of state workers.

Chapter 3

Selling transcendence

This chapter examines the ethnographic case of a team of teachers inside a public school near Medellín that considered themselves 'STEM enthusiasts' and how they dealt with the critical and selective way other teachers seemed to engage with STEM (Levy 2019) . In this chapter, I focus on the relations between teachers as a community of practice. This different focus allows me to ask two questions that expand the wider question of the thesis about the 'integral' promise of STEM: how do teachers understand the *integral* power of STEM in their own terms? Moreover, how does that definition play out in the process of disseminating STEM as a solution to education's problems? The first question will allow me to engage with the previous chapters by differentiating the experiences of teachers and other types of state-related workers. Such differentiation will deepen the discussion of what forms of moralisation appear among state representatives in Colombia when approaching STEM as 'integral.' As I showed in Chapter 1, there have been historical points of contact and confrontation between MEN officials (usually policymakers and managers) and public schoolteachers about how to conceive technical education and to what ends. There are similarities in their approaches, one of them being the recognition that generating job market skills in students is important and STEM could generate such 'integral' workers. However, as the chapter will show, there are also differences, and teachers' envisioning of STEM and its promise exceeds these market-shaped definitions.

To substantiate this first point, I align my ethnographic observations with other anthropological studies analysing the relationship between teaching (and comparable professions) and morally charged words such as care, responsibility, sacrifice, and transcendence. Ethnographies of teachers in Latin America have shown how policies define teaching as a responsibility that goes beyond the mere transmission of knowledge

(Schaaf 2022; Verdugo 2021) . From this view, teachers (should) follow an ethos of care that involves worrying about students on a personal level and engaging with their well-being beyond marked assignments. Rommy Schaaff (2022) calls this a 'pedagogy of love,' which materialises in the way teachers relate to students and make internal distinctions among their fellow colleagues based on these 'caring' relations. Of course, following these moral precepts becomes unpaid labour (Doyle and McMurray 2022) and it can be seen as part of a wider trend of neoliberal self-responsibilisation that eliminates state intervention and reframes it as individuals helping each other (Rose 1996) . However, ethnographies of other professional communities, like humanitarian aid workers, who guide their work through similar notions of care and sacrifice, have shown how this ethos predates neoliberalism and could be traced to a political theology of Western intervention that has its roots in Christian notions of helping a 'suffering other' (Bolotta, Fountain, and Feener 2020; Fassin 2012; Barnett and Stein 2012) . I will show how this neoliberal-cum-theological ethos of care is present in teachers' self-understandings and how this ethos gives value to STEM in achieving an 'integral' pedagogical process and forging students as 'integral' individuals.

The second part of the chapter focuses on responding to the question of how teachers understand the value of persuasion to enrol more teachers into implementing STEM. Marie Curie teachers (the school I will focus on) engaged with STEM in many ways, depending on their personal convictions. Some of these engagements were critical, and 'STEM enthusiasts' were aware about it. However, a key point is that the STEM enthusiastic teachers interpreted all criticisms and reservations from their colleagues in a similar way: their non-STEM colleagues were alienated from their ethos of care because they had not understood yet the power of STEM.

All in all, I argue that the enchanting power of 'the integral' cannot be understood without the vernacular perspectives that redefine its power from generating a more holistic set of skills for the labour market into more transcendental views of its efficacy. Before starting, however, let me first introduce the school and the team of 'convinced' teachers in which I will base my descriptions.

The school and STEM

Marie Curie was an all-female public school (*Institución Educativa*) located near the centre of San Carlos¹⁴ – the city I described in the second half of Chapter 2. Between March and August 2022 (when I did my visits), the school had around 1,000 students from primary to secondary school. As has happened with most schools in the area, Marie Curie has offered both technical and academic degrees to students in their last two years, especially on topics related to digital technologies such as multimedia design and web development. However, the school was well-known in the city for its curricular focus on STEM Education beyond said technical degrees. Leading this process of integrating elements of STEM's pedagogical approach to transform the entire school's curriculum was the school's headteacher, Rosario – who also appeared in Chapter 2 as part of the policymaking committee. With the support of Pedro, the school coordinator, and Eduardo, one of the teachers who identified as STEM enthusiasts, Rosario's ambition was to become one of the few schools in the country entirely guided by STEM's precepts.

Rosario and her team had been working on that goal for a long time. She told me that their work with STEM Education started around 2011. Back then, the acronym STEM was still not in the country, but that was the year in which the school started modifying the technical degrees they offered, from technical drawing and typewriting (designed to give female students job opportunities as assistants) to web development and multimedia design (to give the students the opportunity to become engineers). After that, Rosario told me that they became interested in digital technologies. The school began participating in several local, national, and international projects, including *Plan Ceibal*, a Uruguayan policy implementing MIT's famous One Laptop Per Child programme (Ames 2014; Beitler 2013). They also adopted robotics as a topic with primary education students, and in that way, they were invited to a university in Albuquerque, United States, to participate in a contest. There, while the students were competing with their robots, the administrative

teachers attended a few university talks, and that was how they first heard about STEM Education. As Rosario once put it, they arrived back to Colombia "totally convinced" of STEM's potential. But most importantly, that enthusiasm came with a specific idea: to join the school's areas – natural sciences, social sciences, arts, humanities, and others in a way that they could be taught together through project-based and problem-based learning (PBL) pedagogical activities with students.

When I started visiting the school, Rosario and her team changed several documents to include STEM. Similar to how STEM triggered the shifting of organisational shapes in the previous chapter, at Marie Curie, they changed, for example, the "mission and vision" statement of the school, as well as other formal documents that schools need to present to the Ministry of Education, to include STEM as its focus. However, the curricular transformation that they were envisioning through STEM was turning out differently than expected. This chapter will describe how they put their hopes and energies in persuading other teachers to comply with the curricular transformation based on the idea that STEM's power to interconnect everything could 'save students lives'. Let me start with the last part, that is, the importance that teachers gave to sacrificing for students.

The transcendental value of teaching

I was sitting in a small, windowless room surrounded by books. Eduardo sat in front of me behind a wooden desk. We were in the school's library, which was also Eduardo's office. Apart from being a social sciences teacher, Eduardo helped Rosario transform the curriculum through the STEM approach. We had been talking for a while inside his office when he began an explanation about his motivation towards STEM. He told me about a frequent conversation he had with other teachers:

Many colleagues tell me, 'Look, you did as well in the annual performance evaluation as this other profe (teacher) even though he does nothing, and you are involved in a thousand things! Why?' Well, here's the difference: I am convinced. I do it because it improves students' lives, not because of the performance evaluation.

Eduardo saw himself as having something that other teachers did not, which allowed him to work regardless of the price – since the "price," the salary, was not enough incentive. To explain it further, Eduardo put it in terms of classical philosophy:

I'm going to use the Aristotelian terms of substance and accident to explain it to you. Other teachers lack substance. They can say that they are implementing STEM in the classroom, but that is not genuine and profound because it is only an accident: something superficial, a project that will end—but not a human connection.

Eduardo's self-understanding of following a vocational call that is relationally driven and deeply rooted in care was not exclusive to STEM enthusiasts. Rather, it was something I heard repeatedly amongst teachers to justify their actions and views. Another Marie Curie teacher, who was critical of the school's approach to STEM, told me in a conversation that "teachers might not be brilliant, nor have every possible qualification; but if they love what they do, then they will make students feel in love with the topic." I heard multiple times the words "passion," "love," "enthusiasm," and "vocational call" (*vocación*) in my conversations with and about public school teachers. As Marisol Verdugo (2021) also identified in her ethnography of public schools in Southern Chile, teachers invoked a vocational call (*vocación*) when talking about their profession. She suggests that the "call" was related to several elements. First, her interlocutors viewed students as immersed in a vicious environment: violent neighbourhoods, alcoholic and abusive parents, drugs, and child labour, amongst others. Second, they held liberal values such as meritocracy and social mobility through education as the paths to getting out of that vicious milieu – e.g.,

education will give enough social and cultural capital to the hard-working student who wants to get out of poverty. Lastly, teachers saw themselves as fulfilling a "heroic role" since they provide that education. Thus, the teacher's vocational call was not about teaching content exclusively, as they were changing students' lives in general (Verdugo 2021, 110–11). In conversations I had with teachers all over the city, I could hear them following a similar logic. I heard stories about all kinds of violence that students had to endure.

For Verdugo (2021), teachers' way of defining their profession as a heroic attempt to change students' lives was directly related to a vernacular worldview that resembled Pierre Bourdieu's theory of cultural capital. In other words, teachers see their value as providing cultural capital to students so they can ascend the social ladder – and paradoxically, they also see some of the students as lost causes because they lack social capital to start with. However, I disagree with Verdugo. There is more to consider when understanding teachers' justifications for their role. At least in my interlocutor's explanations, there is a rich vocabulary that points to notions of sacrifice and transcendence that run closer to a religious ethos than a liberal and economist vernacular theory. Eduardo's account of him working extra hours for the students' fulfilment rather than for the salary is an example of the value that they place on sacrifice. On the other hand, Rosario once exemplified the value of transcendence: "What I exist for, because I believe in destiny, is to be able to create a spirit in students, something that transcends. (...) It's the fact that STEM goes further." Then, she added: "I don't give a shit about STEM if it doesn't serve to create *E/ Ser* (the Self)." This last word was also common to hear amongst other Medellín's teachers. As I noted in the last chapter, *Ser* even appears in the way Medellín defined their STEM local policy while I was doing fieldwork: *Ser* + STEM. Its definition is ambivalent because some define *E/ Ser* as those interpersonal skills, such as teamwork and emotional regulation, that complement technical skills. I will describe that approach in more detail in Chapter 4. In the meantime, it is worth noting that others, such as Rosario, placed transcendence closer to core moral values through the notion of creating "a spirit" in students. Rosario was a specific case in the sense that she identified

as a practicing Catholic, but Eduardo's notion of substance also points to how teachers see themselves as doing something that go beyond their individuality.

As I showed in Chapter 1, after Colombia's independence from Spain (1810) and up into the 1940s, the country faced the battle between two forms of conceiving the state: a conservative one that made the Catholic Church responsible for education and a liberal one that aimed for a public, secular, modern-like-Europe educational system. Luis Vásquez Zora (2015) argues that teachers experienced the collision of those political projects that took turns to rule the country. On the one hand, teachers had a moral (understood as Christian) responsibility towards their students. Teachers needed to discipline students' *souls* and become moral role models simultaneously. On the other hand, they also had to forge dutiful and responsible citizens, professing individuality, objectivity, and other values of the Enlightenment. Even though the latter responsibility pointed towards implanting rationality in the population, we could say that there was a transcendental aim in both cases: to maintain a theological order and forge an Enlightened nation. Sociologist Rodrigo Parra (1996) terms this duty as the teachers' "sacred image" (1996, 281). However, for Parra, this image became less and less recognised in their everyday teaching practices, especially in the 1970s. They passed from community leaders – people with a similar authority to priests or mayors – to state employees having to focus only on the topics they teach in the classroom. If the state wanted to forge individualist and rational citizens, by extension teachers were also forced to become individualist and rational (in a similar way in which forging a Christian student implied that teachers had to become Christian moral exemplars).

Thus, teachers' positionality is a clear instance of the tension that this thesis wants to highlight: the promise of a technologically driven modernity and the desire for a holistic approach that complements such technological promise with the aspiration of a morally rich nation. Moral notions of sacrifice and transcendence (among others) were valuable for teachers' understanding of themselves. My 'STEM enthusiast' interlocutors saw *vocación* as something inherent that they possessed, and as I will show in the next section, they also saw it as the substance that took STEM's potential to make connections to

another level. I will delve into this reasoning by describing one 'solution' that Rosario's team was developing to convince teachers about STEM.

The power of STEM as integral: A glossary

Rosario had her L-shaped office on the 2nd floor, on the corner of a corridor surrounding a light-filled internal patio. Her office – and the rest of the school – was decorated austere, with a few pictures on the wall and a desk to hold her meetings. As usual, I sat at the desk with her one early morning, and while having a *tintico* (coffee) and a snack (fried chicken), she told me about a new project she had in mind. It was a "STEM glossary," a document that defined STEM Education's most important concepts – including the definition of STEM Education – in a way that could be understood clearly by all the school's teaching staff. For Rosario, the cause of teachers not implementing STEM 'correctly,' and therefore having critical thoughts and actions, had to do with a multiplicity of terms that had been accumulated since the beginning of their exploration of STEM (see section above). She gave me a specific example that, as I will show, was not casual: the notion of interconnectedness. According to her, many teachers were aware of the notion but used different words: transversal, interdisciplinarity, topic connections, and curricular integration, amongst others. Thus, Rosario wanted "a unified language" that would allow them to know when to use which concept and to show every teacher that all those concepts were doing the same – in her words, "working through connecting knowledge (*conocimientos*).” The glossary seemed to be a form of standardisation – the establishment of a *lingua franca* that could generate stronger dialogues between administrative and regular teachers.

A few months later, Rosario achieved the first step towards a glossary. Her team wrote a small pamphlet for a STEM conference that the school organised annually and gave the

pamphlet to the attendants. The pamphlet included a definition of STEM. The definition focused on highlighting two elements. First, the wide range of applications that the STEM disciplines entailed, and second, its potential to open the labour market to students:

STEM is the acronym in English for Science [English in the original], a field that approaches problems such as global warming, climate change and medicine; Technology [English in the original], which goes from computers to the digital era with Artificial Intelligence and coding; Engineering [English in the original], with topics such as infrastructure, building design (...); and Mathematics [English in the original], that goes from economy, accounting (...) to cryptography. Alums from these fields are in high demand in the labour market (...), according to the United States Department of Commerce.

Beyond its accuracy, what struck me about the definition was its ability to encompass a wide range of heterogeneous elements. However, this was intended, and here is why I said that the example of 'interconnectivity' Rosario gave me when introducing the glossary was not fortuitous. Interconnectivity was the way of making STEM an example of integrality. That is, interconnectivity was not a part of STEM. Rather, STEM was an instantiation of the power of interconnectivity. But what does this 'power' of interconnectivity consist of?

The pamphlet highlighted elements related to the disciplines of the acronym, but at other times, it went beyond it. On the first level, the pamphlet's definition of STEM also included disciplines that, in formal terms, could be defined as non-STEM, such as social sciences and humanities. Later in the text, the pamphlet explained the connections between disciplines as a semantic landscape, a product of how STEM has travelled globally:

“STEM’s popularity has been so great that several strands have emerged: STEAM, for example, where the “A” represents the Arts, or STREAM, where the “R” is for Reading (Lectura) and “A” for Arts. Today, STEM+ [the current name of San Carlos’ public policy] contemplates and respects contextual research, but the root or

premise remains the same – to make students learn about critical thinking, problem-solving, creativity, innovation, research, collaboration, and leadership."

Through this way of defining STEM and its integrative power, the student could become an integral person, comprising all sorts of 'skills' that expanded, and thus improved, their desirability in the labour market.

The definition of STEM as related to many complementary skills might sound like the way STEM was defined, for example, inside the policymaking meetings that I described in Chapter 2, and connects to how I described the neoliberal turn of education in the 1980s in Chapter 1 (c.f. Martínez Boom's [2019] notion of market neo-realism). The following chapter will describe this 'standard' definition of STEM in greater detail. However, from Rosario's perspective, the power of interconnection that STEM brought about went even further than this standard definition, exceeding job skills. In a meeting, she defined STEM in the following terms:

"What is STEM? Beyond the acronym, STEM is an opportunity. I don't know how to define it, but it makes me not think in a straight line. It makes me join, find, couple, mix, and add. But what? Well, life. Matter. Cells. Society. Space. That opening of the mind [she stopped to think for a second] is like magic."

This time, her definition was much more poetic. When I heard this, it reminded me of Bruno Latour's (2005) definitions of networks and how they are made of different human and non-human actors. I was attracted to this definition, which affected me and made me more curious about what the integrative aspect of STEM does.

This seductiveness of STEM as an endlessly integrative device creates a clear connection with the descriptions of "magic" from Chapter 2. Here, it is relevant to take Rile's (2000) ethnography of UN bureaucrats in Fiji because she shows that the network has become a form of relationality that sustains the hopes of numerous types of actors (including academics) who aim to replicate it in all types of scales by crossing those scalar divisions. As I said in the previous chapter, Riles shows that to make the network a global and encompassing form, UN officials cropped different documents from different

instances (local, national, regional) so that words and terminologies are together because of their aesthetics. In Chapter 2, this pattern-making happened through post-it notes and policy terminologies. However, by describing it as "magic," Rosario went beyond the quality of patterning and adhered to an inherent quality of STEM. STEM became a magical method with the agency to change people's minds and make them think differently. It resembled Alfred Gell's (1998) *abduction* in the sense that the object itself seemed to stand for the social relations that created it. In this case, it is not science and technology as such that were persuasive, but the quality of the acronym to bring together things that were not expected to be together. The acronym stopped standing exclusively as "science, technology, engineering, and maths" and expanded to stand as integrality – of the potentiality to see the 'whole' in a new way. In the previous chapter, San Carlos STEM policy had the capacity to shift the shapes of other policies and organisations by overcoming the boundaries between distinctions and oppositions – i.e., a Digital Education policy could become STEM in the same way as an entrepreneurship policy can be STEM. Here, the magic of STEM does similar work but acquires the capacity to interconnect and overcome (even ontological) barriers endlessly.

The integrality of STEM and its moral value

Now, what is the relation of all of this with the moral ethos of teachers? To respond to this question, let me bring back a quote from Rosario that I used earlier in the chapter so that I can put it in context and interpret it:

What I exist for, because I believe in destiny, is to be able to create a spirit in students, something that transcends. (...) It's the fact that STEM goes further. I don't give a shit about STEM if it doesn't serve to create El Ser (the Self).

The day Rosario told me this, we had coffee at the school's canteen. I asked her how she had never gotten tired of talking about STEM after so many years. She replied to me that she was indeed tired, though only on a personal level:

But professionally, no. As public teachers and educators, we have a huge historical debt with our students. I can't believe Einstein's relativity theory was formulated decades ago, and we're still not able to translate it into a common language for students. We have so much to do left, and that is why I can't stop fighting.

For me, it was evident that Rosario saw a strong relation between STEM, its capacity to change people by interconnection, and her duty to sacrifice herself to transform her students. She used Einstein's relativity theory because it represented the way science changed the world, and because STEM stands as science (among other things), she was showing how the latter could generate transformation in her students.

Then, she used the multiverse theory as another related example to illustrate her point, although it changed the course of our conversation:

So, yes. This has been a lot about working hard and ser una volada (being crazy). In my presentations I talk about the multiverse, which is the theory that says that we are talking here in this canteen, but in another dimension we can be talking in a canteen at your university in the UK. But for me, quantum physics theory goes beyond that and connects with topics like energies and spirituality. But I can't say those words in my talks because they would send me to an asylum! [laughs] So, I'm left with the possibility to talk about computational thinking, circuits, and other things from the flat world.

She went on to tell me about her experiences with spirituality, from Jewish mysticism (Kabbalah) to readings about the Third Eye. I was used to hearing Rosario talking about how God put her in her role as a leader, as she was quite open about her religious beliefs as a practising Catholic.¹⁵ But it was the first time she had talked about this side of spirituality to me. What I found interesting was that, for Rosario, these topics also pointed to interconnectivity: By talking about the Third Eye, Rosario was expressing her view of

the world as consisting of connections that we cannot see, let alone define with words or images.

Before concluding her narration about her interests in spirituality, Rosario began talking to me about the pamphlet with the STEM glossary. At first, I thought it was a complete change of topic. Nonetheless, she ended up linking the pamphlet to communicating these spiritual perspectives:

[With the pamphlet] I want to show everyone the topic of the multiple universes, how science is a universe and maths. I mean that I want to include those topics that I can't talk about by explaining STEM. It's like talking about what you can't because you use other words. I see it as something symbolic or metaphorical. The keyword here is "this is as if." So, we can write a tale about STEM, something very creative; in that way, we are saying what we cannot talk about by talking about something else. (...) Because there are people that read at different levels. Some of them will read it in the flat sense, about electricity and STEM. And these people are really important, too! But others will read it and get the other world.

By making the distinction between what can be said and what cannot (because she would be sent to an asylum), Rosario gave the pamphlet the power to bridge what she saw as socially approved and disapproved connections between the Self and the world. The pamphlet about STEM would act as a hidden messenger, representing the disapproved message (spiritual connections) by concealing it behind STEM's own meaning. Rosario considered that, within the technology education sector, talking about spirituality – even in its connection to scientific topics such as quantum physics – was *taboo*. Regardless of the social restrictions around it, Rosario considered spreading the message important. So, what was that important message that Rosario needed to communicate? Did Rosario want to make people interested in Kabbalah or the Third Eye when reading about STEM?

I would answer the last question with a 'no.' Because, once again, our conversation shifted to the concept of *culture*, an (apparently) secular, well-known word for anthropologists that, as I showed in Chapter 1 with the history of Integral Humanism and

its connection to the MP, culture pointed to integrality as a more general sense of 'doing good.' In previous moments, when I attended meetings between Rosario and other STEM enthusiasts, I noted that her team and she started using the term 'STEM culture.' When I asked her about it, she explained it to me in relation to two other concepts: praxis and habits.

When I went to Bogotá for a national STEM conference, I saw that there was an explosion of pedagogical activities related to STEM all over the country, and because there are many, these creative activities in the classroom generate connections between modules, and those connections begin to accumulate, and create what I call 'praxis.' That praxis creates a habit [in students]. But the problem is that habits are not enough because in order to transcend, one has to be useful for something; it needs to solve a need and become useful to society, and so we need to create a Self, an individual first, and then that individual can contribute to their milieu.

Culture is an addition to the nexus between STEM's interconnective power and the transcendental end of making integral students positively transform the world. New Age spirituality and Catholic conceptions of the soul were not the end goal; instead, they were part of a (rather peculiar) set of terms that created a direct link between STEM and teachers' moral ethos – a set of terms that traverse liberal views of individual improvement, social sciences jargon, and spiritual terminologies that point to a vitalist vernacular theory. At that point, Rosario said the quote from the beginning of this section about not caring about STEM if it does not create "a spirit" in students. In fact, she finished that quote by saying: "The spirit in students is something that transcends because it connects with the Earth Spirit, that is complaining." Teachers' sacrifice (long extra hours, free labour) when implementing STEM has value because it is seen to deeply transform society, not only because they follow a liberal value of self-responsibility. Thus, now it is clear why STEM enthusiasts can say they are 'in love' with STEM in public, and express that they don't care about STEM in private: it is the power of STEM to do more than science and technology – of joining transcendental goals with the persuasive power of interconnection.

In that way, STEM can act on the school context that teachers want to transform through their vocation. Now that I have delved into the relation between integrality, STEM, and morality, in the second part of this chapter, I will turn towards responding to a second question: how do these 'convinced' teachers understand the process of making other teachers 'see' the potential of implementing STEM in the school's curriculum? I will start by explaining why persuasion is so important.

The value of persuasion

Persuasion, or similar words such as captivation and convincing, occupied a big part of Rosario's day. Other headteachers, international organisations, and university professors constantly invited her to share the school's experience implementing STEM. Rosario defined these presentations as "sensitisations (*sensibilizaciones*)," this specific word illustrates how important it was to move people towards STEM and make it in an affective, experiential process. However, the persuasive process was not exclusively done outside of the school. For Rosario, it was even more important to use persuasion with the teachers from her team that were not (fully) convinced about the importance of STEM's value. It is necessary to describe how schools work in an organisational sense to understand this stress of persuasion within public schools.

Colombia's public education system has been reformed several times in the past. One of the biggest, most recent reforms happened in the early 1990s, with the advent of the 1991 Colombia Constitution. The Constitution introduced the concept of *autonomy*, specifically the autonomy of universities, which later became central to the whole educational system. Article 69 of the Constitution established a "special regime" for universities in the country, which allowed them to organise themselves independently and decide their own organisational structures and timelines, among other aspects (Pulgarín Martínez and Castañeda Ruiz 2005). Later, in 1994, the Colombian government issued a new Education Law, which transposed the Constitution's notion of university autonomy

into public schools. The concept of autonomy rested on the notion of decentralisation, the idea that universities and schools did not have to depend on centralised institutions, such as the MEN, to choose how to organise themselves. This autonomy also mandated public schools to formulate their own curriculums and the MEN to make suggestions through pedagogical and technical guidelines. The Education Law listed the basic modules (discrete disciplines taught in a separate way) that should appear in every school's curriculum, but the schools had the autonomy to add other modules or to decide how to teach them. Thus, introducing STEM to guide the school's curriculum depended on the internal decisions of the schools, not on national instances such as the Ministry of Education.

Furthermore, the Education Law also used the notion of autonomy to define the internal organisation of schools. The Law and subsequent decrees established three formal roles inside schools for teachers: the ones dedicated to teaching activities, the ones coordinating those teaching, and the headteachers managing everyone. This form of organising might look like a hierarchy; some teachers have the capacity to determine the actions of others. However, the notion of autonomy was also present in that sense. Headteachers were not the direct bosses of the 'regular' teachers. Instead, they were both directly commanded by the MEN or the local Secretariat of Education, so teachers could not command each other – rather, they had to dialogue and negotiate. As Eduardo explained to me:

“STEM works in private schools because they work as a company. If you don't comply, you get sacked. Here, things are different. Could the headteacher force me to do certain things? Yes. But let's see if she dares because that would become a long fight. So, this ends up being a relationship between colleagues.”

Even the performance evaluation process, in which headteachers ranked numerically how well the regular teachers did in teaching the modules, and which in theory had an impact on the salary of teachers, worked as a process of dialogue and negotiation – an *entente cordiale* in which the headteacher could manage (but not command) the regular teacher.

In short, the concept of teacher autonomy materialised in the law, and institutional relations between teachers made coercion difficult and persuasion a tool for implementation. For schools, using STEM in the curriculum was not mandatory in formal terms, and amongst teachers, it was not as easy to command everyone to comply. One of the reasons why persuasion becomes valuable is the institutional characteristic of autonomy, which makes it difficult to use hierarchy or coercion, making persuasion the main strategy.

Problems of implementation

Of course, the opinions about – and engagements with – STEM Education were not homogeneous nor always positive. Some teachers disagreed with Rosario's decision to use STEM to structure the whole curriculum and classroom activities. Some of the teachers were vocal in their disagreement; some others simply did not comply with the procedures that Rosario, Eduardo, and others from the administrative team created. Let me briefly describe the reforms around STEM that they were trying to implement. First, they divided the modules into three groups: the school's STEM areas – natural sciences, maths, and technology –; the Humanities areas – Spanish, English, history, philosophy –; and the areas they termed "the fun ones" – ethics, physical education, and arts. Then, inspired by Problem-Based Learning (PBL) methodologies, they established a pedagogical dynamic in which teachers created a research project that included all the modules from one of the module group divisions. So, for example, teachers from the STEM modules had to meet at the beginning of the academic year to propose a topic that could be used to teach natural sciences, maths, and technology – say, food and cooking, in which the maths teacher could teach fractions by cutting apples, the natural science teacher could talk about plant typologies when choosing ingredients, and the technology teacher could teach about algorithms by using the analogy of following a recipe. Once the teachers had chosen the topic, they had to fill out a form explaining the pedagogical aims,

the expected outcomes, and the proposed activities. Then, they also had to register each student's progress, all of this in addition to their usual teaching tasks and without allocated extra time.

There were various critiques and resistances to this pedagogical activity, which was trying to materialise the 'interconnectivity' supposedly inherent to the STEM Education approach. Some teachers, especially the ones teaching the non-STEM modules, complained that establishing connections between maths and chemistry was easier (and more useful) than between, say, ethics and physical education. Others expressed their disagreement with the amount of extra work that this process required, especially if one of the other teachers in the group did not put any effort in the activity. Others asked why this teamwork effort was necessary if they could include topics from other modules in their classroom activities without the help of the other teachers – in other words, that the 'interconnectivity' could work inside one module and not within modules. Finally, others questioned the logic of the whole exercise, asking why STEM was about connecting modules for the sake of it and instead of concentrating on teaching Science, Technology, Engineering, and Maths in a better way (i.e., sticking to what STEM really stands for).

Regardless of the specificity of the criticisms, Rosario and her team were certain that they were not obtaining the expected results in integrating STEM into the curricular activities. They saw the inability of the teachers to understand the benefits of STEM and the interconnectivity of knowledge that it offered as the root of the problem. To understand why they reached that conclusion, we can return to Eduardo's reflections on substance and accident at the beginning of the chapter.

Eduardo's narrative proves the existence of 'conviction,' the vocational impetus that ignites the will to sacrifice and care for students' lives. However, his explanation of being 'convinced' made sense in opposition to the non-convinced – the teachers who only work for the salary and do nothing more than what is written in their contracts. But as I said earlier as well, the critical-towards-STEM teachers would also call themselves

'convencidos' – not of STEM, but of their vocation towards saving students' lives. It would seem that Eduardo, Rosario and other members of the STEM team were collapsing the enthusiasm towards STEM and the vocational call towards saving students' lives. In other words, not being a STEM *convencido* would be the same as lacking a vocational call. But the reasoning was not as simple. When I asked Eduardo if not being convinced about STEM would mean not having a teaching vocation, he said, "No." Eduardo's hypothesis ran closer to a logic of alienation. He told me that (at least some) of his colleagues did have the vocational call. The problem was that they were so busy with their workloads that they lost track of what was important: sacrifice and care. The solution was, then, to show them 'the path' back again. The STEM enthusiasts wanted to show the other teachers how sacrificing to implement STEM at school was the same as sacrificing for the students' well-being. If they helped implement STEM, they would be returning to their pedagogical call, so the only thing non-enthusiast teachers needed was to 'understand' what STEM was really about. The STEM glossary (see above) became relevant again, but this time as a persuasive solution to proselytise STEM and 'convert' the other teachers.

'Selling' to convince

During my visits to Marie Curie school, I also had the chance to talk to Pedro, the secondary school's academic coordinator. He invited me to sit in his office just by Rosario's. We started talking about the computers and laptops that the school had at that time, but the conversation slowly turned towards the glossary that Rosario had in mind:

I'm going to explain to you what's going on with that. You also speak English, right? Is that a fair request if you are asked to learn a thousand words in one day? It's very hard, and you probably won't make it. Or let's say the rectora (headteacher) asks you to lift this table. You look like you can lift it, but it will be uncomfortable. The same goes for these issues. For this, you must take three things into account: utility, easiness, and motivation. STEM is useful, but we need a way for teachers to

understand it easily so that they can adapt to the lexicon. It's also about selling them the idea. For example, see this wristwatch. How much do you think it costs? It costs 700,000 [Colombian Peso]. But, if I just tell you how much it costs, are you going to buy it from me? No. Right? I should tell him that it can be used underwater, has stopwatches, never runs out of battery, and so on. Then, one must sell them the idea, motivate them, and captivate them.

Pedro talked about "captivating" unconvinced teachers to "buy" STEM as a product by making the explanation easy. Libardo's explanation seemed to me like some sort of meta-example of what he was telling me. He used different analogies, like learning English words, lifting tables, and selling a wristwatch. Also, his creative but slightly condescending explanation reminded me of the fact that he was a teacher. By that, I mean that Libardo reminded me of other moments in which I heard teachers compare (effective) teaching with transforming things into a familiar, easy-to-grasp form. For example, before Marie Curie school produced the pamphlet in which they defined STEM Education (see section above), Rosario told me that she wanted the pamphlet to look like *Nacho* or *Coquito*, two instructional books developed in the 1970s to teach children how to read (see image below). In those books, she told me, "They put '*ma-má*,' and then they write '*mamá* is the person who took care of you and brought you to the world.' So, children associate the experience with sounds. I want to make the *Coquito* of STEM, to tell people really, really easy what STEM is and show them that maths is a whole universe, and science too."

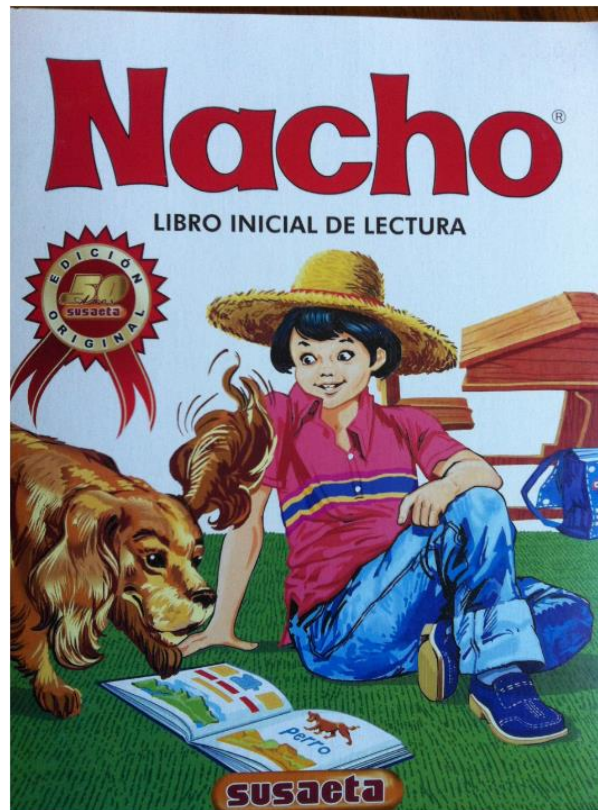


Illustration 4 – Cover of a Nacho Reading Book. Source: Nachobooks.com

As I showed in Chapter 1, from the end of the 1970s to the end of the 1990s, the Colombian Federation of Educators (FECODE, the biggest teacher's Union in the country) led what was known as the MP. The MP was a national social movement in which teachers nationwide fought against neoliberal education policies through national strikes. However, the MP also gathered several authors, ranging from philosophers to historians to mathematicians, and created research groups with teachers to analyse and define what being a pedagogist meant. Through those gatherings, teachers had access and co-created a critical – specifically, Foucauldian – narrative of the teacher as a subject of the state. They aimed to reveal how teachers were disciplined and dominated by a set of institutional configurations in which non-teachers, that is, Catholic priests in the XIX Century, technocrats from the MEN, and even psychologists through texts and instructional manuals, dictated what and how different topics should be taught. Authors

and teachers then asked the question of what has been the 'silenced' knowledge of pedagogy and how teachers could claim pedagogical knowledge as a form of transforming society. The answer was that what pedagogy and pedagogists, by extension, do is to join heterogeneous knowledge and do it in a way that generates new knowledge. Pedagogists began seeing themselves as *bricoleurs*, as masters of the form (as well as the content) of classroom lessons, and I interpret Pedro and Rosario's ideas of resorting to 'easy-to-learn' formats like *Nacho* as a way of using familiar procedures of enchantment.

The other element of Pedro's explanation about captivating teachers with STEM had to do with 'selling,' which in Colombia is highly used to convince someone: 'selling the tale' (*vender el cuento*). However, as an emic category, it can also be related to the regional specificity of Antioquia (the County in which San Carlos is located). Several authors have highlighted the strong identification of *Antioqueños* with cultural values such as entrepreneurship, commercial skills, and individualism (Maclean 2017; Restrepo Echavarría and Berrío Meneses 2019). While living in Medellín, it was familiar for me to hear people talking about their Jewish legacy as the cause for being good salespeople and proudly say that the city was Colombia's greatest industrial capital until the 1970s. I even heard people use the expression *hacer la paisa* (do it the Antioquian way) when they needed to find their way to solve something by convincing people. For example, while talking to an internet room facilitator, she told me that she had to get out into the street and "sell" the internet room to citizens, one by one, by getting them inside the room and hear all the services they provided. "I asked myself, 'What do I do'? And I replied [to myself]: 'Well, *la paisa!*' (laughs)."

Politicians and policymakers in Chapter 2 were aware of how the enchantment towards STEM entailed a process of crafting that enchantment – through fashionable terms and practices of spectacle and rhetoric that were closer to politics and marketing. Teachers were also aware of the importance of making STEM persuasive to enchant more teachers and reproduce the method in the curriculum. But in the case of teachers, their persuasive strategies did not come from political marketing. Instead, their actions came from the notions of what teaching does and why that practice of teaching is effective.

Enchantment, or the capturing of other teachers' affects and intentions, was seen as going through a process similar to that which teachers use with students: translating and mixing content so that students could grasp the lessons. The process through which Rosario and her team could direct the other teachers' actions took the shape of the action of 'selling:' the object on sale cannot generate desire on its own but needs the help of someone who highlights specific aspects of the object to create desire in the buyer. The logic is similar to the one in Chapter 2 – making STEM something marketable. But in this case, teachers were not unscrupulous politicians, nor lazy bureaucrats enacting the pathological state. Teachers were already virtuous – they just needed to be shown clearly and simply why STEM was the way to fulfil their vocational call.

Conclusion

This chapter started by asking in what ways teachers understand STEM as 'integral' and how those understandings are put to 'work' on other teachers. Teachers have a transcendental understanding of their work: they transform students' lives and, thus, society through their personal sacrifice. Through this moral framework, teachers such as Rosario, Eduardo, and Pedro understood STEM's capacity to join disparate elements by going beyond (although not denying) the conventional idea that those 'elements' were job market skills. Convinced teachers understand STEM as having an inherent capacity to make people generate 'caring' connections between 'selves' and the world around them. In the case of Rosario, this transcendental capacity of interconnectivity was expressed through notions such as spirituality, the multiverse, and culture and praxis. Although I do not think every teacher would express it in the same terms, I argue that Rosario's conceptualisation is an example of how STEM's power is seen to lie in its capacity for being 'integral,' and that 'integral' is made up of moral actions as well. However, STEM's capacity or power was not seen as immediately convincing other teachers. Here, teachers used their own sense of agency to try and find a way to implement STEM at school. In an

institutional context where centralised commands are not made effective, teachers resorted to their skills to present content in a graspable way, using metaphors and pedagogical procedures to change the other teachers' minds about STEM. Furthermore, they saw this process using the emic metaphor of 'selling,' that is, as a process coming from the 'salesperson' that creates a desire in the 'buyer' about a specific object.

The chapter finished by making a comparison with the managers and politicians that appeared in Chapter 2. I want to continue with that comparison to highlight this chapter's contributions to the wider argument of this thesis. The first point of comparison concerns the relation between STEM and 'the integral.' Chapter 2 sketched out the relation between STEM and 'the integral' in two ways. Firstly, as a magic concept (Pollitt and Hupe 2011), STEM acquired in the eyes of policymakers the capacity to overcome boundaries and distinctions, and that boundary-breaking was multi-level. On the one hand, STEM appeared to integrate technical and non-technical skills inside the classroom; and on the other hand, STEM crossed the boundaries between policy terms and organisational divisions – for instance, STEM could be applied to institutions developing science fairs as well as education offices working on coding and other digital skills. Secondly, the previous chapter also advanced the notion of the 'not only' logic that appeared in Chapter 1. It did so by showing how it was vital that the ethics of public service (impartiality, technocracy, hard work) was present in the development of the STEM policy – thus making STEM an 'integral intervention' in the sense that it (and the people that deploy it) must possess moral integrity (*ser íntegro*).

This chapter strengthens and extends these contributions. Firstly, by showing how STEM's apparent capacity to integrate expands beyond the lexicon of market skills, and includes other dimensions that are epistemologically or ontologically separated: technology and culture, the natural and the supernatural, and the visible and the invisible. It showed how STEM is considered 'integral' (and, therefore, enchanting) not for the elements that it contains but for the *capacity* to contain endless elements – a stretchy quality if you will. Secondly, by showing how STEM's capacity of interconnectivity is related to a moral order, it also points to the 'not only' logic of Chapter 1. The capacity to

join spiritual connection, habits and culture, and technical skills pointed to the idea of *EI Ser*, a type of transcendental subjectivity that better represented the holistic improvement of the students' lives.

Chapter 2 showed how the moral order that public servants pursued was a state made up of impartial, technical, and efficient bureaucrats – so, the combined work of impartial actors would add up to generate a non-discriminatory state. STEM and its enchantment would be a tool, not a replacement for the servant's hard work. Thus, the ethos this moral order triggers is the hard-working quality of public servants. In this chapter, teachers' moral order was different. Teachers did not talk of a general public good but about 'students' lives,' which meant a specific way of casting students and their contexts. Moreover, teachers did not speak of the state as the transcendental collectivity that they aimed at. Their normative order was one made of caring, heroic, or sacrificed teachers, as well as wholesome, fully formed students who can correspond to their communities and the broader world in which they live. STEM had the power to transcend divisions and connect elements to achieve that moral order – as long as that power connected to teachers' will to sacrifice. If state managers valued the ethos of 'do the work you are supposed to do through STEM' (instead of promising that STEM will do it for you), teachers' value looked more like an ethos of 'do more than what you are supposed to do to allow STEM to do its job.' One could say, then, that the content of an 'integral' technomoral regime is heterogeneous and changing.

This point begs the question of how those heterogeneous moral forms connect, and how they relate to the making of STEM as national policy. Chapters 4 and 5 will start approaching these questions. However, this chapter gave a hint of it already: it has to do with the identification of limitations in the implementation process and the people responsible for them. Chapter 1 brought up the idea of holographic lack and how that lack is connected to crafting the desire to be holistic within a regime of representation. Chapter 2 took the notions of virtuous and pathological state ideas to show that the lack never fully disappears in the eyes of public servants. If politicians do not follow the technomoral order, their materialisation of STEM will be partial (not holistic) and will therefore fail. But when

they try to show their work as implementing STEM differently (this time with ethics), they still do not deny that STEM is limited – it is magical but still a tool.

This chapter has highlighted a key piece in this process: responsabilisation. Other teachers were able to spot shortcomings, inconsistencies, and even absurdities in the process of transforming the school curriculum using STEM. But regardless of the wisdom that these questionings could bring, the STEM enthusiasts reinterpreted them as ignorance from the other teachers – they had not properly understood STEM and its integral qualities. Non-enthusiastic teachers did not understand STEM because they were alienated from their vocational call – they did not have it anymore. They needed to go through a process of motivation. However, what is interesting is that similar to Chapter 2, these recognitions of personal lack implied that STEM did not have the power to solve such personal lack. This is paradoxical in that the promise of STEM is to change people by opening their minds to new connections. Thus, something new had to come into the equation: ethical (i.e., sacrificed and caring) teachers and their knowledge about pedagogical strategies to simplify and reconnect information. If the lack (of vocational call) was individual, the solution also implied individuals to make the enchantment happen. Thus, the chapter shows how the process of resignifying the holographic lack as an opportunity for further holographic work (integrality) relies heavily on the notion of individual responsibility to *redistribute* the lacks of STEM.

The next two chapters will focus on the issue of motivation and enthusiasm in relation to how individual agency plays an important role in keeping technology education as national policy. If this chapter has shown that responsabilisation towards the individual is key in the way teachers and other public servants see the potentials of STEM, Chapter 4 will focus on the question of how state managers and private contractors try to extend STEM's benefits into teachers' lives to make them active, enthusiastic teachers.

Chapter 4

Insufficiency and motivation

The previous chapter finished with two insights. Firstly, it showed that the enthusiastic STEM teachers interpreted numerous questions about STEM as the incapacity of other critical teachers to understand what STEM is. That lack of understanding was why those teachers were unwilling to help – and even responsible for the project’s failure. Secondly, it showed that the enthusiastic teachers saw their pedagogical know-how as a useful, complementary tool to STEM’s integrative potential towards the other teachers’ ‘conversion’ as STEM enthusiasts. In short, the previous chapter identified the responsabilisation of individuals as an essential part of the process of moralising STEM as an ‘integral’ solution to education.

In this chapter, I delve more deeply into the relation between the identification (or rather, crafting) of an individual lack and identifying the potentialities and/or limits of STEM as an ‘integral intervention.’ The chapter asks what this ‘individual lack’ is about and how STEM is supposedly affecting or being affected by it, for this question helps to clarify how limitations mediate between the enchantment of STEM and the ethical imperative to adhere to a moral order. To do so, I move away from the exclusive focus on the relations between teachers and examine spaces in which different actors interact – the state-education-technology nexus I sketched in the introduction. The chapter describes two capacity-building workshops inside *Vivero del Software* (the Software Greenhouse), an office of the Secretariat of Education in Medellín that was the product of such technology-state-education nexus (see illustration below). This empirical move shows how the positive value that teachers in San Carlos had towards pedagogy as a transformative tool

is not exclusive to teachers. Rather, it can also be seen among public servants, following the logic that if the problem with STEM is individual behaviour, there is no better solution than pedagogy to change people's minds.



Illustration 5 – Vivero del Software. Source: Foursquare

Several anthropological studies have focused on pedagogy in international development through categories such as capacity building and knowledge transfer (Douglas Jones and Shaffner 2021; Watanabe 2021; 2017; John 2011; Mentore 2017; Allen 2018; Brada 2023). These authors show how, for their interlocutors, pedagogy in its different forms carries the hope of a more inclusive, socially just, and emancipatory future. The hope is based on the premise that pedagogical programmes, capacity-building workshops, or knowledge transfer schemes *extend* the development ‘model’ that organisations want to circulate with targeted populations during the workshops into their personal lives, changing society through the transformation of individual insufficiencies (Douglas-Jones 2017; Watanabe 2017; Ellison 2017). But that hope of improving society

through extending capacities in individuals' lives entails an assumption: those individuals *lack* the capacity to realise such futures for themselves. These anthropological studies show that when discussing capacity-building, we discuss social conceptions of individual agency (or the lack of it) concerning an ideal future. Pedagogy is seen as a key part of improving populations through individual transformation.

But how exactly is it imagined that this transformation happens? Chika Watanabe (2017) notes that pedagogical training programmes do "development work" because they aim to make trainees copy what they have learned during the workshops in their local contexts. As with play and ritual, bounded pedagogical activities craft imitative practices to generate an effect on an 'outside' (i.e., the 'real world'). Personifying a 'model' within the bounded activity is believed to be useful because that personification will be reproduced outside of it (Hamayon 2016). As with games, they also have "predictable effects" by "compel[ling] individuals to evaluate themselves against a normative standard" (Hopkinson and Zidaru 2023, 3). However, imitation is not reduced to a unilateral original-copy relation (Lempert 2014). Even though official discourse frames the training process as making the trainees copy or replicate what they have learned, in practice, both trainers and trainees negotiate what it means to become a 'good model': it does not have to do with copying or personifying exactly as told, but with adapting or translating what was told to their local conditions – what Watanabe (2017) terms "transformative imitation" (2017, 593), and that in this chapter will appear as "motivation." If, as seen in Chapters 1 and 2, STEM is seen to have the 'magic' to transform the education system by integrating students into the market, pedagogy would be seen in the intervention sector as having the power to change people – so that they follow the specific path that the projects set them towards but in their own local way. If people identify the limit of STEM as dependent on the teacher's ethical lack, pedagogy would complement STEM and make it an integral intervention.

Following these anthropological insights, I argue that the 'problem of agency' that STEM enthusiasts are trying to solve in non-enthusiastic teachers (so that STEM can fulfil its promises of social improvement) finds a solution through what I call a double epistemic

trick. Following Gregory Bateson's ideas on play and fantasy (1972), I will show how pedagogical activities create bounded fictions. Within these fictions, teachers become outdated and unmotivated, acquiring the responsibility of not letting STEM do its work at schools. Simultaneously, STEM acquires the capacity to create endless interconnections (through a technological object). Finally, the fictions join in a way in which STEM allow teachers to make connections that will help students, and teachers allow STEM to expand into unexpected directions. In that way, the cycle between identifying a holographic lack and generating actions to keep working on a holistic (integral) intervention can continue.

I divide this chapter into three parts. The first part will describe how the depiction of teachers as lacking happens in relation to depicting the world as an 'integral' global market. The second part will show how local state institutions and technology companies cast STEM mainly as technology to fit into the depiction of the global market. Finally, the third part will show how those depictions of teachers as being insufficient concerning the 'real world' take shape within pedagogical activities alongside demonstrations that STEM can be endlessly interconnecting if teachers participate in this process.

Integral markets and outdated teachers

Workshops started with a presentation – sometimes short and schematic, sometimes longer and detailed – that framed teachers and students within a broader context. Take, for example, the presentation that Nicolás, a T-level teacher collaborating with VS, did about the importance of STEM Education in Medellín. Nicolás started his narrative similar to Medellín's mayor and his political performance in Chapter 2: through the myth of Pablo Escobar's violent legacy in the city. The idea was to show how the city had moved from the most dangerous city in the world in the 1980s to a city globally recognised as an urban 'miracle,' even winning a prize for the world's most innovative city. With his confident voice, he told the teachers:

All this was possible because three key actors worked together: the state provided the buildings and infrastructure, the industry (la empresa) brought employment opportunities for this new digital economy, and the universities brought the workforce that the companies needed to grow.

The future was tangible and achievable for Nicolás and several other people promoting STEM Education. New technologies were generating new opportunities, not only in the US and Europe but now closer to the student's homes: at the 'Science and Innovation District,' a neighbourhood that Medellín's local government re-built for hosting tech giants such as HP and Amazon. Thanks to the partnership between the industry (*la industria*) and the state, the city was full of new (employment) opportunities, partly available in the present and potentially proliferating in the future. This narrative reflected the idea in Chapter 2 that technology had a magical power to transform the city and its citizens.

Even though Nicolás highlighted the collaborative side of the state and the private sector, it was clear that he also emphasised 'the industry' as having the key to the city's development, given that it 'knew' what type of labour the market needed. VS also proved that the industry wanted technical knowledge and coding skills. But later, Nicolás brought another set of skills that, in the same way as he did, several teachers and public officials termed "the Self" (*el Ser*). Nicolás said:

One problem with technical degrees (media técnica) is that students go out and just become manual labourers (operadores). That's what we are currently training them for. But what we need is people who transform the economy. (...) We are no longer in the type of capitalism that makes more and more money because that mindset only generates financial bubbles and bankruptcy. This has changed. We are now in the era of conscious capitalism, where companies see products in terms of their social impact. Now, it is all about the Self (el Ser), so if students get to manage a company, many skills are needed. We need an integral student (un estudiante integral)!

The digital thus became important *vis-à-vis* other types of skills. “Many skills,” as Nicolás phrased it. Like other actors in the educational sector, such as politicians and policymakers in Chapter 2, Nicolás suggested that there is an 'integral' quality to the global market. Furthermore, for Nicolás, capitalism now had a new 'spirit,' which required individuals to mirror the quality of being integral (c.f. Boltanski and Chiapello 2007). The Self as an integral individual comprises a holistic set of technical and interpersonal skills and an ethical framework of social and environmental awareness (which also generates economic profit). In that sense, Nicolás' narrative also matched ideas from Chapters 1 and 3 about the integral as a techno-moral holistic order that individuals and states had to mirror. But apart from showing these speeches as further proof of what was discussed previously, I bring them again to highlight how they play out in the process of crafting teachers' and students' disinterest or dislike for STEM as a lack.

Rachel Douglas-Jones and Justin Shaffner (2021) suggest in their theorisation of the concept of capacity, as used by NGOs and international organisations that building capacity means to identify a future (in this case, a market-oriented one) as well as to “generate (preferably measurable) insufficiencies which need to be made appear – an absence that becomes a potential” (2021, 8). With the expansion of the Global Digital Market into Medellín, Nicolás identified an ‘integral’ out-there, one which explicitly demanded integral individuals (through job profiles asking for specific skills), and those ideal types of workers became the normative element through which students could be compared as integral or not. Students were not part of the prosperity and benefits of the digital future already unfolding in the city because they did not have the skills and the knowledge required by “the industry.” In the case of Nicolás and others within the workshops, however, the insufficiencies were not measured to see them. Rather, they used an analogy to identify that gap. They were made present through the expression of ‘changing the chip’ (*cambiar el chip*) – as in “we need to change the students’ chip.” The idiom was also used by all types of actors and present in all kinds of events and workshops related to education technology¹⁶. It is not clear where the phrase comes from or when it first appeared, but it is undoubtedly a powerful analogy of something (i.e., a skill, a piece

of knowledge) that can be inserted in the 'minds' of people in the same way a SIM Card or a microchip can be implanted onto a mobile phone or computer. By default, students were seen as not having that 'chip' (i.e., an integral set of skills) within them. In that sense, such a lack of knowledge has become a potential for inserting that integral set of skills as a module through STEM.

Students were the main target of intervention within the wider narrative of technology and education policies. However, the same reasoning of capacity building and insufficiency (Douglas-Jones and Shaffner 2021) presented by Nicolás could be applied to teachers. In that sense, the narrative of STEM's magic was not only useful to enchant teachers. It was also useful to forge teachers as insufficient, as teachers did not have the technological skills that 'the industry' supposedly needed. Nor did they have the skills bundled in the concept of 'the Self' and the integral knowledge people should have in the so-called interconnected world. The reason for that to be a problem, however, was different. Teachers needed to have that same set of skills because they were seen as the actors in charge of *transmitting* the knowledge to students. They needed to possess that knowledge before they could teach students anything about it. These two capacity-building projects were based on that understanding, and I heard (or read) the same reason in interviews, events, documents, and videos: if the teacher does not know how to use technology, the technological objects will stay unused and will not transform education. In short, teachers were *collateral subjects* of the wider technology and education policies: they ended up being intervened subjects indirectly, that is, without being the primary targeted group (students).

The reason that teachers were collateral subjects of the pedagogical projects thus stemmed from their positionality as subject-makers. Their actions were seen as part of a chain of efforts that included the workshop organisers, the funding institutions, innovation labs such as VS, the Secretary of Education, and the national government to improve the education system's quality. Teachers were responsible for teaching students STEM-related content (that they received during these workshops). Therefore, regarding capacity and insufficiency, it meant that teachers' insufficiencies went beyond coding or

other technical knowledge and involved their skills as pedagogues or educators. During a coffee break, I interviewed Marta, a teacher coordinator¹⁷ attending the workshop session with her 'team' of teachers. She told me:

One of the things we struggle a lot [at school] is the fact that teachers must learn all these new methodologies from scratch, because they are at odds with what they learned during their careers as educators. The faculties of education continue teaching very conventional curriculum subjects. What they learn at Uni leaves aside learning and practice. They also leave out the topic of technology even more.

Marta's understanding of teachers' insufficiencies was related to the knowledge they previously acquired in their training. Apart from technology, there was knowledge of new "learning and practice" methods that teachers missed because of that outdated training. The project organisers and attendants identified three negative attributes of the teachers' outdated training during the workshop presentations. Firstly, teachers saw knowledge as separated rather than interconnected. For example, in the Q&A section after Nicolás' presentation, one of the attendants stood up and said:

We agree that something needs to change. The school system was created centuries ago, and back then, it might have made sense to separate and fragment knowledge into pieces. But things have changed in the world, and now we need to do the opposite and make knowledge transversal.

Secondly, there was a generalised understanding that teachers and schools were repeatedly giving students specific knowledge as curricular content they needed to memorise instead of preparing them to solve problems or work with time-bounded and collaborative projects. Teachers (and public education in general) were said to repeat content instead of adopting 'new' methodologies such as Problem-Based Learning (PBL) – methodologies that were advertised as being more in line with the 'real world.' Teachers were not integral because they were outdated and lacked transversal knowledge and new teaching methods.

Finally, perhaps the most important aspect of "changing the chip" of teachers involved a *predisposition* towards those new methods, technologies, and skills. The terminologies to define such individual and their internal predisposition varied, but similarly to Chapter 3, most of my participants used motivation (*motivación*), enthusiasm (*entusiasmo*), falling in love (*enamorarse*), or conviction (*convencimiento*). In this chapter, I choose the term motivation over others, firstly because it was highly used within the workshops as the desired outcome, and secondly because motivation better represents the activeness and sense of independent impetus that workshop developers defined as lacking in some teachers. For example, one of the headteachers attending Nicolás' presentation on STEM Education put it like this:

We've had many successful years and years where not so much. Why? Because there are teachers, who are committed to their classroom and to working with their peers. But there are teachers who say, 'No, I am already busy, and I'm not going to do anything other than my responsibilities.' What we do [in that case] is a process of convincing teachers to understand the motivation that transversal classroom projects generate in students.

According to STEM Education proponents, unmotivated teachers looked like disinterested teachers doing what their contracts said. In that sense, we could compare the word motivation and the word sacrifice that appeared in the previous chapter. Unmotivated teachers are the ones who do not sacrifice for the improvement of their students, and thus, they do not follow an ethics of care. Furthermore, motivation was thus closely related to 'changing the chip': generating an effect in the outdated "mentality" of teachers meant that they were given technical knowledge, but more importantly, they were affected in a way in which they looked for new STEM-related knowledge *by themselves* once they left the workshops. In Douglas-Jones' terms (2017), STEM-related knowledge was valuable not only in itself but also in its "extensibility," that is, in its capacity to "extend out of the work-based environments in which trainees first discover it, and into

their lives” (2017, 60). Motivated teachers were similar to “transformative imitation” in Watanabe’s (2017) description that I sketched in the introduction. Motivation meant that teachers would keep learning, practising and collaborating with their colleagues instead of repeating the specific content they acquired in the workshops. It matched the value of constant movement and self-fulfilment within project-based capitalism (Boltanski and Chiapello 2007). Changing the teachers’ chip was how to equate a responsibility towards an ‘other’ - teaching students - with a responsibility towards the Self – keep learning by yourself (Trnka and Trundle 2017) .

In sum, the capacity-building workshops for teachers aimed to extend the digital market's integral quality into the teachers' work (and personal) life – which needs to frame teachers as lacking this integral quality in the first place by casting them as outdated. The link between market integrality and teachers’ behaving in an integral way was motivation. I now turn to show how the capacity-building workshops aimed at ‘changing the chip’ of teachers – mainly, creating motivation in them – and how STEM appeared in this process. Before that, though, I will give an overview of the workshops and describe who developed them – as that will give a sense of why these workshop developers were putting so much emphasis on the technology part of STEM rather than on all the other elements that STEM could stand as (science, engineering, and even non-technical knowledge and new educational methods).

The workshops and the Education-Technology nexus

For the following description, I will use two different capacity-building projects that took place inside VS. VS was involved in both projects but in partnership with different actors. The first one was organised in collaboration with Antioquia's Centre of Science and Technology (CTA) and *Ruta N*, both local semi-public organisations promoting science and technology for development. Ruta N oversaw the project and provided the funding to develop it. VS only had to provide the space. Finally, CTA developed the project, taking

responsibility for organising the workshops, advertising them among teachers, monitoring the number of teachers enrolled, and undertaking the workshops. For this last purpose, they hired young engineers who acted as 'facilitators' – although everyone referred to them as *los profes* (the teachers). I will focus my description on one of them, called Raúl. Raúl was a young engineer born and raised in Medellín. He recently finished his master's degree in bioengineering and worked as a facilitator on this and several other projects. He had experience teaching rural school students and teachers how to use computers and write educational texts in STEM Education. The partners set out the first project to train teachers in what they termed "4.0 technologies"¹⁸ – 3D printers, drones, educational robots, and Internet of Things (IoT) – although the project also had a component of 'new' pedagogical methods: problem-solving and Project-Based Learning (PBL). Initially, they targeted only public school teachers, but because of poor enrolment numbers, they also offered the last sessions to private school teachers.

The second project was made in alliance with another Medellín's Education Secretariat office. Camila, a young state official from VS, oversaw it. It all started because she was the direct link between VS and Medellín's Educational Nodes (*Nodos Educativos*), an administrative division of the Education Secretariat that split all the schools of the city into smaller groups (nodes) that could work in a relatively autonomous manner – as a sort of network. Each of these nodes grouped schools from a specific area of the city. Furthermore, the nodes had to identify the most urgent issues in their educational communities (schools, parents, and students) so that the Education Secretariat could help them. Each node had one coordinator, who mediated between the schools and the Education Secretariat – the headteachers usually called these coordinators their "boss." One of these nodes' coordinators, called Sabrina, contacted Camila (from VS) because the node decided that they wanted to know more about STEM Education and how it could help them in their "curricular transformation" – one of the urgent "issues" that they identified. Camila, who had a master's in education, organised a series of workshops to "build skills" in teachers regarding STEM, and the node decided to start with the T-levels (technical degree) teachers because they were the ones directly hired by the Secretariat

of Education, so they could 'order' them to attend.¹⁹ Camila organised the workshops with the help of Nicolás, another T-level teacher who implemented STEM in his classroom activities and usually presented the topic at the Secretariat of Education's events. He talked about 'the industry' and the integral student I described in the last section.

As it is already evident, the developers of the workshops are a heterogeneous mix of state institutions, public and private companies, schools, teachers, and facilitators, amongst others. I call this an education-technology nexus. However, this nexus was not new, and it connected to the turn towards the digital economy that I described in the historical section of Chapter 2. The history of VS reflects that turn. VS was originally conceived in 2004. Back then, Medellín's Secretariat of Education partnered up with local universities and a group of software companies operating in the city. The partnership was called Medellín's Digital Future Alliance (*Alianza Medellín Futuro Digital*), and it was formed to implement a new national policy aiming to update public schools' T-levels or technical degrees (*medias técnicas*). Therefore, the partnership centred its efforts on updating the technical curriculum of the schools to teach software development.

After sending 16 representatives on a 'mission' to Silicon Valley to understand how industries and universities worked together, the partnership highlighted the importance of two practices—first, having curriculums and research projects to be always aligned with the digital industry; second, local companies and schools collaborating to teach students according to the needs of private companies. Thus, the partnership's research about the software industry led to new technical curricula for Medellín's public schools, making software development its focus. Furthermore, in 2015, the Education Secretariat built and inaugurated VS as a place where the partnership's universities and software companies could carry out lessons and workshops for students in their last year (so software companies could hire them in less time).

The education-technology nexus shows that the market-driven discourse and the emphasis on digital skills are not only from the Colombian state but are a normative view that has been co-produced with the digital industry sector.

Technology is central to these capacity-building projects, alongside the discourse of the integral market and the integral student/teacher. The more moral side of the 'integral' discourse (that Nicolás condensed with the concept *El Ser*) was seen as supplementary, and I contend that this is so because of the nexus I just described. Noting this preponderance of technology is relevant because it helps to understand, in the descriptions that follow, how STEM appears both as a powerful transforming agent (filling teachers' lacks) and as a limited tool (a limitation filled with teachers' work). Making STEM synonymous with technology gives it its capacity to interconnect and its holographic limitation – the one that makes it depend on teachers' pedagogical and disciplinary know-how.

Ludic activities and STEM

I will now focus on the core part of the workshop sessions: the pedagogical activities – usually referred to simply as *actividades* (activities). There were two or more activities that teachers had to attend during each workshop session. The activities were as hands-on as possible and involved game-like formats: competitions, role-play, and challenges, among others. Therefore, I will engage with anthropological work around play and games to describe and analyse these activities (Bateson 1972; Watanabe 2021; Malaby 2007; Hamayon 2016; McCarthy 2023). Here, play is thus as much an analytical category as a vernacular one, in the sense that workshop organisers and teachers recognised its efficacy when mixed with a pedagogical strategy. Play becomes the way to craft a frame (Bateson 1972) for the double epistemic trick I talked about in the introduction of this chapter: making insufficiency visible and depicting STEM as integral. Such a trick happens when an activity is composed of three movements that place teachers in specific positionalities: framing, then engaging, and finally, exemplifying.

Framing

All the activities started with a short explanation by the workshop organiser. The explanation intended to do three things. Firstly, to 'frame' the activities, that is, to set the situation on which the activity was built. Secondly, to state any rules that the teacher must follow. Thirdly, to give a condensed overview of what the teachers would learn by the end of the activity. Take, for example, an activity that Raúl, a young electrical engineer acting as the workshop developer, carried out with a group of private school teachers during one of the workshop sessions. He called this activity "the robot." That day's topic, Raúl told the teachers, was educational robotics: building and using robots with students (usually primary schoolers) to teach them any school topic. For that reason, he told the teachers that they would be divided into two groups – there were 13 teachers that day, so each group had seven members, including me in one of them. He asked each group to choose one member. "Each of these two *profes*," he explained to the room while pointing at the two chosen teachers, "will be your robots. I will cover their eyes, and they won't be able to speak, so the rest of you must instruct your [team member] robot to get to the end of a maze I will build with these chairs. The team that can do it without making too many mistakes wins!".

As Thomas Malaby (2007, 96-97) points out in his theorisation of games, one of the key issues that anthropologists have identified with play (and games as a subcategory) is how it is bounded apart from the 'reality' of social worlds. One perennial essay exploring such dimension of play is Gregory Bateson's 'On Play and Fantasy,' which forms part of his *Steps to an Ecology of Mind* (1972). Bateson argued that the relation between play and 'real' life is paradoxical. He started with an example inside a zoo of "two young monkeys *playing*" to combat, that is, whose actions "were similar to but not the same as those of combat" (1972, 185, italics in the original). Monkeys interpreted a nip as playful and not as a 'serious' bite in combat because the framing of play uses two levels of communication: the immediate, first level ('this is a bite') and a second,

metacommunicative level ('this is play'). The two levels together form a relation between the signifier (the bite) and the signified (combat) that Bateson compared to the relation between a map and a territory: the former stands for the latter, but we could not affirm that the former *is* the latter. This implies a fictional element to the signifier: as much as a playful nip denoting a bite in combat, the nip is fiction as much as it is not a bite.

However, the nip's resemblance to the bite implies an effect of confounding one with the other, at least momentarily. Following this idea, Bateson compared the play to a painting's frame: the frame is not separating element A inside (nip) from element B outside (combat); rather, it is delineating them in a way that one becomes the background (combat) and the other becomes the foreground (nip). The 'as if' relation between a 'just for fun' nip and a 'real life' combat bite is not only a relation between what happens inside the game and outside in 'real life.' The relation between levels of representation would complicate the inside-outside relation. Or, in Bateson's words, "The playful nip denotes the bite, but it does not denote what would be denoted by the bite" (1972, 186). Back to Raúl's "robot" activity, he was therefore framing it 'as if' the teachers' movements and actions were like robots and robot builders, but more importantly, he was also implicitly framing the teachers' actions within the activity 'as if' they were students, and as if he was the teacher. The activity denotes the classroom dynamics of teachers and students, yet the activity *is not* a classroom.

For Roberte Hamayon (2016), Bateson's framing of play points, first, to the way play can become a way to generate an effect outside of it, given that it is separated from 'real life' but still points to it, and second, to how that effect involves a specific amount of imitation. Through a description of ritual games in pre- and post-Soviet Siberia, Hamayon shows how bodily movements of dancing, singing, and speaking within the games imitated specific actions of humans and non-humans 'outside' the game. Those movements were said to have (positive or negative) effects on the villages' prosperity, depending on whether the movements were executed correctly or not. However, Hamayon also clarifies that players did not have to replicate the movements precisely as farmers or birds would move to be efficacious – it would even be considered ridiculous. Teachers did not have

to speak or walk like children during the activity; instead, they needed to ‘follow’ instructions (imitate) and engage with the activity as students would. In that way, teachers could put their role of teachers in suspension and become ‘learners’ of what Raúl wanted to teach them about educational robotics. The desired effect was to circulate knowledge to students through the teachers’ embodiment of such knowledge through the teacher-student dynamic of imitation.

In sum, the pedagogical activity framed teachers ‘as if’ they were students, not to make them act like children, but to put them in a position where they acted ‘as if’ they did not know about STEM, whereas the workshop developer did. It was the first movement of the epistemic trick: casting teachers as lacking the capacity to know how technology (i.e., a robot) works and use it in the classroom. They are positioned as incomplete in terms of what they know (technical skills).

Engagement through ‘fun’

I contend that, to make the second movement of the trick, after framing teachers in the position of a student and making them imitate pre-scripted actions, workshop organisers were trying to generate an affective reaction (as well as inculcating technical knowledge) that could be understood as ‘having fun’ or positively engaging with the ‘model’ they wanted to transmit. Let me give another example from Raúl’s sessions. A few days later, Raúl developed another activity. This time, the activity aimed to teach Arduino hardware – a chip and a set of sensors designed to create electronic circuits, machines, and simple robots. Because Arduino involved too many components (i.e., cables, LED lights, and protoboards) in carrying out the activity, Raúl told me he decided first to teach them Arduino using an interactive software simulator that represented each component and teachers could use as if they were doing an actual circuit. The activity involved connecting the Arduino board to three LED lights – one red, one yellow, and one green – and programming the Arduino to turn on each light as if it were a traffic light. Once Raúl had

shown the teachers (through step-by-step instructions) how to connect each component to create the circuit, he moved on to explain how to code the Arduino using the software's 'Coding Blocks' functionality – colourful squares that are used to teach children how to code more visually.

I sat next to Caterina, a primary school teacher who had never coded before. She seemed confused with Raúl's instructions and asked me and other teachers for help. Henry, an ICT teacher who was also nearby, sat with Caterina to help her. But he did not provide the answers straight away. Instead, he asked her in return. "Okay, you can use this orange block to turn the LEDs on and off, right? How can you turn the LED on and off continuously? Remember you have this C-shaped green block, too." After a couple of attempts, Caterina could do the smaller tasks that Henry challenged her to do, and after a couple more instructions, she could do the traffic light. Caterina's eyes lightened when she accomplished the task, and she screamed joyfully. "Did you see this?" – she asked me while pointing at the screen and smiling widely. "Coding is wonderful, right?" She took a picture of the simulated circuit with her phone and said, "I'm going to send this to my son." Malaby (2007, 99) noted that anthropologists usually identify 'fun' as an inherent characteristic of play and games. Malaby disagrees and shows that games do not necessarily have to be 'fun' (or "compelling," as he prefers). For him, the question is how that positive reaction known as 'fun' gets crafted within the game. Following this, I interpret pedagogical activities as crafting fun by modulating engagement and attention through the engagement with objects and challenges. Caterina's engagement with the simulation software exemplifies the *enchantment* that technical objects generate (Gell 1999) by trapping users' attention (Pedersen et al. 2021).

However, this engagement-through-enchantment had its caveats and went beyond technology. I saw other moments where the mere engagement with software (or even paint and canvas) did not spark fun. Caterina is also an example of this. Initially, she was having trouble with the software, feeling frustrated with what Raúl showed them. I also saw other teachers lose their attention quite quickly to their smartphones. In her ethnography of pedagogical games for mass disaster preparation in Japan and Chile,

Watanabe (2021) also notes that these activities “need to be both (...) ‘just for fun’ and educational” to attract “both children and adults to these activities” (2021, 242). Because of the ambiguous positionality of teachers (both teachers and learners) I described above, the activities at VS needed to be both ‘fun’ and educational for teachers alone. Henry, the ICT teacher who helped Caterina, also serves as an example: he used the Socratic method of asking Caterina the right questions to guide her towards solving Raúl’s challenge. In Watanabe’s words (*sensu* Bateson 1972), “there is always something more than meets the eye in playful methods, beckoning people to look twice” - that is, ‘just for fun’ can also be educational, and that “double take” is helpful to generate an affective reaction into teachers (2021, 242). Such “double take” reflects the 'not only' logic that this thesis has explored throughout the other chapters because it puts together the enchanting effects of technology (this time, the magic that its technical complexity generates), plus the help of education in the making of STEM as an integral intervention. I will expand on the latter educational element that complements technology and its engaging capacity.

Narrative and examples

The process needed another step to make this educational, more-than-technological side appear: reviewing the game-like activities, not ‘as if’ they were students, but in their role as teachers. After the “robot” activity, Raúl first reflected on what the teachers learned in technical terms. “Okay, *profes*, what do you think we did with this activity?” After a teacher’s silence, he answered his own question: “Probably some of you noticed, some of you didn’t, but here we learned the basics of coding without touching a computer. When you told the robot to go forward, you were giving instructions. Moreover, when you combine both, it’s called algorithms. You were doing algorithms here! If you use this activity with your students, you can also make it more difficult so that they can learn loops and conditionals.” Then, Raúl’s reflections went beyond the technical content. “But we

also saw the importance of speaking clearly to each other when working in teams. That is important to show students but also valuable for us as teachers." After Raúl's presentation, some teachers raised their hands. Some of them stated that they found the activity very useful and inspiring. Others had concrete questions, such as whether the activity could be used with 7-year-olds or if Arduino could be used in a project they were already developing. To both questions, Raúl's answer was affirmative. In most of the workshops I attended, the possibilities of using these activities in different contexts were valued as positive. Workshop developers praised the teachers who made those 'new' connections between the technical activity and its connection with other learning outcomes – i.e., acquiring non-technical skills. By making connections themselves, they were participating in the process, and by participating in the process, they were showing motivation and enthusiasm. But before delving into participation, let me dwell on Raúl's narration and its effects.

Firstly, the activity changed from ludic – based on play and fun – and became narrative – describing why some specific moments of the activity were meaningful and valuable in the learning process (Malaby 2007, 101). Through Raúl's narration of the experience, teachers were guided into a detached or objective position, in which they could observe the benefits of STEM Education or 'new technologies' in themselves but as if they were an 'other.' This detached position, helped by Raúl's narrative, unearthed teachers' agency in seeing the benefit of the process and how 'new technologies' or STEM Education, combined with a pedagogical activity, affected them – and, by extension, students (Candea 2018) . There were two moments of 'as ifness': the first one was 'as if' they were students (lacking skills and engaging with the enchantment of technology), and the second one was 'as if' they were teachers (seeing the more transcendental usefulness of the activity).

Secondly, the detached position of teachers was also valuable for the appearance of STEM's potential of endless interconnectivity, which I described in Chapter 3. But in this context, the endless interconnection was usually within the boundaries of the 'integral' global market I described above. Raúl's narrative is also an example of this. Raúl's

translation from experiential activity to 'lessons learned' happened through the notion of skills. In the narration, there was technical knowledge, like understanding an algorithm, but there was also the ability to work as a team and collaborate. Moreover, I heard several times that those skills inside the activity were linked to what happened in the 'real world.' Here, it is useful to bring back the way Bateson (1972) defines the *frame* of play by using a painting analogy. The act of playing is not separating element A (a playful nip) from element B (a bite in a fight) but putting element A in the foreground and element B in the background, as well as putting limits on what element B constitutes. In other words, element A (a nip) makes sense because it is related to element B (a bite), but it excludes the seriousness of the bite in the context of a fight. In this case, Raúl's narration of the activity framed the acquired skills in the activity (element A) as the skills that the 'real world' desired (element B), but without other complexities of the job-seeking context.

By casting the acquired skills in the activity 'as if' they matched with the integral (technical plus non-technical) requirements of the global market, they were doing what Alberto Corsín Jiménez (2013) calls a '*trompe l'oeil* of proportionality,' that is, an epistemic trick in which the complexities of a 'real world' could shrink and be observable inside the four walls of the classroom. The trick resembled Jorge Luis Borges' (2013 [1949]) famous short story *The Aleph*. In *The Aleph*, the main character discovers a sphere that contains the whole universe within. By leaning on a basement stair and looking at the gap between two steps from a specific angle, the character could see the sphere in which space and time collapsed, and he could see all the precious memories he had with his late wife. Here, Raúl's narration allowed them to see the activity they just experienced as a sort of 'past', but that 'past' had potentially endless elements they could identify. Thus, here we can see the second epistemic trick that I argued in the introduction of this chapter. The first trick was to craft teachers as lacking knowledge and motivation (as if they were students). The second trick was to make STEM look capable of making endless connections within the activity (as if it was integral).

Now, here is when the issue of teachers' participation becomes important. As I said, the aim of the activity went beyond merely proving or evidencing STEM's capacity to be

integral. The workshops aimed to motivate teachers. In a moment of narrative retrospection between Raúl and the teachers, as when he described instructions to go forward as algorithms, the ludic activities became *examples* – specific instances of a wider point that Raúl was trying to make. According to Lars Højer and Andreas Bandak (2015), examples are epistemic objects with particular characteristics and effects. The authors argue that examples are different from evidence, although both aim to join the particular and the universal or parts and wholes. Evidence, on the one hand, is based on established protocols to become *proof* of something that was already there. In their words, “evidence ‘makes evident’ or ‘recognises’ (in something outside itself) and can be gathered (the many become one)” (2015, 12). Examples, on the other hand, are less about accuracy and proof and more about imagination and persuasion. By establishing connections between elements to produce a persuasive effect, the examples craft their assemblage of elements (general and particular, global and local, abstract or empirical) in new and unexpected ways. Examples grow and might create their own evidence (2015, 13), and their unruliness point to a temporal dimension of future possibility. Through exemplification, a concrete experience could be linked to any possible hypothetical use that teachers could come up with. Raúl used his examples to connect abstract skills (teamwork, algorithmic thinking) with specific experiences and, more importantly, link what they did in the activities with a potential activity outside the workshop. Raúl's exemplifications of the activity generated hope in teachers. The hope was about generating in students the motivation and knowledge that teachers experienced first-hand during the workshop. Raúl could do so because his examples could link the activity with many (potentially every) topics or skills the teacher could think of. STEM's endless capacity could happen if teachers added elements through their know-how. Only by participating and *extending* what they lived in the workshops into their classroom activities was STEM going to be integral and bring students closer to the global market (c.f. Douglas-Jones 2017).

Finally, the aim of motivating – “creating an absence that becomes a potential” (Douglas-Jones and Schaffer 2021, 8) created the effect of casting STEM as powerful,

yes, but also as limited – needing the motivated participation of teachers. Furthermore, this is where defining STEM mainly as technology became important. The endless potential of linking the robot was open-ended in the sense that the linking of topics depended on the teachers' creativity, and in that sense, it could include many other pedagogical elements and learning outcomes. However, its open-endedness did not mean it was also disordered. The activity clearly aimed to show how *technology* allowed this endless assembly, as shown by exemplification. There was a hierarchy implicit in this moment of the pedagogical activity, one that reflected the emphasis of the workshop developers on making teachers 'motivated' about technology. This hierarchy could be expressed in other forms as well.

As I said, Raúl's activity focused on a pedagogical activity related to technology (a robot) and joined other elements from it. His workshop was part of the '4.0 technologies' project that VS organised with *Ruta N* and CTA, so he had to make this activity explicitly about the technologies they were promoting. The other project differed in that it was not specifically about technology because it was about STEM, which also comprised other disciplines and methods. Nonetheless, the workshops from that project also reflected this hierarchy, only that they separated the 'technical' and the 'Self' (interpersonal skills) in different workshop activities. In other words, teachers also had practical activities concerning technical skills, such as making electronic circuits and learning how to use 3D printers. After these activities, they also had workshops specifically dedicated to the 'Self,' such as drawing and painting a 'mask' that reflected their way of understanding their role as teachers, or other activities focusing on teamwork and collaboration. When presenting these non-technical activities to teachers, one of the VS members referred to them as the 'relaxing' ones – the ones they could do when they were tired and did not want to discuss technology in their classrooms. If the workshop developers wanted to use the power of 'the integral' lesson by showing how it went beyond technology, the 'integral' had technology as its centre or core. In that way, STEM (as a techno-centric integral) could be capable of endless interconnectivity but also dependent on teachers' motivation and pedagogical skills.

Conclusion

This chapter started with the insights that Chapter 3 unearthed regarding STEM's shortcomings. On the one hand, the failures of STEM were passed on to teachers. On the other hand, to solve the holographic lack behind those failures, teachers needed to be 'convinced' and motivated through the pedagogical tools of teachers. The capacity-building workshops that I described here followed these insights to explore how that responsabilisation happens and how it is related to the integral potentials and limits of STEM. VS workshops were seen by its developers as creating motivation. Each activity had a knowledge-transfer purpose, and one could say that the activities pointed to a skill such as 'making an electric circuit' or 'teamwork.' However, the main aim was more ambiguous. It was to trigger 'motivation' in teachers – that is, a will to keep working with STEM, following a similar approach, in the classroom (with the hope that this same motivation would be passed on to students).

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I argued, then, that to motivate teachers towards STEM, the workshop had to do the 'work' of creating a double epistemic trick. Following Bateson (1972), I showed that the VS workshops worked as a device to create a playful framing in which two fictions happened. On the one hand, by combining technological enchantment and pedagogical framing, the ludic activities inside the workshops made teachers look 'as if' they were students, that is, lacking everything that the workshop developers wanted to instil in teachers. On the other hand, the activities also framed teachers as capable of seeing the potential interconnectivity of STEM and their capacity to participate in the process of making unexpected connections to forge new skills in students. The historical technology-education nexus that formed in Medellín and its emphasis on STEM (mainly) as digital technology was useful in that it allowed a hierarchical distinction between the centre (technology) and its possible extensions (non-technical skills). Technology was the core of the process, and it could join in the pedagogical activities whatever the teachers wanted to bring as a new learning element.

This chapter has several implications for the overall argument of the thesis, although its main one is the dialectic process of individual responsabilisation and depicting STEM as a (limited) integral intervention. With regards to the theme of the 'techno-moral' explored previously, this chapter showed, firstly, that the moral order that workshop developers instantiated was closer to the Global Market order that Chapter 1 traced historically from the 1980s, and which Chapter 2 briefly sketched in how the MEN understood STEM as 'integral.' It gave further details on how this moral order looks like from the point of view of state managers (and some teachers), and in which there is a hierarchy within STEM as technology plus other market skills and social values²⁰ – and not the other way around, as with teachers in Chapter 3. Secondly, and more importantly, the chapter also showed how this moral order is not just useful to enchant (to trigger an ethics of public service or an ethics of sacrifice) vis-à-vis the fetish-like promise of solving education through technology. The 'integral market' moral order is also useful in setting a normativity by which teachers could be cast as outdated technologically, pedagogically, and personally.

Those findings take me to the central implication of the chapter within the theme of holographic lacks. The chapter shows how both the endless capacity of STEM and the incapacity of teachers appear dynamically through a similar mechanism: an 'as if' framing. As Chapter 2 has shown, the integral promise of STEM appears within, and thanks to, performances such as events, speeches, and even documents (see also Sims 2017; Larkin 2013). But what this chapter shows is that personal limitations also appear performatively by doing figure-ground reversals of teachers' positionalities and STEM capabilities. Teachers can appear to lack skills and motivation in some parts and suddenly participate in improving education in others. Similarly, STEM can appear at some points as full of potential but also at other points as needing to share the process with teachers' actions. These framing fictions (playful activities) act as the hinge between the holographic lack of STEM and the call to action to do further holographic work. Framing fictions make the holographic lack to be redistributed (STEM did not work because teachers did not have the ethics/motivation) and then craft the performance in which both STEM and teachers work together in a complementary and holistic way.

One insight that this chapter evidenced but did not fully explore was the fact that the ethics of sacrifice sketched in Chapter 3 translated into motivation – a word that translates problems into individual drive and self-responsibility, a set of values that have become popular in late liberalism (Trnka and Trundle 2017). From the chapter materials, one could say that teachers who do not actively seek to implement STEM are said to be unmotivated; that is, they do not have the drive to 'do more' for students, which means that teachers do not care about students. The next chapter will delve into the relation between the ethics of sacrifice and individual responsibility, but to make that connection more explicit, it will approach it through the notion of enthusiasm. Moreover, it will analyse the relation from the point of view of the teachers who attended the VS workshops. The chapter will illuminate the ways in which STEM's limitations (not only its potential) trigger an ethical drive in teachers.

Chapter 5

Uncomfortable enthusiasm

Chapter 3 identified the issue of individual responsabilisation as a form of redistributing STEM's shortcomings. Chapter 4 enquired how this process happened in capacity-building workshops in Medellín and showed the importance of playful activities as a form of framing fiction of teachers' insufficiency and fiction of STEM's potentiality to 'update' those teachers. We could say that workshops created an experiential narrative through which the moral ideal (global market), the fetish-like enchantment of technology (capacity of interconnection), and the ethics of service came together through the appearance of individual insufficiency. By crafting a fiction of lack, VS redistributed STEM's limitations and resignified teachers' limitations as a potential as long as STEM was present. In terms of this thesis' argument, the previous chapter showed how limitations are not just 'there' (a fact) that people identify, but people make limitations appear explicitly. They craft and make limitations visible and assign them to specific groups and actors such as teachers.

This chapter keeps the enquiry of the process of redistributing and revaluing STEM's limitations to call teachers (and other public servants) into action, but this time, from the point of view of the teachers who attended VS workshops. The distinction between points of view is important because the previous chapter focused on what the workshop developers assumed and hoped that STEM would improve in teachers. However, this is different from how those teachers understood and valued this process. In the last instance, teachers decided to extend STEM's enchantment from the fiction of the capacity-building workshop into their classroom activities. Given that the narrative inside the workshops linked STEM's enchanting promise with the teachers' insufficiencies, how did teachers react to those representations that cast them as lacking the impetus and

skills to implement STEM? The reactions could be many. One option could be explicitly rejecting and openly criticising such understanding; another one could be quietly resisting such fiction through sarcasm, boycotting, or other less open strategies. But as I show in the chapter, many of those teachers did not openly question STEM's potential, nor did they explicitly deny the accusations of their lack of involvement. Instead, teachers challenged the state's assumptions of insufficiency by showing how they were indeed motivated and enthusiastic about STEM even before the workshops.

I argue that teachers created their own definition of enthusiasm in order to navigate the imperatives of implementing STEM. They de-scaled, or measured, the expectations towards them around their agency and power to change students' lives, and in the process, they also measured STEM's integral promise. Instead of following the state's narrative of STEM having the power to transform and work with insufficient individuals, teachers understood STEM's limited agency in a symmetric way as they understood their agency. In other words, STEM was as effective and as limited as teachers were. This was based on a key distinction between teachers, the state, and STEM. In short, the chapter makes a contribution to the thesis's wider argument by showing how the process of redistributing STEM's responsibility also goes to the state (not only to individuals) and how this process of redistribution also impacts how STEM's limitations acquire a new value (and thus trigger the teachers' ethical action).

Although this chapter continues the theme of individual responsabilisation, I have changed the focus from motivation to enthusiasm. I do so because enthusiasm encompasses motivation at the same time as adding other elements. If motivation is about the will to act, enthusiasm also implies this mobility, but in relation to affect and morality. Nowadays, people use the word enthusiasm to indicate the passion that fans, hobbyists, or geeks feel for things such as music bands, guns, or computers. However, enthusiasm comes from ancient Greek, and its original meaning is 'divine inspiration,' which highlights the relationship between a person and a more transcendental order. Moreover, enthusiasm indicates that the person is actively pursuing such order, and they are doing so by feeling a positive affective reaction, like passion or love. In that sense, enthusiasm

captures a sense of moral order that is so valuable to teachers and acts like an umbrella term to affective emic notions such as ‘being in love’ (*enamorarse*) or ‘having one’s attention stuck’ (*engomarse*) with STEM. But I also take enthusiasm not just as an objective feeling. Following Sara Ahmed (2015), I take enthusiasm as an object of enunciation – an affect that is publicly claimed to be possessed by actors, which mediates relations and has social effects. Teachers claim to possess enthusiasm publicly to insert themselves in a techno-moral order that values STEM’s transformative potential as well as the individual drive towards an ideal society.

Borrowing Jenniffer Cearns and Hannah Knox’s (2024) term, one could say that teachers make part of a ‘consensus’ of what STEM can do and how a public servant should approach that promise (i.e., positively). But as these authors also show, even if there is an acceptance of terms, it does not mean that teachers have exactly the same view as the rest of the state (as I already showed in Chapter 3). In this chapter, I will show how teachers have their reservations towards STEM – what Cearns and Knox (2024, 26) call a ‘yes-but approach’ – because they define STEM’s potential in relation to the failures of the Colombian state. Teachers do not identify entirely as public servants, although they see their actions happening within the state order and infrastructure. Such dislocated positionality is expressed in how teachers value their work with STEM as both proof of their enthusiasm and proof of the difficulties and discomforts of working within the Colombian state. Thus, teachers have a double view of their agency: as having a positive impact and as being limited. I argue that this is how they also see the potential of STEM: powerful but limited. The enchantment of STEM is not just for its capacity to make endless connections but to keep doing positive change regardless of the limitations around it. Teachers’ enthusiasm is a measured enthusiasm, and this enthusiasm gives us a view of how STEM keeps being valuable for the Colombian state amid limitations, lacks, and failures.

Work as enthusiasm

I was talking to Linda, an ICT teacher attending the STEM workshops at VS, during a coffee break. The day was full of activities, so the workshop developers gave the teachers around half an hour to rest before the next ones. Cristian, the teacher/workshop developer who appeared in the previous chapter, had just given a practical workshop on teamwork, and we were talking with Linda about it. He followed the same steps to build the pedagogical activity that I already described – i.e., framing, engaging, and narrating. Cristian framed the activity as a role-playing game. He divided the room into groups of five and said that each group was a team of engineers at NASA. Our challenge was to design a spacecraft that could land safely on Mars without damaging its contents. To design the spacecraft, he gave us a few plastic straws that we had to piece together. Then, he gave each group an egg, which represented the 'cargo' of our spaceship. At the end of the activity, he told us that he was going to take the egg with his hand and let it fall from as high as he could into each group's spaceships. The straw spaceship that would 'receive' the egg without breaking it would win. Cristian's framing and stirring of the activity generated an atmosphere of 'fun' and engagement. I participated in one of the groups, and I noted how this crafted environment of engagement generated a labour division: one of the members proclaimed herself the leader, another member said that she was going to be the 'entrepreneur' that would pitch the idea to NASA, and Linda and I took the role of makers of the spaceship. In the end, our group did not win, but the game-like activity triggered a highly interactive discussion with Cristian about what lessons could be drawn from this activity.

Back to my conversation with Linda during the coffee break, when our chat touched on how each of us liked Cristian's activity with the egg, Linda was excited. "Wow, that was great! I will replicate it with my T-level students because it was an amazing activity," – she told me with a smile on her face. I became interested in her emphasis on teaching it to her T-level students – the last two years of school, in which students did a 'technical degree.' I knew that teachers did not have to follow a national or school-established curriculum when teaching T-levels, and they had more flexibility in what to teach to

students (more about this later). So, I asked her if she could apply this same activity to her 8th-year students (15 years old), a grade in which they had to follow the school curriculum and the national law of education – both of which dictated the specific contents teachers must teach. She replied:

Yes, also! We must follow the curriculum's set topics, but we have the freedom to teach those topics as we please. For example, I could use this activity to teach computational thinking because it also involves logic. I can also use it in the software documentation module. I just need Nicolás to share the rules and dynamic, and I'll do the rest.

Linda's *motivation* to extend the activity into her classroom activities and her impetus towards making unexpected connections between the activity and all sorts of topics could be seen as the recognition of Linda's enthusiasm towards STEM. And Linda, of course, was not the only one. Chapter 3 already showed how teachers openly and publicly expressed their enthusiasm towards STEM and how they even used this enthusiasm as a sign of identity. They were 'convinced,' 'in love,' or other terms denoting sustained and passionate engagement with STEM. In their ethnography of a new AI system to anticipate risk with vulnerable children in the UK, Cearns and Knox (2024) show how managers, politicians, and social workers expressed their enthusiasm towards the new predictive data management system. Cearns and Knox call this shared enthusiasm the 'data consensus.' But they call it consensus because they also show how social workers agreed with the AI proponents, but not in everything. I find these authors' category helpful in describing how public servants from Medellín's local government and public schoolteachers found points in common (and points of disagreement) with what STEM was. It could be said that instead of a 'data consensus,' in the context I am describing, there is a 'STEM consensus.' However, I also aim to expand this notion because, in this situation, there was more at stake than just the usefulness of STEM. There was also a consensus on what a public servant should look like to be considered enthusiastic about

STEM – and, therefore, whether they were helping or limiting STEM's potential. As I showed in the previous chapter, the magic efficacy of STEM to create connections and transform the students' learning process came side-to-side with another framing: the making of teachers as if they lacked motivation and capacity to understand STEM in the first place (Douglas-Jones and Schaffer 2021). However, teachers expressed their enthusiasm towards STEM precisely as a way to counter that representation.

The first way to express their enthusiasm was less explicit but conveyed the idea that teachers were already working on STEM projects even before the term was coined, and therefore, they already had the enthusiasm that the Ministry of Education assumed was missing. I heard this reasoning several times at the end of training workshops and events when organisers allowed time for questions and comments from the audience. For example, after Cristian gave a talk, he opened the floor for some teachers and headteachers to express themselves. One principal said the following:

We come from an educational history where institutions were forced to divide knowledge. But now we are obligated to find the connecting points again because real life is a single object of knowledge. That's why we reconstruct that pedagogical knowledge through disciplinary nodes and cycle-based learning.

I used some of this headteacher's intervention in the previous chapter. But here, I want to highlight the part of "disciplinary nodes" and "cycles." The principal was referring to a process called "curricular transformation" by the Ministry of Education, which began to be implemented during the COVID-19 pandemic in 2020 to address the problems caused by virtual learning. This involved combining tasks from different subjects into a single project so that students did not have so much academic load outside of class. But the fact that she brought up this prior experience to defend the usefulness of STEM education linked curricular transformation with STEM. Another principal also spoke, saying, "Yes, in our school, we have also been working on [STEM], but from the perspective of competencies." Lastly, a third principal intervened, saying, "We have been working too.

In our institution, all learning is done through the formulation of questions because asking questions is the most difficult thing.”

With these interventions, the headteachers and other teachers associated the positive work they were doing in their schools under different names and then created a connection between these experiences and the idea that it could be considered STEM. Their actions (and the articulation of those actions with STEM) were meant to prove to the Secretariat of Education that they were also STEM enthusiasts. Moreover, they expressed how they were already enthusiasts of STEM not just by expressing positive affective reactions but also by acting towards making that happen. They connected their enthusiasm with their ethics of sacrifice and hard work. Enthusiasm was not simply exaltation and happiness but a dedicated effort – and they were already dedicated teachers.

Work as discomfort

However, the highlighting of their hard work implementing STEM at school also pointed to something beyond enthusiasm. Their actions were not condensed in that word alone but also in others that denoted the opposite of exaltation and happiness: fatigue, frustration, and irritation, among others. This led me to realise that the STEM enthusiasts were speaking not from a place of entire conformity with the techno-centric and market-centric promises of VS and the Colombian state in general but from a more ambiguous and critical position. This realisation happened outside VS, but because it helped me interpret what I heard from teachers at VS, let me briefly turn away from VS to make my point and then return. That ethnographic setting was a conversation with Rosario, headteacher in San Carlos and one of the main characters of Chapter 3.

As I already noted in the methodological section of this thesis’ introduction, in the weeks leading up to the end of my fieldwork in Medellín, I began to notice a feeling of

fatigue and weariness invading my body. I couldn't hear the word STEM without feeling irritation. In all the events I attended, I heard the promise that STEM would bring the dynamics of the 'real world' to the education sector. These discourses started to seem similar to the point of becoming repetitive. This repetition made it difficult for me to follow the thread of the interventions by 'experts' on the subject, and when they concluded their talks with recommendations about what people and institutions 'should' do, I felt a negative reaction. I could not help but roll my eyes in disapproval and felt the urge to leave the place (and the research project). Of course, as an anthropologically trained researcher, I felt the pressure to 'see' my interlocutors in the field on their own terms and to try to 'immerse' myself in their dynamics, so when I had these emotional reactions to the techno-optimistic discourses of STEM, I was filled with shame.

The shame grew even greater when I compared my visceral rejection of STEM with Rosario, who never seemed to get tired of advocating for the implementation of STEM education and spoke so passionately about the methodology and its benefits at the meetings I attended with her. So, a few days before finishing my time in Medellín, I decided to share my feelings of discomfort with Rosario. And upon telling her my discontent, I discovered that she also used words similar to mine, although not in the same way. With a coffee in hand, Rosario expressed to me that she also felt frustrated. But for her, the fatigue did not come from 'hearing' repetitively about STEM, but from *making repeated efforts* for STEM education. Rosario located her feeling of frustration by distinguishing two moments. One was when she spoke at public policy events as a guest and as an 'expert'; and another was when she had to do "management" to transform the school's curriculum following the guidelines of STEM education. In the first space, she found it easy to initiate actions around STEM education. But 'inside,' that is, in the day-to-day of the school, she and her team found nothing but difficulties, administrative obstacles, and disagreements with several of the teachers. "Oh my, I didn't know this thing was so tough. It's like crashing into a wall over and over again," Rosario told me. From talking about STEM passionately, we ended up discussing the feelings of fatigue, loneliness, anger, and exhaustion from the process of implementing STEM in her school. "It's like hacking a path

through the jungle with a machete (*es como bolear machete para abrir trocha*)," Rosario told me that day to summarise her experience in the process: it was not just about creating a path but forging a way through to be able to walk on it.

After this conversation, I realised that I had heard several moments inside the VS workshops when those who expressed "enthusiasm" towards STEM also used other words to express their relationship with it. I heard expressions like "I'm about to throw in the towel," "I give so much but don't receive anything back," or simply "I'm tired" or "I'm bored." There was an ambivalence in how they articulated their actions towards STEM. If, in one sense, their laboriousness was a sign of their enthusiasm for STEM, in another sense, that same work was a sign of the difficulty of meeting the expectation of passion and exaltation. It was a mix of both, and I interpret this ambiguity as *discomfort*. Feminist author Rachel Chadwick (2021) describes feeling her discomfort in research encounters as "a strong visceral and geomaterial sense of un-ease or dislocation" (2021: 561). If comfort is experienced as a pleasant sensation occurring in places that evoke "familiarity and vital identification," discomfort is the opposite, a product of the "disconnection between our experience of 'self' (...) and the norms, values, narratives, and authoritative knowledge of our societies, institutions, and broader communities" (2021: 560). Discomfort is thus related to how we position ourselves and how we are positioned in social, material, and moral dynamics and structures. Discomfort points to being neither completely inside nor completely outside of that relationship – which Ahmed (2014) wonderfully synthesises with the analogy of a chair: the feeling of dislocation is like a chair (the social set) that is not adapted to the shape of our body, as we cannot sit (and feel) entirely comfortably. Now, I will focus on the specificity of that dislocation on the part of the enthusiastic teachers.

On (not) being the state

Upon further investigating the feelings of discomfort and dislocation that teachers experienced when implementing STEM education in schools, it became evident that these were part of a critical reflection process related to their partiality as state representatives and as something more than that, i.e., as teachers. Numerous ethnographies of education have shown how teachers' agency and impetus to implement public policies stem from their critical positioning, which often does not align with the state's actions – what Jordan Levy (2019) calls partial compliance (see also Miñana 2008; Wilson 2001) . In Colombia, their partial positionality has its roots in their history as a unionised group. I have touched on that history in Chapter 1 (to trace the integral) and in Chapter 3 (to highlight the value of teachers in pedagogy). Let me briefly return to it back again, this time to place more emphasis on teachers versus the state.

Between the 1980s and 1990s, the *Movimiento Pedagógico* emerged. The MP was a unique combination of union-affiliated teachers, critical theorists from academia, and popular educators who came together to think politically about pedagogy on a national level. Alejandro Casas Nova (2021) situates the start of the MPN with the inclusion of new, younger union leaders from the Colombian Federation of Educators (FECODE), the country's largest teachers' union. FECODE had been fighting for teachers' labour rights for years, but the generational shift brought a new vision that questioned the definition of 'the political' as solely fighting for labour rights. Additionally, they advocated for an open and dialogical position with actors outside the unions, such as members of academia. This expansion of their goals materialised in the creation of spaces for dialogue, research, and action called Teacher Research and Education Centers (CIED). In these CIEDs, which FECODE's regional offices opened across the country, teachers intellectually nourished themselves with critical studies from the social sciences. Through these commitments, state oppression was understood as something that went beyond the control of the means of production (work) and was also defined as the control of all other aspects of people's lives, specifically teachers. Thus, the MP also saw state education policies as part of a longer history of state disciplining of teachers, making them docile and subjugated subjects.

The domination of teachers by the state lies in the standardisation and control of their main mode of knowledge: pedagogy. During those years, the Ministry of Education was expanding previous policies to implement what was called Educational Technology (*Tecnología Educativa*), a concept from international organisations to standardise the teaching content in schools and dictate to teachers how to impart that content. The MPN called these policies 'Taylorism,' reductive ways of controlling pedagogical practice – what it means and what it can do – for capitalist reproduction (Mockus 2002) . Thus, the MPN's main struggle was to return pedagogy to where it always belonged: to the teachers' practices and away from the state. Casas Nova (2021) highlights a passage written by Olga Zuluaga (2002) , an influential Colombian historian for the MPN, in which she urges teachers to

place teaching in the heart of civil society, 'outside the bureaucratic quotas of state officials and patrons (gamonales), outside of the priest's gaze and the rush of businesses that stupefy people's minds, reducing their beings into a corporation-like existence (Zuluaga 2002, 305 in Casas Nova 2021, 63).

Reclaiming pedagogy became synonymous with political commitment because by taking pedagogy out of the state's oppressive hands and its reductive policies, pedagogy was re-embedded in local contexts and could help solve the problems of the most in need.

The history of teachers in Colombia does not, of course, determine all teachers' actions in the present. But it does provide clues about why the laboriousness of articulating oneself as a STEM enthusiast simultaneously points to a feeling of passion and love and one of fatigue and frustration. Returning to the case of STEM in Medellín, teachers' expressions of fatigue and anger were accompanied by specific criticisms. These were diverse and pointed to various aspects of STEM implementation as state policy. Here, I group the criticisms into three types: criticisms of the curricular restrictions of the education system, the execution times, and the availability of infrastructure and resources.

The first type of criticism highlighted by some STEM-enthusiastic teachers was the thematic and curricular barrier of the Colombian education system. Although Colombian schools had the autonomy to choose and organise the content they taught, they needed to follow a National Education Plan and a series of Education Guides that dictated which modules and topics students should learn. Additionally, these essential contents were evaluated in a national exam (called *Saber 11*) that students had to take in their final year of school. Many of the teachers I spoke with saw the curricular structure as limiting. Some saw it this way because the subjects they taught (e.g., physics or chemistry) were highly structured by the Guides, so they had little room to teach things that wouldn't appear on the national *Saber 11* exam. In other words, doing creative and 'integral' classroom activities that connected the topic with others became more difficult. Others saw it as a barrier depending on whether they were primary or secondary school teachers, as the primary school had more flexibility to make classroom practices more "integrative" and "cross-disciplinary," while the secondary or high school did not.

The second limitation for teachers was the amount of time they had to invest – and did not have due to the large number of tasks and responsibilities they already had as teachers. As I showed in the previous chapter, workshop developers interpreted the lack of STEM education implementation in the schools as the result of what they called a lack of effort by the teachers. From this perspective, teachers who did not use their free time to learn about STEM or technology were portrayed as "unmotivated" and thinking only about their well-being (and not the students'). However, for some teachers, especially those who did not teach computer science but other subjects like literature or chemistry, this stance by the organisers was wrong. For example, after another workshop activity ended, Roberto – a high school math teacher – told me:

These workshops are nice, but they aren't teaching us how to use the technologies properly. They're very introductory. If I really wanted to use technology with students, I would have to go to the ICT room a few hours a day to learn by myself. Then, I would also need some extra hours to design and prepare the lessons while still not feeling confident with the technologies. If many teachers do this, then we

need to coordinate with each other so that we can use the same space in different moments. It is quite a lot of work, and we still have the same teaching responsibilities; they don't give us extra time to do any of this.

Even feeling enthusiastic about STEM, teachers like Roberto had to balance their self-learning with teaching tasks that already took up a large part of their time. So, teachers like Roberto criticised the low applicability of what they learned in SEM workshops, which was transferred to them as a responsibility to continue learning, and if they could not keep up with more learning, they were seen as “unmotivated.”

Finally, STEM-enthusiastic teachers identified infrastructure problems (electricity supply, buildings, internet, computers) as a significant difficulty in implementing STEM in the classroom. A computer science teacher, for example, told me she could not teach programming properly because the computers at the school were too old or slow to download and use programming languages like Java. She adapted the curricular activities so that students could at least learn HTML, a more basic programming language that required no software beyond a web browser. Other teachers had internet problems, no computers, or the computer rooms were perpetually closed due to humidity issues. Teachers, who still defined themselves as STEM enthusiasts, told me they ended up redesigning their lessons to avoid using computers. They used other objects, like washing machine parts or televisions, as examples to teach students about technology and engineering.

The feelings of discomfort pointed to implementation problems, and these implementation problems were commonly part of the state's management of STEM implementation rather than STEM itself. Teachers made a distinction between themselves (as individuals and as teachers) and an ‘other’ (materialised both in people and in relationships and infrastructures) from which they did not see themselves as part. For teachers, having enthusiasm was not the only indicator of whether someone considered STEM education an integral intervention that would improve lives. There was also the matter of who pursues it and how that ideal is achieved. Enthusiastic teachers were

uncomfortable not with the promise of STEM but with how the state tried to carry it out. As I will show in the next section, discomfort-producing differentiation from the state also implied a different way of seeing their own sense of agency in implementing STEM – since the state is not just an ‘other’ but the structural milieu in which they also act.

The (limited) ‘good’ coming out of the ‘bad’

I had another chat with Linda a few weeks after Cristian’s ‘spaceship and egg’ activity that I described earlier in this chapter. It was just before the start of another session of activities, around 8 a.m. We sat on VS's patio with a cup of coffee in our hands under the cloudy sky of Medellín, feeling the chilly morning air. This time, the conversation went quite quickly into the topic of the problems that Linda had to face every day in her job as an ICT teacher. She was also one of the teachers who expressed their unconformity in teaching about technology with old or damaged computers and no Internet connection. She told me that she saw two issues in making students interested in the topic – resources (*recursos*) and willingness (*ganas*):

Here [at VS], they don't give us [the money] to pay for the children's transportation, so I would have to ask my school's headteacher for that money, and that will not happen because there is none of it. (...) In addition, there is also the issue of willingness [ganas]. In the school I am now, there's no willingness at all. There, I fight tooth and nail to convince students to study. (...) But if one manages to convince one student, just one, it is already worth it. What happens is that making all that effort so that only one or two students come is very hard. Also, if there are no resources, there is no willingness. They tell me, 'profe, but why are we going there if after that we have no way to practice?' And what can I answer? They're right!

Linda's conceptualisation of resources pointed to a more-than-the-individual dynamic, a structural force if you will, that limited their agency (willingness) as teachers – as well as students. Linda's distinction between resources and willingness summarised the difference between how workshop developers and teachers saw the problems and the solutions that STEM supposedly brings forth. For institutions developing capacity-building workshops, such as VS, the relationship between resources and willingness – which I consider an emic conceptualisation of structure and agency (Steinmüller, 2011) – was causal and unilateral. If the teachers had willingness (or enthusiasm), they would find the resources, or structural means, to improve their students' lives. I do not think that teachers would necessarily contradict that affirmation, as it was part of the liberal narrative (and fantasy) of social mobility that teachers also defended (Verdugo 2021). However, their conceptualisation seemed two-way: willingness affects the resources that students could receive, but resources can also affect the willingness of both students and teachers to keep going.

Behind teachers' uncomfortable enthusiasm, there was a different form of ordering things in comparison to VS workshop developers and other public servants. Chapters 1 to 3 showed the difference in a positive sense. The economic depiction of society as being only the sum of individuals, and therefore reducing everything to market-like laws and to the laws of the market – which workshops at VS were intending (see chapter 4) – cannot make sense of everything. There was also a side of humanness that was 'better' (in the sense of having more value) than rationalistic forms of seeing education. Now, I want to focus on something else that teachers' different 'whole' also comprised: the negative side of 'life.' Linda's recognition of limiting resources is saying how they understand students' local 'reality' in the slums (*comunas*) as being inhabited by 'bad' things. They see students' lives filled with problems such as suffering domestic violence, having a high risk of becoming drug addicts, living in streets with high murder rates, and, in the case of female students, also suffering the risk of being drawn into prostitution networks. Linda also told me a phrase that summarises it: "I don't want those children to get eaten by the slum (*no quiero que se los coma la comuna*)." The negative side of

teachers' own professional lives already became evident in the collection of critiques that I listed earlier: budget precarity, infrastructural failure, or overloaded workloads – and we could add other ones that I also heard outside VS, such as corruption.

Corinna Howland and Tom Powell Davis (2022) note that most anthropological work on ethically driven behaviour focuses on the 'good,' that is, in practices such as self-cultivation and the desire for moral striving (Robbins 2013). For the authors, this overemphasis points to a long-standing anthropological assumption – rooted in Euroamerican thinking – that conceive “human interconnection as inherently benign or positive” (Howland and Powell Davis 2022, 8; *sensu* Strathern 2020, 26–27). Some anthropologists cast immoral actions simply as an absence of sociality, or in the case of interlocutors identifying and condemning actions as negative, and other anthropologists interpret it as performing a social function for the reinforcement of the 'good': hope, empathy, care, mutuality, and so on. Both approaches define and locate 'the negative' *a priori*. Howland and Powell Davis thus invite us to pay attention to how our interlocutors in the field understand, evaluate, and deal with the negative in their own right. The negative makes part of people's way to understand and act on sociality, so the first step to analyse the negative is to decentre it and see how our interlocutors define it. In that sense, people can define and locate the negative in different ways: it can be the background or "foundation" in which social relations unfold or the "focal point" on which their actions will concentrate (amongst other possibilities).

I bring Howland and Powell Davies' (2022) suggestion because it substantiates the relevance of teachers' discomfort with the state's implementation of STEM. In teachers' view, 'life' is constituted by the market and by something other that exceeds it – the Self, cultural values – but also by inequalities, state failures, violence, and other negative aspects of what it means to live in a *comuna* and to work with the Colombian state. The state's abandonment, precarity, and failure were also the background in which teachers saw their positive (yet limited) actions happening. They felt dislocated because they could not understand their actions as equal to the state, nor could they see their actions as outside the state's action. The key phrase to understand this dislocated or uncomfortable

inhabiting is also in Linda's, "if you manage to convince a student, just one is already all worth it." This phrase was not unique to Linda, and I heard it countless times when a teacher spoke about their passion and vocation as a teacher. But here, Linda was making the clarification that, as much as the passion for student improvement was present, it was not an easy thing because of all the structural problems that they faced as (partial) state representatives. Later that day, it became even clearer. When we were at a workshop session, I sat again with Linda and two other teachers. These other teachers worked in a different school, telling Linda how hard it was for them to keep students motivated. Linda nodded and then added: "Yes, but with one student we convince is worth it and blah, blah. I know." This time, her tone was sarcastic. The phrase was not intended to communicate passion but repetition, as if the three of them shared the tiredness of their professional duty.

By saying "with only one student," the teachers expressed their effort in their work. That effort had to do with a distinction between them (as caring teachers) and the structurally limiting state, but it also had to do with the fact that teachers did not see themselves as completely detached from the state – hence their sense of simultaneous enthusiasm and discomfort. The phrase highlights the positive (transformation, hope, fulfilment) while leaving the negative in the background – unsaid but still present. The emphasis on the number is key here: the "just one" was denying the total effectiveness of their efforts as teachers due to limiting factors (the state implementation) and, at the same time, confirming that change was actually possible, only that at a smaller scale. By saying "just one", they de-scaled the promise of their actions, acknowledging that the negative background was still present – it did not magically go away – but at the same time, the "just one" also did the job of affirming that they had agency in changing students' lives. They were able to assert themselves as part of the 'STEM-enthusiastic consensus' with their own sense of discomfort and critique towards the state. Now, let me finish by showing how this limited-but-affirming sense of enthusiasm is symmetrical to the way they understand the potential of STEM.

A limited integral

What I find interesting is that this way of de-scaling their agency also extends to de-scaling STEM's power. In the specific context of my conversation with Linda, the phrase also enabled and limited the promise of STEM education. Qualitatively, for Linda, STEM could (or at least had the potential to) change her students' quality of life, which was also her personal desire and duty as a teacher. But quantitatively ("just one student"), its impact was smaller. The STEM policy could be 'integral,' meaning it could change students' lives in holistic ways; but at the same time, the 'integrality' of the STEM policy was limited by the state's shortcomings that also limited them as teachers.

This symmetrical valuing of STEM was evident in another setting – one in which teachers were not accused by the state of not being STEM enthusiasts but by other critical teachers who accused them of falling into the trap of politics. The example to illustrate this happened within the VS workshops, but this time, the workshop attendants were headteachers. It was also Cristian (whom I had already mentioned at the beginning of this chapter and in Chapter 4) who led the session. After explaining the 'integral' definition of STEM used by the Medellín government, Cristian prepared a short activity to sensitise the headteachers on the subject. Cristian explained the activity by projecting a slide on the wall. The slide showed a photo of a young, white, blond woman, wearing sunglasses and a red swimming suit, sitting on a sailboat in the sea. According to Cristian, the activity consisted of making a list of things that the blond woman needed to know to sail the sailboat and complete her journey around the world. The list had to be divided into five categories: science, technology, mathematics, and humanities, following the integral approach of Medellín's STEM policy. Finally, Cristian gave a few minutes for the principals to fill out their lists and then opened the floor for the principals to share their experience doing the activity.

The first intervention came from Ramiro, a young principal dressed in a suit and blue tie. However, Ramiro did not talk about his experience filling out the list. "With all due

respect and with the intention of providing constructive criticism, the image is very nice and all, but that's not the reality of this neighbourhood," said Ramiro. He continued:

With this talk, I am coming to the conclusion that STEM is still like other past projects, where they show us images of smiling European blond children and promise us the world. And I don't want that because it means that the politicians in office invest money in this for four years and then leave. Science, technology, and innovation are still very distant for us because we want to teach software development, and we don't even have the equipment [computers] for that. It's sad to tell the kids that this [the photo] is STEM when we have nothing to make it happen.

After a brief silence, Marcela, another principal of a local school, raised her hand and, in response to Ramiro, intervened:

I also know that it is not a reality; we agree on that. But I think it's important for students to dream and have hope. The least we can do is show the children the reality of the world. I like this example from the activity because this girl reminded me so much of my daughter. She went to Australia, where she has a good job designing apps. And I want the same to happen with my students here. Besides, they like all these topics, and in that way, they can also ask new questions about the world.

If, in the relationship with the workshop developers and other state institutions, the teachers placed students' improvement as a common moral ideal and the concrete actions as a differentiating element, in the case of the two principals, it was the opposite. Both agreed that the state does not implement its policies effectively and that it operates with other logics (what Ramiro called "politicians in office" promoting the policy and then abandoning the project, which resembles the criticisms of "political will" that I described in Chapter 2). Nevertheless, Ramiro saw this action as inseparable from the promise of STEM, while Marcela saw it as two separate elements. In this case, Marcela advocated

for following the ideal of STEM analogously to what Pieter de Vries (2007) calls ‘not compromising the desire for development.’

For De Vries, desire is vital to the process of importing something – knowledge, technologies, methodologies – into the Global South as a ‘solution’ to its so-called underdevelopment. The ‘solutions’ (in this case, STEM) become a sort of commodity in the sense that, rather than imposed by force, they are ‘sold’ as if they were a product such as chocolate. In other words, organisations create a void in the subject (i.e., you lack this chocolate in your life) and offer that commodity as a solution to fill the void they created. In the specific case of STEM, the desire machine would go like this: ‘People in the *comunas* lack economic stability and good education because they are not in line with the global market, so we bring STEM to satisfy your need to be included in the digital economy.’ The desire machine creates a need and offers a fantasy of fulfilment. But of course, most of the time, these ‘solutions’ do not work, so it starts a never-ending cycle of proposing new solutions to fill the already generated need. De Vries calls this the *desire machine*.

An expected reaction to such desire machine would be to reject the solution (STEM). Ramiro, the critical headteacher, could be seen as taking that path – i.e., by saying that they do not want STEM in the neighbourhood. However, Marcela did not want to get rid of the promise of fulfilment that STEM brought with it. Her emphasis on the importance of dreams and hopes is a way to get hold of the opportunities that privileged children have and their students from the *comuna* do not. But this would not mean that Marcela was less of a ‘realist’ than Ramiro. Marcela’s analysis of the situation was based on a similar observation: there is a local reality of inequality and a reality of a state promising solutions. The failed actions of the state and its negative consequences were seen by both as the foundation or background on which their actions as teachers happened (Howland and Powell Davies 2022, 19). Marcela did not deny the political machinery of the state. Moreover, like Linda, Marcela was also limiting and de-scaling the potential of STEM education by reducing STEM policies as a way of “giving hope” and “generating questions” instead of promising that it would radically change students’ lives.

But she was, nonetheless, also defending the promise of STEM to change students' lives – not abandoning it altogether as Ramiro was doing. She saw STEM's potency symmetrically to the way teachers saw their own agency, and in that sense, she held a double vision (*sensu* Riles 2000 notion of 'seeing twice') of STEM as both inside and outside the state.

Conclusion

This chapter has explored teachers' reactions to their depiction as unenthusiastic, lacking individuals inside VS capacity-building workshops. The chapter has shown how, instead of openly questioning the workshops' depictions of them as lacking and STEM as powerful, some (but not all) teachers chose to enter into what I have called (*sensu* Cearns and Knox 2024) the 'STEM-enthusiasm consensus.' In public, teachers enunciated themselves as 'in love' and proclaimed their earnest conviction that STEM can transform the educational system and, with it, the opportunities for marginalised students to get away from all the problems and inequalities of their contexts. To prove this enthusiasm, teachers defined their work at school as a way of advancing STEM. However, in private conversations, teachers also defined this work as tiring, demanding, and ungrateful. I interpreted this double way of defining their effort as discomfort, in the sense that their ambivalent affective reactions reflect their affective positionality in relation to the state. Such an ambivalent position is related to a different form of defining limitations. If VS redistributed STEM's limitations (to achieve the integral intervention) by casting teachers as outdated, incapable individuals – i.e., responsabilising them for STEM's failures, teachers redistributed STEM's limitations by casting the state as failing in its implementation of STEM as a policy. That redistribution did not mean that teachers saw themselves as redeemed from any guilt. Because they were partly the state, they also saw their actions as limited by structural constraints and shortcomings but also as non-state actors; they saw themselves as having the agency and power to make social transformations. They

had a similar depiction of STEM: while having the power of transformation, STEM's reach was also limited. In short, I argued that, in the process of enunciating their enthusiasm, teachers valued STEM's limitations (vis-à-vis their techno-moral promises) symmetrically to the way they valued their work as partial public servants.

This chapter advanced the previous chapter in terms of exploring how limitations are built, assigned, and valued. Together, both chapters fleshed out the process through which STEM's limitations are not papered over but resignified in a way which, as I argue in this thesis, takes part in the reproduction of STEM as a policy tool of governance. Individual insufficiencies and previous state failures need to be present in the narrative of improvement. But that does not mean that the limitations are seen to go away: they stay and, more importantly, they give a positive significance to teachers' (and STEM's) effort – it proves that they are doing something for the achievement of a moral order. As a second point for the thesis, this chapter also shows how, when talking about morality, one cannot only focus on the ideal, future-making side of it. Morality appears in relation to a (negative or non-moral) 'present,' and that relation between the actual and the ideal is what gives meaning to action – not only the promise of achieving an ideal future. It means that the fetish-like quality of STEM (Chapter 3) cannot be understood without the boundary work (what is 'the state' and who enacts it properly) that come around it.

Finally, this chapter has addressed the question of 'the political' sketched in the introduction. By making enthusiasm not just an affective reaction but an object of enunciation (Ahmed 2015), the chapter has shown how there were several actors involved in the process of defining what STEM enthusiasm meant in the first place. There was a process of differentiation between an 'us' and an 'other,' which resembled the distinctions between virtuous and pathological states in Chapter 2. Within such processes of differentiation, there was also a process of defining and contesting definitions of the actual and the desired form in which the state should be organised. The next chapter will continue with the exploration of the place of moralisation in making STEM endure as a tool of governance in spite of its shortcomings, but it will do so from another angle of the

politics of STEM enthusiasm: not the crafting of a desire to participate, but the making of the techno-moral as a means of exclusion.

Chapter 6

Exclusion through ‘best practice’

The previous chapter ended by foregrounding the issue of differentiation and exclusion. This chapter aims to delve into this question, for it shows how the redistribution of responsibility (Chapter 4) from STEM to individuals and states implies a possibility of exclusion if those individuals take no further action to try again to implement STEM. To explore how STEM inserts into the politics of ‘the state’ and how that relates to STEM's endurance as a state intervention, this chapter (and the next one) will depart from the context of Medellín and move towards the examination of STEM at national-scale policies. More specifically, it will describe one specific state agency, called *Computadores para Educar* (CpE), and how the state officials that worked there navigated their relations with teachers through the framing of STEM as an ‘integral’ and technomoral intervention.

As I said in Chapter 2, Medellín's local government was one of the pioneers in implementing a STEM policy based on their previous focus on software development and the digital economy. A few years later, after Medellín's declaration of a STEM policy, the national government became interested in STEM as well. By national government, I mean three public institutions: the MEN, the Ministry of Science, and the Ministry of ICTs. The MEN asked a few national 'experts' to act as consultants and write a report on Medellín's approach to STEM to use it as 'best practice' to formulate their own national policy. Simultaneously, the Ministry of ICTs also became enchanted by STEM, and the result was that one of the national policies that both institutions co-created, called *Tecnologías para Aprender* (TPA), included the term STEM. The institution in charge of deploying this policy and its emphasis on STEM was CpE, a state agency co-administered by the MEN and the Ministry of ICTs to deliver laptops and other electronic objects to all public schools in Colombia. Chapter 7 will focus on the description of CpE's main task of designing and

disseminating techno-educational solutions for public schools. This chapter, however, centres on a secondary policy task – the making of a motivational event called *Educa Digital*.

CpE planned, organised, and executed *Educa Digital* because the public policy framed the event as a way of advancing the "appropriation" of the ICTs and techno-pedagogical methods such as STEM in the classroom. TPA framed *Educa Digital* as a space to “socialise” or disseminate the public policy with the teachers attending the event and, at the same time, act as the way to “promote the exchange of pedagogical experiences using ICTs in the classroom, making the most innovative teacher’s actions visible” (2021, n.d.). Thus, the event was framed to show the Colombian state's efforts to achieve the techno-utopian project, "including" teachers' efforts. The event was framed as "for" teachers and "by" teachers, reproducing the idea of an integral intervention as including everyone in the process. *Educa Digital* was an annual event, usually held in an elegant hotel or conference centre in Bogotá or Medellín. The event usually gathered around 150 schoolteachers from around the country, some of them competing at CpE's contest and others just attending as spectators of all the activities that CpE and its contractors had organised. Apart from the teachers, the event also had the presence of logistical contractors (wearing purple vests), state officials from other national and local government institutions, and a few ‘experts’ in technology education acting as keynote speakers. The main activity of the event was the contest, in which experts judged teacher's pedagogical activities using technology and designated a 'winner.' The event felt like the mixture of a gala and an academic conference, with people rushing to attend several simultaneous talks, get free lunch, or talk to colleagues.

I follow Kimberly Chong's (2018) explorations on the concept of 'best practice' and Asta Vonderau's (2019) notion of ‘politics of scaling’ to show that, through performances like *Educa Digital*, state officials adapted a standardised and globally-circulating definition of STEM as ‘integral.’ Chong (2018) shows how ‘best practice’ is a process through which a specific practice or knowledge is taken out of its local context and represented as a solution that could work anywhere. Moreover, for Chong, this

process is not just epistemic but ethical: best practice implies an injunction to follow and enact a normative ideal of action that is condensed in the word 'best.' In turn, Vonderau (2019) sees such process of making a local practice global as a *politics*, in the sense that the quality of being 'global' or 'local' serves the intentions of situated groups. In other words, what appears like a global 'trend' is crafted to be global, but it is also crafted to become a national, regional, or local element in order to reinforce governmentality.

I argue that through a standardised 'best practice' of STEM that could be used as an example for the whole nation, CpE officials established a mechanism through which they could choose who to cast as responsible for STEM limitations, and at the same time, show how they were making an integral intervention through that same process of choosing. CpE officials made a STEM contest. Through that contest, they redistributed the responsibility of STEM's limitations towards certain teachers (i.e., the ones that did not win). And given that CpE officials also brought the 'best practice' to teachers' attention through Educa Digital, CpE officials were now able to do STEM correctly at schools. Simultaneously, CpE officials could use the contest to show how they gave visibility to the winners of the competition, thus proving that they participated in the making of a holistic intervention: they worked with all the parts involved. Thus, if teachers revalued the limitations of STEM as a reason to keep sacrificing themselves and caring for others, CpE officials valued the limitations of STEM as a way to reproduce the hierarchical division within the Colombian state while performing an inclusive, collaborative approach between actors (what I will term 'centrifocal' and 'plurifocal' state enactments; c.f. Krupa and Nugent 2015). The Educa Digital contest exemplifies how the possibility of being excluded works for different forms of revaluing STEM's shortcomings – either to make oneself valuable in the next iteration of STEM implementation or to make an 'other' valuable if this 'other' wants to be considered part of the solution.

I divided this chapter into three parts. Each of them will be a description and analysis of a specific part of Educa Digital. I will start by describing the opening speeches of the event as a means to describe how national-level officials see the differences between them and teachers and how that relation should be in a normative sense. Then,

I will describe the presentation of 'expert' authorities about what STEM is according to the global 'trend.' This section will examine how CpE officials were able to position their way of defining STEM as a best practice – an 'expert' and normative definition that the whole state should follow. Finally, the third part will describe the contest as such, and how the processes of evaluation opened a way for CpE to choose which teacher was “with” them – i.e., deploying STEM in an 'integral' way – and which teachers were lacking knowledge and ethics.

Managers, teachers, and the centrifocal/plurifocal state

In Chapters 2 and 3, I have sketched the differences between state managers and teachers, and in Chapters 4 and 5, it was possible to see that the relation between those two was one of subjection (i.e., managers and other state representatives making teachers *collateral subjects* through activities like workshops). However, the relationship between national-level state officials like CpE staff and public schoolteachers is more ambivalent for several reasons. Firstly, both CpE officials and public schoolteachers are state representatives. Teachers have the obligation to 'serve' students by educating them. But CpE's official subjects of intervention are public schoolteachers (although in recent years, they have modified their 'institutional mission' to include students as well). That means public schoolteachers are both colleagues and subjects of intervention of CpE staff. Secondly, the distinction between CpE and schoolteachers is also based on terms of scale. CpE officials work at a national scale, writing and deploying public policies through projects executed all over the territory, whereas schoolteachers work in their local settings, and the national scale expects that teachers comply with what they tell them. CpE officials work at the political centre of Colombia (Bogotá), whereas most public schoolteachers work in marginal areas. Thus, in one sense, state officials like CpE staff and teachers are 'equals' or colleagues; in another sense, they are also 'others' to one another, and that

difference is based on the scale of their positionality as well as on who has more authority over the other.

Let me start with the latter form of their relation – the differentiation between them and what it implies in terms of the identification of lacks and the technomoral promises of STEM. As Christopher Krupa and David Nugent (2015) note, states (and more specifically, Andean states) have the characteristic of being figured by a stark hierarchy between central and peripheral powers. The state is not a homogenous political project being imposed over citizens; rather, it is formed by "multiple and conflicting claims to the right to rule within government institutions, beyond them, and between what is generally considered to be inside and outside the state" (2015, 5). In the case of Andean states, this conflicting multiplicity has followed an underlying imaginary that the author's term "centrifocal" (2015, 15):

State power is regarded as something that is concentrated in various bureaucratic-administrative centres, from which it radiates outward across national-territorial space. (...) Underlying this approach is a somewhat hydraulic assumption that as one moves farther away from the wellspring of the state at its centre to its margins or peripheries, so is the power of the state progressively reduced to a trickle or gets corrupted and transformed as it diffuses into "local" (as opposed to "national") arenas, where it is overcome by forms of personalistic (i.e., "nonstate") power, be they those of warlord, caudillo, or drug baron (Idem).

The fact that CpE, a national instance of the state, has proclaimed that its intervention target is public schoolteachers, points to this logic of the centrifocal enactment of the state. Schoolteachers can be public servants, but they are ones farther from the 'centre' than CpE staff, so CpE has the authority to dictate what is best for the Colombian people – given that local instances of the state are closer to the nonstate power. The relation of difference based on distance – who is closer and further to the centre – can be seen as a way in which the relation between lacks and desires that I explored in Chapter 1 is expressed in relational terms. In other words, the centrifocal enactment of the state is

based on the idea that there is a population (teachers) that lacks the quality of being state and another population (national state officials) that has more of that quality that others lack. Furthermore, there is also the desire to be whole or integral: if both national state officials and teachers enact the state, then there is the need to make the state a homogeneous enactment – a state that acts as a whole in terms of what it does and how.

The centrifocal enactment of the state became visible as soon as Educa Digital started. As I said in the introduction of this chapter, CpE structured Educa Digital as a gala-like event, with a local TV network broadcasting it live and two professional presenters acting as the hosts of the event. The hosts invited the 'guests' to approach the scenario and do the presentation while the rest of us sat silently as the audience. One of the hosts welcomed the first "guests of honour" (*invitado de honor*). The "guests of honour" were usually two or three state officials, sometimes the heads or directors of the Ministries of ICTs and Education (MEN). I want to focus on one of those guests of honour, the Director of one of the many sub-offices in the Ministry, a young woman dressed in a long white linen shirt who spoke with a *bogotano* accent. Her speech was impassive, and she focused on three elements throughout it. First, she focused on providing facts: the number of teachers attending the conference, the number of students registered in the MEN's database, and the number of students going back to studying in person after the pandemic, among others. Then, she highlighted the importance of those facts to prove the "advancements" of the MEN in the "improvements of educational quality for our children and youth." Finally, she thanked the schoolteachers attending the event for their effort in contributing to this quality improvement and closed by challenging them to "always think of the development of our children" and to "generate the conditions for an integral and human development."

The first highlight of her speech is how she placed the MEN as the engine of educational transformation. The MEN became a (discursive) entity that controlled and caused the process of improving education. Teachers were cast (at least temporarily) as outside the MEN, even though the MEN hired teachers. In Colombia, public schoolteachers need to take a magisterial exam. Depending on their exam performance,

they were officially assigned to a school through a state decree. Finally, teachers received a salary from the state as public servants. Because the MEN oversaw and executed all those activities, teachers were technically hired by the MEN. So, as such, one could also consider them part of the Ministry. In fact, the Director did close by thanking them for their contributions, so she did not consider them completely apart, but this acknowledgement also implied that they were not considered fully part of MEN. Furthermore, the distance between the MEN (which was substantiated in the Director's role) and the teachers increased when she reminded them of their moral duty to "always think" in the children of their country. The MEN Director's speech materialised a centrifocal relation between state representatives, one in which a national institution, physically placed in the country's capital (Bogotá), claimed to be doing state work all over the country. The 'facts' that the Director brought to the fore were an instantiation of their work at a national scale. Teachers were, on the other hand, located further out from this centre – they were still acting as the state but, in the eyes of the MEN, needing a reminder of what they should be doing when representing the MEN in their localities. Similar to what happened in Chapter 4, but this time without pedagogical framings, the MEN Director depicted teachers in her speech 'as if' they were less state.

The second highlight of the Director's speech was the content of the reminder directed to teachers at the end of it – that is, what teachers supposedly did not have and needed to acquire as state representatives. The Director referenced an ethos of public service, that is, the ethical rules that they should follow as public servants. I have described this ethics of public service already in Chapter 2 – what I called the virtuous idea of the state (Dávila 2017). However, it is worth briefly describing it back again. Paul Du Gay (2008) reminds us that this ethos developed in modern states is an instance of a Weberian philosophy that condenses in the expression 'without affection or enthusiasm' (2008, 337). This means that public servants should be impartial and driven not by personal interests or affects but by the duty to serve *everyone* in the nation. More specifically, in the Colombian context, Rafael Sánchez (2016) noted a long historical genealogy in Latin American politics in which the pursuit of representative democracy

emphasises less the value of freedom – individual volition – and more on equality. In other words, the state representatives performed a view of the nation as "one and indivisible," emphasising "virtue, which sacrifices private interest for the sake of the common good, and the active exercise of the general will" (Botana, 1994, 477 in Sánchez, 2016, 23). "The children of our country" in the Director's speech denoted both the imperative to think of an 'other' they are serving and the scale of such imperative – the public servant works for the improvement of the whole country – in this case, all the children. In that sense, the moral duty should be with the whole nation or society, implying, as I said in the introduction of this thesis, that the main task of the public servants in Colombia is the integration of marginalised areas of the country (c.f. Burnyeat 2020; Dávila 2017). In that way, the moral order of one nation (everyone is the same under the eyes of the state) is matched by a whole and impartial state – represented by a public servant that possesses integrity as synonymous with impartiality. The state should be impartial as it is driven towards a whole, not just one of the whole's parts, and such holistic striving is considered something 'right.'

Finally, the Director highlighted the importance of national integration as a moral duty but also talked about the quality of such integration. "Integral and human development" was the keyword. As I showed in Chapter 1, the words integral and human have a longstanding relationship within the Colombian state. Evoking the two together meant placing an emphasis on the logic of the 'not only.' As important as it is to provide students with technical skills for job insertion, there is also more than the market – and that is represented by the word 'human.' Although the MEN Director did not expand on this, there was an implicit exhortation to follow the MEN's guides of educational improvement (through science and technology) and the duty to make children (students) ethical citizens – that is, the duty of making a techno-moral intervention to make individuals 'whole' in that sense. It was not just the state who needed to be 'whole', but also society.



Illustration 6 – MEN’s speech at Educa Digital (event hosts in the corners).

Screenshot by the author.

What I want to highlight in this section is how MEN and CpE state officials at this event saw teachers as lacking the ethos of public service and the drive and knowledge to make an integral intervention. Like in Chapter 4, public servants used framing (this time, through speeches instead of pedagogical activities) to depict teachers ‘as if’ they were incomplete or insufficient. Implicit in their exhortations was an ethics of public service that pointed to different instances of wholeness or completeness as a desired element: a virtuous (egalitarian) state, an impartial public servant, and an integral (humanist) child. The Director’s exhortation followed a pattern I already noticed in Chapter 2, namely, the casting of local public servants as lazy, corrupt, and working only for their salary (see also McFee 2019). It is similar to the representation between MEN or CpE officials and public schoolteachers, and my first point is that such representation is related to the centrifocal hierarchy reproduced within the Colombian state. Yet, this form of casting the relation is not the only one. In the next subsection, I will describe another form of state enactment that CpE officials also navigated.

The plurifocal state and its tensions with the centrifocal

The centrifocal imaginary (and engine) of state enactment is not straightforward. If the centrifocal imaginary of the state resembles a hierarchical, Weberian form of public administration, neoliberal reforms since the 1970s around the world criticised and targeted those forms of public administration. Academics and policymakers in the Global North called this post-Weberian trend New Public Management (NPA, *Nueva Administración Pública* in Spanish). In Colombia, economists following this trend popularised the term “decentralisation (*descentralización*),” and the term became ubiquitous in both policy documents and political debates (*Ibid*). Leyva (2018) also shows, for example, how high-level government officials in 1993 depicted the state as “being where it should not be” while “doing half of its job because of its pretensions of being omnipresent” (Gaviria 1993 in Leyva 2018, 73). The solution, NPM, followed a neoliberal logic of market freedom and state delegation, making a distinction between directing and managing. The first action should be made by the state, whereas the second would be made by a private third party – it could be a private company acting as a contractor (see Chapter 7), but in this case, it can also be local partners such as schoolteachers. The discourses of NPM and other neoliberal reforms to the public sector vindicated a different imaginary of the state, one that, in contrast to the centrifocal, we could call plurifocal: concerned with de-centring authority by including multiple local instances of the state through methods of collaboration or participation. In that second mode, the state is enacted as more horizontal – that is, a state that dialogues and collaborates rather than commands. Enacting this plurifocal state means questioning the idea of the state as a single entity by embedding it in dialogues and common work with local communities, corporations, and individuals.

CpE also enacted the plurifocal state imaginary in Educa Digital soon after the MEN Director finished her speech. With a melodic TV voice, the 'host' of the event asked the Director of CpE to take the stage and welcome the audience. CpE's Director was a white

man in his late forties with a North Colombian accent. The fact that he was not from Bogotá coincided with a different way to engage with the audience. Soon after he got on the stage, he tried to establish an emotional connection with teachers. CpE's Director told them how "wonderful" it was to "feel" the teachers "in the same space [after Covid-19]." Then, he carried out an interesting performance. He told the audience he had "something personal" to tell them. He went on by saying how a *profe* (teacher) at his university deeply changed his life by constantly challenging him. "I have a surprise for you," he added to increase the narrative tension. "The *profe* I am talking about is here with us!" His teacher was not part of the audience, however. The person he referred to as 'his' teacher was called Pablo, who worked at a university years ago but now was working as an official from CpE. Pablo entered the stage, too. "As teachers, you might know how it feels to see that one of our students does well," he said, smiling and looking at CpE's Director. Finally, both CpE's Director and Pablo took turns explaining all the projects CpE was developing that year under the frame of the new public policy.

However, a few nights before, I heard something different. I was taking a taxi with Pablo and one of the contractors in charge of the event's logistics back to our respective accommodation after a day of work. "I am always surprised at how much CpE gives teaching resources to teachers, but no one really acknowledges it! It's a pity," said the contractor while looking outside the car. With a tone of discontent, Pablo replied, "Yes, teachers are a bunch of lazy and resentful people." Pablo was here talking not as the teacher he once used to be but as the CpE official he was at that moment. Surprised by this claim, I asked him why teachers were resentful. "Well, they are resentful because they don't appreciate anything we give them. They think they live in Canada. We offer them many good services, but no one makes use of them, and on top of that, they complain about the quality of what we provide." All of us stood in awkward silence for a few seconds until the contractor talked again to diminish the tension. "But when you find a good teacher, though... last time I was in Ituango after the dam collapsed, I saw a teacher staying up until three in the morning printing and sending all his students a copy of the next day's lessons so that they didn't miss one day at school." She concluded: "This effort is all worthwhile

for those types of teachers and for the students." Pablo engaged and said, "Yes, I agree. If we managed to change one child's life and convince them to study engineering or coding or whatever, everything would be worth it."

There are, of course, moments of frustration and hardship that could explain Pablo's critical comments against teachers. But Pablo was not the only one. For example, I heard several times the phrase "*es que los profesores son bien jodidos* (teachers are quite complicated)", and then heard all types of praise for their sacrificed work. One can even move up into the institutional scale, and Educa Digital so far is an example of this. Having the speech of the MEN official and the performance of CpE's Director in the same space creates an encounter between discourses: one that is praising teachers, even trying to mimic their moral authority through performance, and one that casts them as lazy and unmotivated to use the 'services' that CpE gave them. My point here is that there seems to be a contradiction between modes of relating with teachers, one that is centrifocal and one that is plurifocal.

I interpret the simultaneous enactment of both as an instantiation of the holographic desire that the state seeks and its seemingly inevitable shortcoming. On the one hand, there is the enactment of a single-working state that transcends the perceived differences between the centre and the periphery. The MEN official was hoping that her discourse would make teachers act like national officials (impartially and with integrity) so that state action could be homogeneous and impact everyone in the country. On the other hand, there is the enactment of a decentralised state that works in a distributed manner, joining communities and individuals as *parts* of the intervention but dissimilar between themselves. In their exploration of neoliberal governmental and non-governmental organisations, Ruth Prince and Tom Neumark (2022) call this a 'curious utopia: hopes of universal welfare and social justice for all (the 'public good'), but achieved through small-scale, localised interventions that sum up to create what would be a governmental action. It is a utopia because it seeks a public good (what I refer to as an ideal moral order), and it is curious because the means and the ends stand in an awkward relationship between being contradictory and complementary. It reflects the tensions that I have tried

to signal throughout the thesis as a holographic lack and holographic work: the desire to be whole through the process of adding up (technical and moral) partialities.

International experts and the politics of scaling

It is important to introduce another type of actor to understand how state officials navigated the ambivalent imperatives to enact the Colombian state (centrifocal and plurifocal). After the opening speeches from the MEN and CpE's directors, the event also featured a series of talks. These presentations were given by what the event hosts called "international experts." Some of them were academics, and some were not, but what they all had in common was that they were presented under the name of an international organisation. Google, Intel, Siemens, Microsoft, and Movistar, among others, were usually behind the organisation of conferences through their Foundations, as well as behind the crafting of educational texts and videos, the formation of "stakeholder" networks (teachers, governments, other companies, universities), and the funding of capacity-building workshops with teachers. A similar pattern happened with organisations such as the OECD, UNESCO, and the OIE.

Take the example of Educa Digital in 2022. The presenter introduced the expert as an "international speaker of the day, all the way from Mexico." The presenter welcomed the speaker by saying, "We are ready to hear all the knowledge you have for us today." A few seconds later, the projector started projecting a video call with the speaker. With a comforting smile, Carmena, the speaker – a white Mexican woman in her mid-thirties – introduced herself as an "HP Education Ambassador." It meant Carmena was talking as a representative from Hewlett-Packard's "social investment" foundation in Latin America. On its webpage, HP Education stated that it was part of the company's "comprehensive commitment to global citizenship," focusing on "investment programmes" that had to do with "innovations in education." However, what caught my attention was the speaker's title of "Ambassador." As I later found, she was a psychologist with a Master's in "educational

science." Her LinkedIn profile showed that HP was not her official employer but a specialist consulting firm in education. Local governments collaborated with tech-company foundations and other international advocacy organisations to participate in the events, and, in turn, those organisations contracted consultants to talk as their representatives. Apart from the state's presence through CpE officials and representatives from other institutions, we were also in the realm of what Kris Olds and Nigel Thrift (2008) call a "cultural circuit." A cultural circuit is a global network or assemblage of consultancy firms, techno-gurus, companies, and Higher Education institutions, amongst others, in charge of disseminating knowledge and interjecting other people and institutions to comply with that knowledge. In Olds and Thrift's (2008) case, the cultural circuit explicitly disseminated business knowledge amongst managers. In the case of *Educa Digital*, however, the disseminated knowledge was educational and technical.

Before delving into the specific knowledge that consultants such as Carmena disseminated, an important point to highlight here is the fact that CpE invited these experts to talk inside Educa Digital, that is, an event from a national state institution. This detail reveals not just a global government strategy – standardised techno-educational knowledge flowing and being imposed in local sites such as Colombia – but what Asta Vonderau (2019) terms a politics of scaling. In her ethnography of a Facebook data centre in Northern Sweden, Vonderau shows how the implementation of such infrastructures and spaces involved the entanglement of different actors, not just Facebook, that represented the Swedish state in diverse instances – although she focuses on the regional and national government. Both national and regional representatives used Facebook's imagery for their own purposes and through their specific positionality, foregrounding specific elements of the infrastructure and obscuring other details of it. I see a similarity with the ethnographic context of Educa Digital in that the apparently global and detached knowledge about STEM education undertook a process of scaling; that is, the practices, discourses, and material entanglements that allowed rendering STEM Education as global, national, or local. Instead of having a given, *a priori* scale, the circulating knowledge and its infrastructural configurations became the means through which national state officials

such as CpE staff claimed STEM to be a corpus of knowledge that should be circulating all over the country, thus mediating the relationship between them and the teachers. CpE officials included consultants and their knowledge as a form of appropriation, a “proxy” that allowed them to craft their “forms of governmentality and modes of regulation and sovereignty” (Vonderau 2019, 17).

Now, what sort of knowledge did the "international experts" talk circulate exactly? The contents of the consultants' presentations that CpE staff put inside the event gravitated around STEM Education or cognate terminologies, but making an emphasis on STEM as an integral approach in terms of a global skills market and a moral individual project. Continuing with the example of Carmena's talk, this is how she started her presentation:

I want to start with something obvious: how the [COVID-19] pandemic changed us. It made us realise that we're living in a new world. A famous linguist once said, 'Yes, the Internet is already here because it started in the 2000s, but now we have the precious opportunity to experience the transformation as it unfolds because technology has already changed the way of teaching and learning.' We're part of a cultural and scientific revolution; we're now in the Fourth Industrial Revolution, where Artificial Intelligence and the Internet of Things are changing industries. But not only that! It is changing our everyday lives. We all probably have a device at home with a chip connected to the Internet of Things, for example.

Carmina framed the world as undergoing a multi-scalar, multi-actor systemic change caused by a single situation or origin: the introduction of the Internet and other related digital technologies. The word "revolution" points to the idea of an event that breaks time and space and transforms everyone as an expansive wave. Life would not be the same without the Internet, and in the same way, a revolution is seen to change life on every scale possible (c.f. Cherstich, Holbraad, and Tassi 2020) . The COVID-19 pandemic, which could be a structuring event in itself, became a secondary event that made the main event (Internet) visible to more people. Carmina framed everything into that

technological event, attributing a fetish-like power to it. The enchantment of technological infrastructure such as the Internet was performative in the way I already noted in the first two chapters of this thesis.

After framing technology as a revolutionary and central event, Carmina continued with her speech, this time extending the power of technology to achieve social and economic transformation. She claimed that technological change was not the only element defining the “post-industrial” world. “There has been this evolution of labour, so we are not in an industrial era where you go to your job and produce as much as you can, and your knowledge remains the same. No. We are now in the *era of experience*,” she affirmed. “That’s why teamwork becomes essential. Disciplinary knowledge is not enough because children will have an average of seven jobs in the future, so we need to teach them how to solve problems.” She changed her presentation slide, which stated: “Skills for the jobs of the future,” and below the title, a text saying “ensemble (*conjunto*) of skills, mentality, and socio-emotional skills.” The technical and the non-technical co-existed nowadays, according to her narrative. She brought technology and non-technology together by appealing to the notion of skills.

As Bonnie Urcioui (2010) notes, the term 'skill' is closely related to a neoliberal ideology that renders the subject's agency as standardised actions that become valuable in as much as they contribute to the growth of the global labour market. Because the market requires “technical” as well as “socio-emotional” skills, STEM Education would be the most ‘integral’ solution because it promised to bring “digital skills” as well as “collaborative skills,” “critical skills,” “emotional skills,” and so on. An expert from a previous *Educa Digital* put it bluntly: “We can integrate standards in one single level, break the barriers of disciplinary individualism so that it is *not only a single piece of one cake, but the whole cake*. A gear, not only its parts. A jigsaw puzzle that makes things functional.” STEM Education would fulfil both the promise of techno-solutionism and the imperative of an intervention that would benefit the global market in a holistic fashion, and by giving students the chance to find a job, it would also improve society. In that way, the consultants' discourses would illustrate the point that the enchantment of the state

towards socio-technical systems like STEM would be based on the promise of making 'integral' subjects in terms of technical and non-technical skills.

Finally, approaching technology integrally was also the way to make it a moral quest. I heard the phrase "using technology with meaning (*con sentido*)" ubiquitously when attending the consultants' presentations inside Educa Digital. In Carmina's case, she gave the example of TikTok. For her, digital technology had several layers. It could be seen merely as a "platform of short videos." But it could also be used as a pedagogical tool to teach "a new transmedia literacy," that is, "content edition, the capacity of synthesising a message, and the ability to know the relevance of the message." Using TikTok pedagogically would give the platform a new goal or *telos* beyond mere entertainment because it would create valuable individuals for the labour market. But making such pedagogical moves as state representatives would go beyond teaching "skills" for the global economy. Including digital objects such as TikTok inside the classroom would also assume a deficiency of the education system that technology would solve. In this case, it meant casting "the school" as a social institution disconnected from those new market-related processes of the global "out there." In other words, they depicted the school as frozen in time and incapable of changing through its own means. Thus, implementing STEM inside the classroom would mean not only feeding the global labour market but, by doing so, they would also achieve the more transcendental aim of updating education at a national scale. In Olds and Thrift's (2008) words, the cultural circuit rendered STEM as knowledge that goes beyond the technicalities of practice: it also involved "moral codings," that is, telling "what type of people they [public servants] should become in order to be happy and morally conscious [state officials] with fulfilling lives" (2008, 273).

What Carmina and other international consultants expressed during their presentations were similar to public servants' understandings of STEM and how they pointed to a global market order. I have already described a similar logic in Chapters 1 and 2 through the idea of market neo-realism (Martínez-Boom 2019): equating student welfare and accessing the job market and valuing education as long as it can respond to

that market 'reality.' Thus, the importance of the consultants was not about whether they were saying something 'new.' CpE invited them because rendering CpE's programmes and policies as following such international trends of STEM Education legitimised CpE's place as a national authority following the moral imperatives of centralised public service sketched in the previous section: selfless actions that affected *everyone* in the country. If we keep Krupa and Nugent's (2005) vocabulary sketched at the beginning of the chapter, the inclusion of the international experts in Educa Digital would be a way of giving value to a centrifocal enactment of the state by scaling down the centrifocal enactment of the globe as cultural circuits. CpE staff would be legitimising a national-level state intervention by justifying the importance of disseminating STEM Education all over the country as an integral form of improvement. Following one definition of STEM, which is approved by the authority of experts and the evidence that it has been used in other places of the world, allowed CpE officials to fulfil their moral ideal of a unitary, egalitarian state against the pathological, less state-like local enactments of the state. If teachers (local, less state-like actors) would follow the standards of the MEN, then the state could be acting as *one* in the whole nation.

As I said, being a whole, unitary state was not the only moral imperative that public servants had to follow through the integral intervention of STEM. Educa Digital was not just a space to convince and motivate teachers to follow a standardised form of defining STEM. Educa Digital was also designed as a place in which teachers' actions with STEM could be valued as important contributions to the process. It had to be a plurifocal order – one that saw the state as 'whole' not because it was homogeneously unitary but because it joined all the heterogeneous, local parts together. How could CpE officials, then, fulfil both mandates – i.e., to act as one and act as many? In the next section, I will show how they used the figure of the contest to achieve that.

Who else does integral interventions?

CpE dedicated the rest of the afternoon to awarding teachers for their innovative pedagogical activities in the classroom. CpE structured the award, called Meaningful Experiences (*experiencias significativas*), in the known format of a contest. The institution asked teachers to fill out a form with information about the technology-related activities they undertook with their students. To make it scalable and to include teachers from all over the country, they divided Colombia into five “regions” (Andes, Amazon, Caribbean, Pacific and Orinoco) and made a Call for Proposals in each region. Then, CpE would ask "experts" in the area of Education Technology to choose a reduced number of finalists for each region, which competed at the national scale of *Educa Digital* by presenting their projects to the jury and the audience. What did CpE want to achieve with it?

A logistical problem with *Educa Digital* helped me address the question above. 2022 was a presidential election year in Colombia. It meant that it was a year of “transition” between governments: the ruling government (Iván Duque) at that time had to finish executing every ongoing state project and policy so that the new government (Gustavo Petro) could start spending a new budget and new policies. This transition had two implications: first, it was not only a matter of finishing the projects as such but also *showing* that the projects were finished. Second, the fact that the new president and government team were elected in April and officially started duty in August meant that the projects of the current government (Duque) had to be completed very early in the year. In this context, CpE's Education Office received the order from their Director that *Educa Digital* needed to happen earlier: in just a couple of month's time. Because of its scalar organisation of *Educa Digital's* award, in which teachers from different regions first competed locally to end up in the national “finals,” it became a logistical challenge: *Educa Digital* was traditionally carried out at the end of the year because all of the regional competitions had to happen first, and by the time they received the Director's order, it was virtually impossible to deploy all of the regional and the national events with such short notice.

The team met urgently to discuss the situation, and after a few minutes of debate, they decided to make *Educa Digital* – the national event – first and the regional events later. In that way, they could show that they complied with every goal set out by the

institution. But the problem was that the competition did not make sense because the national event ought to bring the representatives of all the regions. Some from the Education Office were concerned (and angry) with the decision because they saw the problem as going beyond logistics and becoming a moral one. According to them, doing *Educa Digital* first would undermine the competition goal: making visible (*visibilizar*) innovative projects and recognising the teachers' efforts because teachers from some regions would not be present in the national event. However, other team members were not as concerned about the solution being immoral. "Now that I think about it," one of them said, "we can take the national champions and show them in the regional events. They can see the best and most innovative projects and learn from them. I think this is even better!" he finished saying with an enthusiastic tone. Thus, they would be making visible "the best", not just everyone, and that would be even more effective in improving education all over the country.

The logistical/moral problem with *Educa Digital* resonates with Kimberly Chong's (2018) analysis of 'best practices' in the consulting world. In her ethnography of management consultants in China, Kimberly Chong (2018) shows how the cultural circuit of management consists of taking the practices from one company or place and circulating them globally. These consultants audited one company, registered the practices that were the most effective and efficient, and then introduced those same practices into other companies, generating a global standardisation process – a circuit in Olds and Thrift (2008) sense. However, according to Chong, the process consisted of abstracting practices and making "ethical injunctions" with them. In other words, by labelling a standard procedure as 'best practice,' consultants rendered profit-making practices a moral decision: choosing to follow the 'best practice' suggested by the consultant would not only bring economic benefit; it would also be what you *should* do. Not following the 'best practice' proposed by the consultants would not only be detrimental to the company but morally questionable – why would you choose not to do what is 'best'? I interpret CpE's use of the national winners of *Educa Digital* to 'teach' local schoolteachers in the regional version of the event as a way to modulate the centrifocal

and the plurifocal imperatives in which CpE staff are immersed. Here, Harvey and Knox's (2015) notion of 'as long as' is useful to give words to the philosophy guiding CpE's actions at Educa Digital: as long as schoolteachers replicate the standardised procedures that consultants frame as 'best practice' in STEM, they could be considered 'part' of the integral effort to improve students' lives. If teachers do not comply with this standardised way, even if they are ethically aligned with the project, they cannot be considered part of the solution.

CpE chose which teachers followed their 'best' practice by using two devices in the competition: a set of written evaluation standards and a group of experts acting as evaluators. Something interesting about the evaluation process was that CpE did not keep the standards concealed, as I attended moments when CpE went through those standards with some of the teachers. For example, I attended a video call in which CpE brought researchers in "engineering and entrepreneurship" from the National University of Colombia to help some of the contest finalists with their presentations. These experts shared an Excel Spreadsheet containing the evaluation standards, and they went through each rubric with the teachers. The experts explained to the teachers that the juries would evaluate them following that same format. The Spreadsheet table showed two columns, one with the evaluation variables and the other with the numerical value of each variable. There were 20 evaluation variables, but they were grouped into four subcategories: "proposal clarity," "coherence between elements of the proposal," "communication," and "integrated elements of STEM Education." The subcategories grouped some of what Carmena, the HP Ambassador, and other international experts described in their talks: "use of digital technology," "interdisciplinary work," "real life context," "learning goals," etc. All of them had the same value of 2 points and were put side by side to represent integrality. Furthermore, the evaluation standard established not only the elements composing the activity but also how to communicate them during the presentation at Educa Digital: when going through the evaluation standard, one of the experts drew an explicit analogy with pitching a business idea to an investor in Silicon Valley, and told them "you are also entrepreneurs because being an entrepreneur is to take ideas forward for

many things, not only for business.” In short, CpE orchestrated a process through which teachers could standardise their activities into an evaluation format to show that they were doing an integral version of STEM in their classroom activities.

The award at *Educa Digital* started after lunch. The presenter announced the activity to the attendants, considerably fewer than the morning’s talks. Before welcoming the contest’s finalists, she welcomed the “expert jury” to decide the winner. They were a combination of academics and people working at the philanthropic arm of tech companies – like Google Education. The three of them sat at a table in front of the stage. The presenter then invited Gabriel, the first teacher-competitor, to present his Meaningful Experience. He started by introducing himself, the name of the school he was representing, and the name of the classroom project. In this case, he came from a town in Putumayo, south Colombia. His pedagogical project was called “Youth and leadership: A strategy to quit the war in peace (*dejar la guerra en paz*).” He showed a short video of about three minutes in which he explained the project and the local problem it was trying to solve, and then a few short testimonies of students talking about how the experience helped them at school. Gabriel presented directly to the camera in the video, evidently reading an already-prepared script. “What is the problem of young people that want to change? Violence. Teenage pregnancy, drug trafficking, suicides, and corruption. So, what they need is to appropriate the law. I took those teenagers out of the context of violence and into the context of public education by teaching them the Colombian Constitution through *Kahoot!*²¹.” While explaining, Gabriel’s video showed images of a classroom. Students dressed in uniform jumped out of their desks, talked, and laughed while observing the image of a *Kahoot* quiz projected on the wall.

Gabriel finished his “pitch,” followed by the public’s applause. The presenter immediately thanked him and asked the jury members if they had questions. One of the juries did. The woman, who worked at a local university, congratulated him enthusiastically. Then, she asked if other teachers from other disciplines, different from social sciences, were involved in the project. The question pointed towards the explicit presence of interdisciplinarity in the learning process. Gabriel showed how he mixed law, technology,

and a local problem in the same activity (outcome). However, he did not show how he used interdisciplinarity to achieve that outcome (medium). The jury's question mirrored a criticism that I heard from different people (experts and state officials) about the teacher's work with different education technology methods, such as STEM: they were not actually putting the different knowledge areas in conversation; instead, teachers were only stating that many knowledge areas were present in their activities. Gabriel looked slightly uncomfortable with the question. He replied, "No, I led the project on my own. But the important thing here is to empower children to appropriate the constitution. To do that, I took them out of Facebook and replaced them with activities that combined maths, humanities, English, and so on. There were 500 people using my Kahoot quizzes at one time."

Four other teachers presented their work in a similar format to Gabriel's, and unfortunately, in the end, the jury did not select Gabriel as the award winner. Even though Gabriel did what was expected as a representative of the state – served the children and improved their lives, his way of doing it did not adhere entirely to the consultant's framework. His case was thus exemplary of the tensions between inclusion and standardisation in what the "best practice" is considered to be in this context. By using the competition to prove which teacher adhered to the 'best practice' of developing STEM Education, CpE was both showing how they conceived their national intervention as a collaboration with local schoolteachers and how they had the authority to decide who was part of the intervention and who was not. As we saw in Chapters 3 and 5, teachers had their own version of valuing STEM in relation to their ethics of sacrifice. Using the international experts' definition of STEM as an evaluative form was a way of depicting teachers as not having enough knowledge of what STEM is and questioning them ethically ('Why are you not following this version of STEM if it is the 'best' one?'). In other words, by evaluating teachers like Gabriel through best practices, national state officials were imposing their view of what integral is in an attempt to achieve the ideal of a state that is whole or integral – both in terms of a central, unitary state and a plural, aggregated one.

Conclusion

This chapter examined the implementation of STEM at the national level through the description of a contest/event called Educa Digital. The event aimed to both bring the most updated 'trends' of STEM and recognise the work that some teachers were already doing with it. The chapter showed how the enchanting, technomoral promise of STEM was put to work as a politics of scale inside the Colombian state. As with policymakers in Chapter 2, CpE officials took the definition of 'integral' in terms of the global market and wanted to standardise this definition to the whole state, including teachers, in order to fulfil the moral order of a state that is unitary, impartial and egalitarian – a virtuous state, as I named it in Chapter 2. They did so to realise the technomoral promise of the integral within the state, not just in society. However, they also needed to enact the national state level by working together with other parts of the state, like local schoolteachers. For that reason, they crafted a politics of scale in which they hold the 'expert' (and global) definition of STEM as integral and used it as a metric to decide which teachers to include in their enactment of STEM as having the power to transform education. Using the terms that previous chapters have proposed, Educa Digital was a performance in which teachers were cast as insufficient (Chapter 4), which redistributed the responsibility for STEM's shortcomings. However, the performance also depicted other teachers as fulfilling what was expected of them, making STEM a 'best practice.' If the insufficient teachers wanted to contribute to STEM's power of transformation, they needed to follow CpE's definition of STEM, revaluing failure as a reason to keep trying (Chapter 5). Hence, CpE saw itself as making an integral intervention because it was helping teachers to do it 'better' – that is, making all the parts (local state representatives) work together as a whole.

This chapter contributes to the general argument of this thesis because it shows how exclusion plays a part in the process of revaluing STEM. Different from teachers in Chapter 5, who saw themselves as powerful but limited agents of transformation, CpE officials saw 'others' as limited – not them. So, if teachers thought that the process of

revaluing limitations implied further work on their part, in the case of national level officials, it implied further work in making 'others' keep fulfilling its limitations – following the centrifocal logic in which the further one goes from the administrative centre, the less one sees 'complete' state representatives. Thus, one could say that the enchantment of STEM is traversed by power, in the sense that its limitations not only call the self into action but the personal action of others if they want to be considered an 'us' in an ethical sense. The technomoral promise of STEM and its 'not only' logic (Chapter 1) can be used as a metric of inclusion and exclusion: as long as the teacher is fulfilling both the technical and the ethical imperatives imposed by the state officials, they can be considered contributing to the improvement of the country. Previous chapters have shown how there is enchantment in the fact that STEM is 'just a tool' – not a fully powerful fetish – because it demands more work to do towards the ideal of a 'whole' (integral) society and state. This chapter follows that insight by showing how STEM becomes a tool in the eyes of public servants, but this time, a tool of governance. The limitations of STEM help to call others into action, and by making that happen, STEM is enchanting the state with the promise that it would finally act as 'one,' complete state.

The next and final chapter will continue the issue of exclusion through another of CpE's main policy tasks: the dissemination of 'new' technologies and emerging pedagogical methods like STEM. But it will not be in terms of how the casting of limitations generates further personal impetus (like in Chapter 5), nor how the depiction of insufficiencies creates the enchantment of power to move others towards action (like in this chapter). The next chapter will approach exclusion as a means to completely cast out actors that do not conform to the technomoral imperatives of the integral intervention. It will also serve as an ethnographic case in which all the insights from previous chapters will add up and come together as a single argument.

Chapter 7

Steps towards a cycle of failure

This chapter finishes the thematic exploration of the relation between STEM's technomoral politics and the overt identification of insufficiencies, lack, and failures in the implementation process of a state STEM policy. Chapters 4, 5, and 6 developed this theme by showing how responsabilisation (towards the individual and the state) is critical in redistributing the limitations of STEM among 'good' and 'bad' state representatives once shortcomings are identified. Secondly, those chapters also revealed how such redistribution entails a revaluing of STEM, not as a fetish with never-ending power, but as an agent with a measured potential that participates in achieving a moral ideal of social and individual wholes. This chapter extends the discussion by focusing specifically on the notion of failure. Previous chapters have described the identification of shortcomings, many of which are related to the impossibility of STEM fulfilling the promise of being an integral intervention. This was evident in Chapter 2, where public servants accused political performances of STEM of not fulfilling the aim of improving students' lives. It was also evident in Chapter 3 when Rosario and other teachers identified that STEM was not successfully changing the school's curriculum but accused other teachers of not being 'convinced.' This chapter names such processes of identifying shortcomings as 'failure'. It follows the term's different forms of appearance in sustaining the enchanting promise of STEM as an integral state intervention.

The chapter continues to explore CpE and the setting of national policymaking and implementation. The previous chapter focused on Educa Digital, a secondary policy activity for CpE. This chapter, however, focuses on CpE's main task: disseminate technological solutions to public schools nationwide. In 2002, CpE started as a four-year public policy programme²² from the National Ministry of ICTs. The programme aimed to

“spread the use of ICTs” in public schools all over the country, given the “limited financial capacity of schools,” by providing second-hand computers and “pedagogical schemes” to learn how to use them (*Conpes* 3063, 4). CpE was eventually transformed from a programme to a whole state agency (*agencia estatal*), with its own Director, headquarters, and organisational structure – although CpE was still funded and dependent on executive orders by the Ministry of ICTs²³. CpE also changed its way of obtaining the computers, abandoning the donation-seeking strategy and opting for buying new computers themselves²⁴. Finally, in 2021 a new public policy (TpA) was published, extending CpE’s life in financial terms and dictating the agency’s new plan of action until 2024. The policy document incorporated new terminologies, such as STEM Education and digital technologies, and tasked *CpE* with delivering “new digital technologies”, such as 3D printers and Arduinos, with improved pedagogical strategies to maximise how schoolteachers “innovated” in the classroom.

This chapter will continue focusing on CpE’s staff and their actions to make STEM work its ‘magic’ nationally. The chapter will examine the relationship between enchantment and failure by describing the material practices involved in making STEM into a tech object that can travel and transform students and teachers at schools. Previous chapters have shown the heavy work that STEM has to do in terms of standing as other things – as abstract notions such as science and technology, as technical and non-technical skills, as a connector of the transcendental, and even as digital objects such as Tik Tok or coding software. In this chapter, STEM will appear as a robotics kit and as the method to connect endless knowledge and skills in all the contexts that compose the Colombian nation. The chapter’s emphasis on national scale implementation and in concrete, electronic objects is significant because it shows how it is this gap between the small and the big, the local and the national, the actual and the potential, or the partial and the integral in which the holographic lack appears – as well as the desire to fill this gap. In other words, failure takes many forms in making STEM, once again, the ever-expanding technical solution for something that is ‘not only’ a technical limitation.

In this chapter, I argue that STEM's failure undergoes a cycle involving technological enchantment and moral exhortation, revaluing 'shortcomings' positively as a vital role towards continuous improvement. I base my analysis on recent anthropological studies that have taken failure as their focus in examining policy practices. Some of these studies have shown how the continual improvement of policies through trial and error is a general approach of modern states, in which they incorporate a scientific logic of experimentation in which a complex problem must be tackled with partial but gradual solutions (Rao 2022). The framing of continual improvement and experimentation generates a cycle of improving policy with further policy. This process of continuous fixing sparks and maintains hope, especially for policymakers trying to realise the project, because failures become the starting point of further work instead of only being an endpoint (Miyazaki and Riles 2008). Moreover, failure becomes knowable (Smith 2023) and valuable (Appadurai and Alexander 2020). This means that failure acquires specific epistemic and material forms and makes part of localised regimes of signification. Many authors trace these regimes of signification in the Tech sector, especially Silicon Valley and its ideology of 'failing to innovate.'

This chapter follows those insights in showing how, within CpE's practices of materialising STEM, failure takes several forms through numbers and objects and acquires different meanings and values. Failure becomes something 'positive' following the idea that, while prototyping the robotics kit as a tech company would do, controlled failure inside the lab can avoid 'real' failure once the product is out in the schools. However, I also follow other anthropological insights showing that failure is a moral judgement on the social relations involving the action (Carroll et al. 2020). Thus, in the case of CpE, failure is also a negative appreciation of specific actors (private contractors), who were seen as breaking the moral boundary of the public good – what CpE officials called "corruption." Ultimately, these different values of failure, from positive to negative and back to positive, create a cycle in which technology-related methods, once again, promise improvement. Such a cycle resembles Chris Kelty's (2017) grammar of participation: a normative ideal sparks collective action, then people realise that the action does not

resemble the normative ideal, and then there is another call for new action towards that normative ideal.

Because I am arguing that the enchantment of STEM and its holographic failures create a cycle of constant revaluing of the actions of different state actors, I divided the chapter into six 'steps' by which this cycle happens. Hence, the chapter's name – which plays with the title of Bateson's (1972) famous book – steps towards a cycle of failure. In the end, I will show how every step of the cycle gathers insights from all the previous chapters by showing how the techno-moral promises (and imperatives) of an integral state play out together with the redistribution and revaluing of holographic limitations in the form of a cycle.

Starting step: holographic failures

Since its inception, CpE's main aim has been to provide "equal access" to Information and Communication Technologies (ICTs) in the public education system (UNAL 2018, 8). In Colombia, the use of computers in schools started during the decade of the 1980s. The popularisation of LOGO and the visits from MIT gurus Seymour Papert and Nicholas Negroponte to the country incentivised a few private schools in Bogotá to buy computers and use them in classroom activities (Martínez and Obregón 1988, 162). Using computers in schools was thus scarce and limited to areas close to Bogotá. However, during that same decade, academics, international organisations, and policymakers became interested in "educational informatics," that is, the use of information technologies to inculcate skills and knowledge in learners. They viewed educational informatics as a 'right' for everyone and something that could modernise the nation (Parra Mosquera 2012). In the 1990s, the Presidency Office (*Presidencia de la República*) started the installation of public internet cafés, explicitly stating that communication technologies should not stay in private and privileged groups but should be available for everyone. CpE followed this genealogy of thought. In 2001, a Presidential Directive claimed that CpE was

"helping to bridge the current digital divide, in which a privileged group of citizens have access to technology and thus to knowledge and progress, whereas other groups do not have access to those opportunities." These affirmations followed an ideal of *equal access to state services*. Furthermore, as other anthropologists of Colombia have shown in other contexts, this ideal of equality implied the widespread discourse in Colombia that the state has been historically absent in marginal areas (Serje 2005; Ramírez 2013). Hence, the claims of equality of access were recognitions of previous state failures in being 'integral' in the moral sense: it did not fulfil its imperative to provide an impartial and equal approach. The solution was to multiply and replicate the same state service everywhere.

However, further realisations of failure followed suit, pointing to the state's failure to be integral – but now in another sense. In the second decade of the 2000s, CPE commissioned two impact studies to measure how much their computers improved public school education. The studies pointed to a relative success – millions of computers were delivered in a decade, and the schools that received those computers improved their scores in the annual state exams. However, based on qualitative indicators that aimed to capture the social impact of computers beyond quantitative tests, these impact studies also highlighted that the delivery of computers was not enough. The report placed the problem in the generic characteristics of CpE's training courses and its inability to provide pedagogical resources to areas without Internet connectivity. The studies reflected what was discussed in other academic and state circles in Latin America – that computers alone do not solve educational problems (Sandoval 2019). In the eyes of the impact studies, the CpE's strategy lacked other elements beyond technology. Firstly, it did not consider local actors, which meant that CpE was integrative but not inclusive. Secondly, and related to the first one, it was not taking other non-technical skills that could correspond to the local needs of each school – i.e., it was not allowing local teachers to generate connections between technology and other skills. In other words, if CpE emerged as a form of solving the failure of the state to provide a solution for everyone, CpE later stood accused of failing to provide an integral (inclusive and holistic) service.

In sum, as the first part of the cycle, failure appeared as the starting point – triggering further integral actions (Miyazaki and Riles 2008). Even though the declaration of (at least partial) failure came from specific reasons – usually materialised in numbers and quantitative indicators such as number of impacted schools or average scores in the national exams – I interpret these failures as pointing to the seeming incapacity of CpE to make an integral intervention. Using the terminology of Chapter 1, one could say that CpE could not solve the holographic lack of the Colombian population, thus failing itself in being holistic – in providing ‘not only’ technology but also other skills. This starting moment of the cycle will lead towards the enunciation of a solution. But even if the failures that the impact studies identified had to do with the emphasis on technology, a technological solution was not thrown out; instead, technology was reshaped into new terminologies to highlight a new enchanting promise: the capacity to include several types of ‘stakeholders’ to prototype an integral intervention.

Second step: The promises of prototyping

Public innovation (*innovación pública*) has recently become a popular work methodology within the public sector in Colombia. Public innovation also follows a global trend in which methods and productive processes of the private sector – and, more concretely, the tech sector – became tools for developing public policies and services. Prototyping, design thinking, human-centred design, and agile product development, which came from start-ups and software development, were said to help the public sector become more efficient. Furthermore, proponents of public innovation advertised its potential in the collaborative relations it could develop between private and public actors (c.f. Kimbell and Bailey 2017). Public innovation became so popular among state agencies that the 2018 National Development Plan included a chapter on public innovation, which meant that public innovation became part of a national government’s agenda. The Plan highlighted the urgency to generate an "ecosystem" of state institutions solving "high complexity public

challenges" through public innovation. "This document considered traditional" ways of facing those challenges as slow, expensive, and "increasing the possibilities of failure" (DNP 2018, n.d.).

Furthermore, those "traditional" solutions were not suited for a changing world on a global scale that demands fast and efficient responses, nor for a diverse country with specific regional nuances. The country's Development Plan explicitly used the word "experimentation" and defined it as a form of making controlled failure part of the process so that the "solution" can be "scaled" in an impactful way (*Ibid.*). Finally, experimentation makes public services go from "creating value for people" to "creating value with people," that is, making the state open, collaborative, and inclusive (*Ibid.*). Terms such as innovation, experimentation, and co-creation thus became vernacular (emic) ways of framing policy solutions and resignified failure as part of the experimental process that would bring about a 'successful' policy.

CpE also adopted public innovation through a specific set of terminologies and methods. CPE staff has been searching for new pedagogical frameworks since 2014, and the term educational innovation (*innovación educativa*) was adopted in several of their training and pedagogical projects. By then, CPE's Education Office set up an "educational innovation lab." The lab was a 45-square-meter space in the warehouse where CpE placed the old computers and electronic waste (see Image below). The idea with the lab was to create innovative pedagogical activities based on new pedagogical approaches to train teachers nationwide. But what were these approaches? They became interested in STEM Education, which implies interdisciplinary and problem-based classroom activities. They also heard about educational robotics and its benefit to inculcate computational thinking and coding logic through hands-on and playful practice. The Education Team contacted academics and teachers working on those topics to learn more about them. Dani was one of the public schoolteachers that they contacted. He was passionate and devoted to educational robotics, specialising in Scratch and Arduino. Even though the Education Office staff was already learning about STEM education, Dani introduced Maker Culture. The term has been popular in Colombia since 2015, especially amongst

enthusiasts of educational robotics and Scratch - an open software that teaches coding to children. Maker Culture proponents advocated for Do-It-Yourself (DIY) solutions based on open-source values and reusing all materials.



Illustration 7 – Corner of CpE’s Prototyping Lab. Photo by the author

CPE thus adopted Maker Culture as a pedagogical framework in addition to STEM. Dani and other proponents claimed that it would grow practical skills in students through its learning-by-doing approach. Most importantly, Maker Culture would allow teachers and students to solve their local problems. Instead of providing an already-made solution, Maker Culture would teach actors in the education system to make their pedagogical prototypes and try them out in the classroom. CPE needed to give them the toolbox (Kits with electronic components) and a few examples of pedagogical activities that teachers could imitate and eventually create their Maker activities. If the consulting reports that CpE commissioned (see section above) framed failure as the inability to deploy an intervention that could be adapted to local contexts and different pedagogical needs, Maker Culture and prototyping would be a way of avoiding such failure. The toolbox of

electronic components CpE would deliver to teachers nationwide would allow teachers to adapt the tools and pedagogical activities to whatever topic they wanted.

In sum, CpE staff also believed in the promise that the explicit use of prototyping and experimentation in STEM Education would bring an integral intervention all over the country. Similar to the political performances and policymaking meetings of Chapter 2 and the capacity-building workshops of Chapter 4, technology (through the form of STEM and prototyping kits) performed once again as holding the promise of transforming public education and improving students' lives. If CpE officials followed STEM's promise, the holographic failure that sparked CpE's new attempt would be avoided, and an integral (inclusive and transversal) intervention could finally happen. Nonetheless, similarly to Chapter 2, the enchantment of STEM as an integral intervention was not just about making society integral. It was about the state making itself integral as well.

Third step: Prototyping bureaucracy

CPE also adopted Maker Culture and prototyping to create those electronic kits and pedagogical guides. The lab went from "educational innovation" to "prototyping and testing lab." CPE staff invited engineering students, public schoolteachers, academics, and state officials from other institutions to prototype together pedagogical activities that could be replicated in schools all over the country using their kits. Everyone interacting with the lab became a "maker" and a "volunteer." Alberto Corsín Jiménez (2014) argues that prototyping has expanded from being a practice inside labs and design studios to become a ubiquitous cultural imaginary and practice. As an object always in the making and open to further transformation, it has fuelled political hopes of collective action and agile future-making. He thus suggests that trying to make a prototype also "reconfigure[s]" and "reshapes" the practices of the "community of developers that [came] together around it" (2014, 388). I follow his lead to contend that CpE officials prototyped their social relations when making and delivering prototypes (electronics kits), standardising relations

to work towards the same moral aim – although pursuing divergent interests (*sensu* Jensen and Winthereik 2013). Furthermore, this standardisation rendered failure as something 'good' because if it happened inside the lab, it could be anticipated and avoided as an outcome once the kits were delivered to schools.

Most of my visits to CPE's lab were devoted to observing or participating in activities related to the lab's most recent product –still in the form of a prototype- called the Maker Kit. It was a 60 by 60 cm cardboard box. Inside, there were electronic tools, such as tin welders and protoboards. There were also dozens of e-waste materials, such as old DVD trays and laptop screens, from the warehouse where CPE put the disassembled parts of old computers collected from schools. The Maker Kit's components finished with a thick book of pedagogical activities that showed teachers how to build robots (or other electronic objects) with the e-waste and the tools provided and how the process of building those robots could be directed towards teaching students basic school subjects such as maths and physics. The design and development of those objects were defined by the people attending the lab as a prototyping process. Seeing the process as experimental allowed CPE staff to anticipate and control the usual problems that would cause a project to fail in not improving education.



Illustration 8 – CpE’s Maker Kit. Photo by the author

Framing the design of the Maker Kit as a prototyping process was seen as effective because it brought horizontal collaboration and a way to transform differences between diverse actors into the generic shape of "volunteers." One prototype from the Maker Kit was exemplary of this. Mario wanted to include another object in the Maker Kit called the Multi-language Game (henceforth, MG). It aimed to stimulate language, maths, and coding skills in students through a board game. It was a multi-purpose board game with keyboard keys instead of tokens or pieces. I collaborated with Mario and some lab volunteers to design and prototype the MG. It all started during my first visit to the lab. That day, Mario told me I could keep attending as much as I wanted to continue my participant observation, but I could not only "sit and watch." I needed to collaborate – by which he meant that I needed to engage by doing. He insisted that I act as one of the volunteers, suggesting and developing a project that could later be added to the Maker Kit as a pedagogical activity. I was keen on collaborating, but I told Carlos I had nothing in mind as I did not know much about electronics or school pedagogy. But Mario had a project in mind, the

MG, and thought I could help develop it. The project would improve students' language skills; as an anthropologist, I was closer to knowledge about "language" than the other volunteers trained in Engineering. For a while, Mario was figuring out how to reuse the thousands of old keyboards that CpE had in its warehouse. Keyboards were mainly composed of plastic, which could not be recycled like other elements from computers made with gold or copper, such as chips and motherboards. Thus, keyboards were piling up in the warehouse with no apparent use. Mario wanted to take the keys out of the keyboards, design a board, and use the keyboard keys as tokens or pieces for different board games. This is how the idea started.

In the following months, we chose the games that could be played with the MG, designed the board, coordinated with the Sustainability Team to find enough keyboards to deliver the game to 1000 schools, and worked with the contractor to buy the remaining materials. At first, Mario first started thinking of the MG as an open-access, Colombian state version of Scrabble. Scrabble was the best fit for the situation at the lab. Firstly, it would tackle English and Spanish language activities, which most other projects did not address because they focused on teaching maths and sciences. Secondly, Scrabble would need many keyboards, as each MG would use many of each letter to form words. However, Mario, the volunteers, and I noted a problem: Scrabble only needs letters to be played, so the keyboard keys representing numbers, grammatical symbols, and other commands (i.e., alt gr, shift, tab) would remain unused. After a few days of research, one of the volunteers suggested that the MG could also include Sudoku, and Mario liked the idea for two reasons. On the one hand, Sudoku would imply using number keys. On the other hand, it would help teachers develop logical skills in their students, so now the game would be about spoken and mathematical language. Finally, Jimmy, a schoolteacher who attended the lab as a volunteer, and I suggested we modify the board so that teachers could use it to teach coding to students without needing the Internet or even a computer. Again, Mario was happy with the idea because it would be enlarging a functional affordance of the object: using command keys to represent coding functionalities such as

cycles. It would also be tackling (what we thought was) a feature of some public schools in remote areas of the country: not having Internet or enough computers.



Illustration 9 – Prototype of the Multi-language Game's board. Photo by the author

Both in my case and with the other 'volunteers,' we were bringing together previously acquired professional knowledge and pre-conceived ideas of what the prototype would do in different Colombian locations. However, it was the process of engaging with the materials and the design process that put all those diverse knowledge and pre-conceptions into dialogue together. The MG provided what Jensen and Winthereik (2013) called "shared proximity:" "involved parties pursue divergent interests through one another" (2013, 41). I sought moments of ethnographic engagement; schoolteachers wanted activities for their students, and engineering students wanted to practice through the lab's resources. However, designing a techno-pedagogical prototype such as the MG rendered 'us' - CpE staff, engineering students, public schoolteachers,

and ethnographer - as "makers." MG acted as a 'boundary object' (Star and Griesemer 1989) because it became the space of interaction and mutual translation.

However, the development of the MG not only concerned non-CpE 'volunteers' but expanded to include other CpE officials from different teams and sections. The difference was that the relations between officials from different parts of the institutions were already formalised: they were mediated by reports, emails, forms, and protocols – what was understood by everyone as "bureaucracy." The lab staff and other volunteers saw bureaucracy as a limitation since it slowed the prototyping process. Testing and experimenting with a specific prototype required flexibility in choosing which material could be the best option to build it. The formality of bureaucracy truncated that experimental and creative quest since every time the lab staff wanted to acquire a new material, they had to go through a formal and lengthy process of requesting it. In the case of the MG, acquiring keyboards for the project required asking the IT Team, as the laptops were in their name, which required a formal email request. Also, finding e-waste to run tests for the prototypes to decide whether acrylic was a better material than plastic for a specific piece implied asking the Sustainability Team to give the lab staff a small sample of those materials. Again, handling materials required a written memo addressed to Paula, the person in charge, so that she could justify it with her bosses.

An instance of this was when 'we' started testing the computer keys to see how many would be needed to play all of the games inside GM (as each game needed a specific amount of keys). To access those keys, we had to ask Paula, who was in charge of managing all the e-waste materials, to give the lab 10 keyboards so that we could disassemble them and extract the keys. The problem was that Paula had to go through a process to justify the extraction of keyboards from the stock – as the process of taking e-waste from the warehouse was formally set to happen at specific moments of the year. However, Mario discovered that the IT Team had a few thousand spare keyboards that they requested to make tests but never used. Mario went to their office to talk directly to the IT Team. The IT staff told him that he arrived too late because they just signed a request to transfer the keyboards to the warehouse, given that they were not using them.

Mario looked frustrated, but then he asked the IT staff if there was something they could do to solve the problem. After a few minutes of discussing possibilities, one of the IT officials asked another one from his team if the document specified the number of keyboards to transfer or if the transfer was going to be made based on the keyboards' total weight²⁵. "If it [the document] asked for the weight, then you're screwed. But if it asked only for the number of keyboards, we could play with it because you can take the keys out, and we can transfer the keyboard carcasses only. The weight will change, but the numbers won't." Mario smiled after learning that the transfer request only specified the number of keyboards, not their weight. As we headed out of the IT Team's office, he asked me, "Did you see that? That's called *gestión*²⁶."

Mario asked the other IT staff to collaborate in the prototyping process by thinking of a solution to the problem (the impossibility of getting keyboards for testing in a reasonable amount of time due to bureaucratic procedures). Thus, by rendering everyone a volunteer, they could access enough materials to make tests. With the tests, CpE could anticipate possible failures and solve them once the Maker kit and its prototypes were 'out' in the schools. Take the example of the Hexapod, a tiny six-legged robot made of vinyl from old computer screens and the engine of a DVD tray (servomotor). The Hexapod was also a robot prototype that teachers and students could build using the Maker Kit. When Claudio, one engineering student/volunteer from the lab, first showed me the Hexapod, the robot was disassembled because he and Mario were still discussing how to join the vinyl legs. They anticipated several situations the Hexapod would face once the Maker Kit arrived at thousands of schools. The Hexapod's legs needed to be joined by something sturdy enough to resist many students manipulating the robot. However, they were also thinking of a material teachers could easily find or replace in remote areas of the country.

They did tests with the vinyl itself, cutting smaller pieces shaped like screws. But in the end, they opted for cheap brass screws that could be found in any ironmongery. It looked like a small detail but had a big reason for them. If the Hexapod failed once it reached the schools, the robot – and the whole Maker Kit – would make part of the long

list of low-quality computers and other faulty technological objects that did not work when CPE delivered them to schools because no one thought of the specific aspects of public education in Colombia. The prototype's underdetermined form (Corsín Jiménez 2014, 386) allowed them to perform failure as something that would happen before and not after the delivery of the techno-pedagogical objects. Thus, as a form of working and relating, prototyping replaced formal bureaucratic procedures with experimental methods that would make failure something that would happen in a controlled micro-environment – the lab – and not at the unmanageable scale of the national. In that way, they were thinking through the realities of teachers in rural places, thus doing the 'work' of making the policy inclusive and opening the potential for endless interconnection of skills. The promise of educational improvement through technology was still alive due to CPE staff's enactment of bureaucratic relations as a process of prototyping – using the terms of Chapter 4, an 'as if' framing that made the promise of prototyping tangible.

Fourth step: Failure foretold

Prototyping as a form of work helped CpE staff avoid bureaucratic procedures enough to make failure *controllable* and happen *before* the object delivery. However, the procedures to 'scale up' the project and deliver thousands of experimental kits brought an inevitable formal (contractual) dynamic. In 2002, the Colombian government reduced the number of public servants by half and redefined every state institution's function as directing and overseeing a private contractor rather than directly providing welfare services (Leyva 2018; Ocampo 2018). This state reform followed a global trend of neoliberal restructuring, that is, diminishing and privatising state welfare (Morgen and Maskovsky 2003; Koch 2019; Muehlebach 2012). Every state institution was legally obligated to execute their projects with a private contractor and follow a protocol. In the case of CPE, the state agency needed to establish an Invitation to Tender (ITT) for their electronic kits, and private contractors had to send a proposal to bid for the contract. The dynamic valued

the contractor's experience and how cost-effective its proposal was – in other words, how much money contractors could save on each element composing the kit. The state institution specified what they needed and the budget for each element the contractor needed to buy or fabricate. In short, these forms of New Public Management aimed to make the state less bureaucratic and more dependent on formal public-private partnerships (Kimbell and Bailey 2017; Leyva 2018).

Take the Engineering Kit as an example. In the context of this second type of experimental kit, CpE sent an ITT to buy or design the necessary objects, technologies, and pedagogical guides inside the kit. The idea was that teachers and students could exploit their creativity by making robots with electronic sensors and Lego-like pieces. In that way, and similarly to the Maker Kit, students could learn science, technology, and engineering. The bidding contractors, most of them public universities with research centres specialised in educational innovation, bid with a proposal that assured spending less than what CpE was offering as a budget. CpE chose one of them, so the elected contractors needed to follow a timeline with partial reports on the brand of the objects they bought and advancements in creating the pedagogical guides that would accompany the electronic elements. Prototyping was CpE's way to limit bureaucracy's malaise, but they also had to deal with the legal and infrastructural materialisations of previous attempts to take bureaucracy out of the picture (Anand 2020).

Dealing with these contractual forms brought a mistranslation, later becoming what CPE members identified as a failure. Colombian law forbade state institutions to specify the brand that contractors should buy in the ITT. In that way, state officials could not make secret deals with companies. Thus, CpE staff had to translate the technical aspects of the brand they liked into a generic term and put it into a list called “technical specifications.” In the case of the Engineering Kit, they translated Lego bricks into “modular pieces,” that is, pieces that could be combined to form a figure – for example, a house. But contractors bought another brand, using magnetised cylinders instead of plastic bricks, and argued that these cylinders could be considered “modular pieces.” The lab members, CpE staff and other 'volunteers' argued that the contractor's decision lowered the project's quality.

The cylinders could be joined to make only a limited (although broad) set of shapes, whereas Lego's bricks could be assembled in endless shapes. If a pedagogical guide asked the students to build a "smart house" using a light sensor and plastic cylinders, the students could only build a house with a generic shape of a triangular roof and a square window. "Where have you seen a house like that built in rural Colombia?" – one of them told me. The plastic cylinders were thus seen as erasing the potentiality of the pedagogical activities to be adapted to local contexts and foreclosing the creative agency of schoolteachers and students to be the actors adapting the activities to their contexts.

Furthermore, the guides were understood as not matching the activity's complexity with the cognitive development of the students that were going to develop it. In other words, an activity designed for fourth graders was too complicated, and an activity designed for high school students was too simple. The lab collaborators saw the Engineering Kit and its pedagogical activities as doomed to fail once they were delivered to the public schools because of the contractor's low-quality materials. Here, it is important to highlight the predictive quality of the lab collaborators' accusations. At that moment, they did not know for sure if the kits failed – they just predicted that, given the evidence of the tests, the kits would not have the potential to make endless connections in the local context (to have an integral power). Thus, paraphrasing Gabriel García Márquez's (1981) book title, for CpE staff, the modular pieces were a chronicle of failure foretold.

Fifth step: Responsibilisation and exclusion

The identification of failure also brought a judgement of who was responsible for it. As Timothy Carroll and co-authors note (2020), failure is a judgement, and as such, it is relational and moral. CpE staff and volunteers blamed the contractors for the imminent failure of the Engineering Kit. Furthermore, they did so by resorting to corruption, another "globally circulating concept" (Muir and Gupta 2018, S5). For CpE officials, the contractor's faulty behaviour was related to seeking personal profit instead of striving to

improve the education system. For CpE staff, seeking cost-effectiveness was not wrong because it could be used for the public good. Cheaper components would allow CpE to buy more of those, so more schools would be able to receive them – as long as lower prices did not mean low quality. For the lab members, contractors did not do it for the public good but for their profit. They told me that numbers did not make sense otherwise. “If CpE had approved a specific amount of money to buy the components, and if the contractors only spent a fraction of those resources but did not buy more components, then where was the rest of the money?” – one of them told me while drawing seven-digit figures on a paper sheet. Those sorts of interjections happened *vis-à-vis* their conversations about a national corruption scandal that happened around the same time (2021-2022). It involved the Ministry of ICTs, which is the institution that gave CpE its financial resources, and private contractors misusing the resources initially set up to build public Internet cafés in rural schools. Newspapers and television channels 'revealed' and circulated the scandal regarding corruption (Gupta 1995) . CpE members discussed the scandal during their coffee breaks, as it felt quite close to them, and they compared what was happening at the Ministry of ICTs and what happened inside CpE by calling both corruption. Corruption is the term that various social actors use to describe the immoral transgression of the private/economic into the public/political sphere (Muir and Gupta 2018; Nugent 2018; Harvey and Knox 2015) . CPE officials used this term to define the failure of the Engineering Kit in terms of some actors (contractors) tainting the public duty of improving education with personal and economic interests.

Some of the lab collaborators wanted to push back against the cylinders' approval and the Engineering Kit's pedagogical guides. At first, I thought this meant rejecting the cylinders and forcing the contractors to buy other "modular" or interlocking pieces similar to Lego. However, I soon learned that the contractors already bought the pieces, so nothing could be done to buy new ones. Still, these lab members gathered to write a report that rejected the pedagogical guides for not being good enough. They linked the lack of quality to using poorly chosen elements in the Engineering Kit. At that moment, I did not understand why they were making such an effort and arguing their case based on

the cylinders if they would be delivered regardless. But several times, they phrased it using a sports analogy: "We can't let them score goals against us (*meternos goles*).” By that sports analogy, they meant not allowing contractors to get away with their so-called hidden intentions (profit from public funds). By basing the rejections on the argument that the cylinders and pedagogical guides did not conform to the technical specifications of the ITT, lab members hoped contractors would have to do amendments and buy other “modular pieces” to complement the ones they had. In that way, lab members hoped to force contractors to invest more of the budget in the project and not take it with them, increasing the quality and impact of the Engineering Kit.

Thus, numbers and technical specifications helped lab members make failure an object of knowledge (Smith 2023). Corruption helped CPE staff find a moral reason for that failure, as it provided for the transgression of the public and the private in these kinds of neoliberal projects. The moral judgement of corrupted actions gave lab members the ground for casting out the actors and actions that produced failure. Following Carroll et al. (2020), it could be seen as an effort to cast contractors as moral 'contaminants,' therefore justifying their being left out of the project (*sensu* Douglas 2002). They made a process of personal responsabilisation, like in Chapter 4, and they linked that responsibility to the practices of a pathological state representative – selfish and thinking in their interests, like the depiction of politicians in Chapter 2. But unlike teachers, contractors did not go through a narrative of transformation like the one I described in Chapter 3. They were simply blamed and excluded.

Final (and starting) step: Revaluing failure as continual improvement

So far, I have used the Maker Kit and the Engineering Kit as similar yet different examples of improving education through experimentalism and technology. The same institution produced them – CpE – but a different office made each kit. The Education and Innovation Team developed the Maker Kit, whereas the IT Team led the production of the

Engineering Kit. The Maker Kit represented values and terminologies of Maker Culture because their creators, that is, Mario and the lab volunteers, had a close relationship with Dani (the teacher that first introduced the terminology in CPE) and were also interested in hacker culture, open-source hardware, and agreed with other techno-libertarian ideas. Two IT Team engineers who were also interested in experimentality proposed the Engineering Kit, this time, from the side of scientific procedures and problem-solving in engineering. However, during my visits to the lab, I saw a third kit called the STEM Kit. The deployment of the STEM Kit was not CpE's responsibility. The idea came from the Ministry of Education (MEN). They were interested in the pedagogical approach of STEM Education, which advocated for interdisciplinary collaborations among teachers to build the necessary skills in students to study STEM-related disciplines after school. The MEN imagined educational robotics as a tool to help teach STEM topics pedagogically and engagingly, so they asked CpE for help developing them. CpE appointed Mario, from the prototyping lab, as an auditor (*interventor*), a third party that would accept or reject the contractor's reports and ensure the project's quality.

The STEM Kit was also like the Engineering Kit in that the project was cast as a failure, and contractors were blamed for mediocrity, negligence, and corruption (although less explicitly than the Engineering Kit). For Mario (acting as auditor), the quality of the materials was lower than what they were expecting. Furthermore, there was an issue with the pedagogical guides because the contractors first understood that those were not going to be included in the STEM Kit. After the misunderstanding was cleared, the contractors started writing the guides in less time, affecting how detailed the guides were. The making of the STEM Kit encountered even more trouble. Mario rejected the contractor's work so many times that the contract expired, delaying tasks even more as they worked to find out how to renew it. The STEM kits were finally assembled, but Mario also had to do random in-person inspections of the kits' contents as an auditor. He and other CpE staff went to the warehouse where the MEN had the kits. They found, once again, inconsistencies and complications: missing cables in some of the kits that would make the electronic parts unusable, broken pieces in others, and other kits were getting

mouldy due to the conditions of the warehouse in which they were held. As a result, the MEN and its contractors delivered the STEM kits in 2022, even if the kits were a project from 2017.

Nevertheless, the STEM Kit served as material and conceptual input for the Maker Kit. Mario showed me a sample of the STEM Kit during one of my visits to the lab. He had the plastic box stacked on top of a tool cabinet. However, it did not take me long to realise that the sample was almost gone. Mario and other lab collaborators reused most of the electronic components and tools from the STEM Kit to make prototypes and tests for the Maker Kit. Apart from the few components left, I could see the pedagogical guide inside the STEM Kit. It had a similar aesthetic to the Maker Kit guide. However, the colours were different: the Maker Kit's pedagogical guide had shapes and decorations in purple and magenta, whereas the STEM Kit's guide had decorations in blue and red. The structure of the guides was also similar. Both introduced an activity, stated the tools needed, did a step-by-step process, and discussed the skills and topics the activity could inculcate in students. The main difference was the length. The STEM Kit's guide described the activities on only one page, whereas the Maker Kit's activities were lengthier and described on several pages. For Mario, that was a significant difference because the length indicated how the pedagogical guides had improved from the STEM to the Maker Kit. Mario told me how, when acting as an auditor of the STEM Kit, his rejections came with detailed feedback on how to write the pedagogical guides. He used that feedback on the STEM Kit to write the Maker Kit's guides. Thus, even if it was shorter and lower-quality than he would have liked, the STEM Kit was a predecessor to the more robust and higher-quality guide accompanying the Maker Kit. The STEM Kit was not a complete failure as much as it could be considered material for improvement in subsequent projects. Once the "contaminant" actors and objects (Carroll et al. 2020) – corrupt contractors and low-quality materials – were out of the picture, the next project could build on the lessons learned.



Illustration 10 – The STEM Kit’s pedagogical guide titled “The school: Getting to know our second house”. Photo by the author

Prototyping was useful again, but this time not to control and bound failure as a process before delivery. A failed outcome became an imperfect income, still open – in beta-version, as it were – to improve in the future. Prototyping opened the door for the hope of future success as a starting point and not an endpoint (Miyazaki and Riles 2008). Failure became part of what Charlotte Bruckermann (2023) calls continuous improvement. Through an ethnographic account of carbon market policies in China, Bruckermann shows how the framework of 'policy experimentation' casts failure as continuous improvement, allowing absolute failure to be ignored and thus suspending the utopian project of carbon emissions reduction further and further into the future. The end goal of an improved environmental future was still on. The Chinese government promised it would eventually happen – only that not yet. It placed that concrete carbon market policy within the endless

cycle of fixing a policy with further policies. Her interlocutors – consultants and experts in the topic – knew in advance that these policies would not work as expected. Still, they kept attached to the projects while they could move on and find something else to do.

As the STEM Kit case showed, CpE officials also viewed failure as continuous improvement. If the responsibility for failure could be redistributed and linked to moral insufficiency, the outcome of those failures could at least be used as income for further techno-pedagogical projects—it could be revalued as a limited yet powerful source of improvement. Failure happened that one time, but it did not mean that a future, improved project would not bring Colombian public schools closer to the goal of improving the education system through STEM.

Conclusion

This chapter examined the relationship between techno-moral politics and the revaluing of STEM's limitations in the specific setting of an educational innovation lab. By examining the making of a robotics kit that transported STEM's endless power of potential interconnection, the chapter showed how failure was a vital part of the cycle through which STEM renewed and endured its enchanting promises. In the everyday practices of Mario, the volunteers, and other CpE staff, the lexicon and methodologies of experimentation (Making Culture, prototyping, public innovation, amongst others) proved complementary to the morally charged lexicon of corruption (decay, mediocrity, private interests, amongst others). The fantasies of interconnectedness and experimental collaboration that STEM brought forward were compelling precisely because they happened vis-à-vis moral judgements and exhortations. Both created a dynamic that, when put in relation to previous projects involving technology, appeared as having a cyclical shape in which failure appeared consistently.

As I said in the introduction, this chapter shows how all the previous chapters come together in a single process. The first step brought Chapter 1's idea of the holographic lack by showing how the state's intervention always stands accused of not being a complete (integrative, inclusive, connecting) intervention and, therefore, constantly failing. The second step brought Chapter 2's emphasis on magic concepts to show how STEM, in this case, mixed with the notion of prototyping, promised to end that holographic lack. It also evoked Chapter 3's description of STEM as enacting an endless interconnective power when the lab volunteers designed the kit to adapt to every context, situation, and lesson. The third step brought together Chapter 2's insight that state representatives follow the integral promise of STEM to show themselves as good 'public servants' and Chapter 4's idea that STEM's potential is seen through a framing that enacts it as a reality. It showed both ideas by describing how the lab collaborators treated every relation (including bureaucratically established ones) 'as if' they were volunteers working on a prototype. The fifth step used Chapter 4's idea of responsabilisation to show how failure is also about moral judgement that can involve exclusion (see Chapter 6). Finally, the sixth step (also seen as the first step) took Chapter 5's idea of revaluing to show how failure becomes, once again, a starting point.

In that way, the chapter not only repeats what previous chapters had shown. By putting it all together, it points directly to the main point of this thesis. Mainly, that technology education policy (like STEM) endures amid its limitations because those limitations are morally revalued by giving state representatives the chance to legitimate their work in relation to 'other' actors. Anticipating a holographic failure and pointing to the originators of those failures through objects and figures gives value to trying once again to realise society and individuals as wholes through an integral intervention.

The chapter also showed the moral politics of STEM as an integral intervention. An ideal moral order calls people into action through a desire for its instantiation, but it also allows the exclusion or expelling of certain actors as outsiders of the policy. It acts as the evaluative means to make differentiations. This chapter continued the issue of exclusion from Chapter 6. Instead of exhorting lacking individuals to engage technically and ethically

in the implementation of STEM, this time, the contractors stood accused of failure (as doing corruption). Such accusation reinstated the importance of the value of public service that I sketched in Chapter 2, and that here condenses in an expression that Mario said repeatedly: "The public is sacred (*lo público es sagrado*)."

Conclusion

This thesis examined the endurance and ubiquity of state interventions involving technology to improve public school education in Colombia. Technology has become an omnipresent remedy for addressing the shortcomings and needs of the educational sector, and Colombia is no exception. For several decades now, the Colombian state has issued numerous policies trying to disseminate technology (as a curricular topic, as a technical object, and as Internet infrastructure) inside public schools, with the hope that those objects, infrastructures, and curricular topics helped the educational sector to improve schools' pedagogical methods and students' employability and morality. A short reminder of the history of techno-educational buzzwords that appeared in the country could be useful to illustrate this omnipresence: Educational Informatics in the 1980s, Social Appropriation of Science and Technology (ASCyT) in the 1990s, and Digital Literacy, Educational Robotics, EdTech, Maker Culture, and STEM Education from the 2000s onwards. Each of these terms condensed the promise of technology to change and improve education and the state's faith in technology to fulfil that promise. However, the number of buzzwords appearing in time also illustrates how that promise falls and rises repeatedly. Why does the enchantment of the state with technology keep happening?

The importance of morality

Anthropologists and other scholars interested in science and technology have long shown that the apparent separation between technical and social/political processes is a modern fantasy (c.f. Latour 1993). The fantasy has fuelled social and political interventions under

the banner of rationality and expertise (Mitchell 2002). However, those technology-based interventions have also generated the hopes and aspirations of a moral order driven by progress, development, and social prosperity, becoming part of a wider sociotechnical imagination that captures the desires of all types of actors in the field (Jasanoff 2015). Those imaginations inhabit not only people's minds; they are enacted and materialised in performances, spectacles, objects, and infrastructures (Larkin 2013). These performances are politically efficacious because they 'capture' peoples' hopes through enchantment (Seaver 2019). However, one could also say that they have also captured the same people and institutions that have tried to use them in the political field – in this case, the state (*sensu* Marvin 1990). Thus, the anthropological literature usually tells us that the recurrence of technology as a state intervention has to do with the enchantment that sociotechnical imaginations produce.

What is the shape of this alluring sociotechnical imagination in the context of education? Studies have shown that the sociotechnical imaginary in education is usually framed as imitating global techno-capitalism in the classroom by including technological objects or know-how (Mamluk 2024) . If Tech Companies like Google or Meta have supposedly 'innovated' and 'disrupted' the global market and the companies' forms of working and managing, then there is the aspiration that technology could do the same to schools, curriculums, and students. That hope seems especially urgent in Global South countries, where there is the imaginary that educational systems are 'behind' the advancements of the so-called developed world, thus reproducing access inequalities (Ferrante et al. 2024; Uleanya and Prinsloo 2024) . Such sociotechnical imaginary materialises in different ways and scales. On the one hand, schools need to undergo organisational and curricular transformation – they need to bootstrap into becoming more like start-ups (Greene 2020; see also Williamson 2018). On the other hand, teachers and students must also transform (Martínez-Boom 2019). Teachers and students each get depicted as needing to 'update' their skills to match what is seen as a dynamic, fast-paced, collaborative, and technology-dependent labour market.

The thesis showed that there is more than meets the eye when those imaginaries are set in motion. It was not all about matching the techno-capitalist market and skills acquisition in the case of STEM. In Colombia, there is a long-standing desire to be ‘morally’ similar to Euro-American countries (Chapter 1). There is a perceived moral lack in society and its individuals, including state representatives (Rojas 2002). Public servants conceptualised the default order of the state as pathological (Dávila 2017), and they wanted to implement a virtuous moral order when implementing STEM. Of course, that moral order changed between different types of public servants. It could be the ideal of a state composed of impartial technocrats who work efficiently in their assigned tasks, as in the case of state managers and policymakers in Chapter 2. Or it could be the ideal of the state as a conglomerate of caring and sacrificed servants that go beyond their tasks in the name of their love towards students’ lives – as in the case of teachers in Chapter 3. Regardless of the difference, the pattern showed that STEM was not just about changing students; it was also about changing state representatives, and STEM was not just about techno-capitalism and skills but about a moral ideal of a ‘good’ state.

Thus, this thesis found that the desire of the Colombian state is both technical *and* moral. Following Strathern (1992), we could call this a desire to be whole (1992, 188). In the specific ethnographic setting of the thesis, the holographic desire took shape through the emic term of ‘integral intervention (*intervención integral*).’ In Colombia, the word integral means to be whole. But that wholeness has a moral angle: being integral also means possessing integrity. An integral intervention would be one in which the state acts as a whole (every institution working together towards the same aim) and one in which the state acts virtuously. The chapters showed how state representatives rendered STEM an integral intervention, which gave STEM a seductive quality – rather than only being another project trying to implement technological objects inside schools. When rendered as ‘integral’, state representatives depicted STEM as capable of providing technical and non-technical skills to students. They exhorted other public servants to work interdisciplinary to achieve that integrality (Chapters 2 and 4). Moreover, in the case of teachers, the integral quality of STEM went beyond such emphasis on (non-)technical

skills and interdisciplinary collaboration. STEM acquired an almost infinite integrative potential: it could join science with the humanities, but it could also connect students' self (*e/ser*) with a wider set of relations – culture, the world, or spirituality (Chapter 3). If STEM could make students moral in the sense that they would be acting for a wider order, then implementing STEM would make teachers and other public servants moral as well, in the sense that they would be acting towards a more transcendental aim. By becoming integral, STEM would acquire the power of connecting previously separated realms of life, thus giving it the promise of fulfilling the desire to be whole in a technological and moral sense.

These findings confirm and extend the anthropological literature on sociotechnical promises and imaginations. On the one hand, the findings prove the need for ethnographic accounts that take seriously the normative and aspirational orders motivating the actions and visions of people in the field about technology and its effects on society. Moral orders could help explain why technology is seen as efficacious in many contexts and situations and why technology is persistently a tool of state intervention. On the other hand, the thesis expanded the monolithic definition of 'moral' that some of these studies managed (explicitly or implicitly). The 'moral' is not just an underlying order visible to the analyst. Morality also has a social life: it appears explicitly as a term in the lexicon of people in the field or with cognate terms such as 'ethics (*ética*);' it also appears through terms such as care, sacrifice, duty, or transcendence; or by words such as 'good' or 'right.' Morality is the reason people justify and value their actions as ethical and, as such, good or bad, right or wrong. Thus, the contribution of studying the promises of technology in the context of education is that morality becomes visible and relevant to the point that we could talk of a technomoral imagination – one that weds together technology with the ideals of different kinds of moral aims to do 'good.'

A focus on technomoral imagination is important because it helps to give an alternative route towards examining the enduring enchantments of technology as state intervention in more general terms. It widens the scope of the relation between an ideal, aspirational order and its relation to the promise that technology would realise it through its transformative powers. The appearance of a moral lexicon in people's everyday actions

as state representatives implementing STEM also pointed to the value of their own actions in achieving the promise of technology. State managers, contractors, policymakers, and teachers constantly highlighted their efforts in following an ethics of (public) service – although that ethics changed according to the type of actor. I distinguished between ethics and moral orders (*sensu* Yan 2011). Talking about the technomoral would mean talking about a tripartite relation between moral orders, technological promises, and ethical actions – rather than just the relation between moral orders and technology. The technomoral would decentre the analytical attention on technology to understand its enchantment. The alluring promises of technology have to do with the fetishisation that a specific sociotechnical system goes through in the context of politics and state enactment (Larkin 2013; Pfaffenberger 1988). But the enchantment also has to do with how the implementation of this promise places responsibility on the persons implementing it and how that responsibility becomes proof of the person's worth in a field of relations guided by a normative ideal of acting rightfully. In the case of this thesis, the decentred and tripartite analysis of the technomoral became useful when responding to a second, interrelated question: why do technological promises still enchant states *amid* the recognitions that those promises have not, and probably will not, be fulfilled?

The revaluing of limitations

In the context of state implementations of technology in the educational sector, anthropological studies have revealed the prevalence of practices that tend to either ignore, paper over, underestimate, or obscure shortcomings, failures, or breakdowns of projects using technology to fix education (Sims 2017; Ames 2020; Chan 2019; Mazzarella 2010). In those ethnographic accounts, there is a constant clash between what the promoters say technology would do and what technology-based programme does. Failure is proof of technology's inability to fulfil what its promoters promised - reduce digital access inequalities, overcome outdated pedagogical practices, allow more interactive

learning, boost employability, or generate socioeconomic development in general. The promise shines through the proofs of failure in the sense that people end up obviating or forgetting about those shortcomings (Chan 2019), choosing to believe that the ideal will eventually happen if a future implementation improves (Ames 2020) or fixating on the few successes that the project managed to achieve (Sims 2017; Mazzarella 2010).

Some of these practices were certainly part of my descriptions throughout the chapters. For a start, STEM enthusiasts dismissed an overt recognition that STEM would not fulfil its promises as “negativity.” As Chapter 5 showed, the usual strategy to approach STEM from a measured and ‘realistic’ perspective implied the enunciation of the enthusiasm and conviction that STEM did have a transformative power – a STEM-enthusiastic consensus (*sensu* Cearns and Knox 2024). The act of directing people’s attention to the most interesting features of the project, or the successful achievements of previous attempts, was also present in the presentations of public servants such as Cristian at VS’s capacity building workshops in Chapter 4, or in the narratives of ‘best practice’ of the international experts attending *Educa Digital* in Chapter 6. Finally, one could say that choosing the ideal way to achieve a technomoral improvement in education over its actual implementations was integral to how STEM survived failure. We could see that choice in Rosario and Eduardo’s hopes that, by ‘convincing’ other teachers, the implementation of STEM and their school would finally achieve better results (Chapter 3). It was also evident in Mario’s conviction that if corrupt contractors were excluded from the STEM Kit project, STEM would arrive at schools and unleash its endless pedagogical potential in teaching students all they need in life (Chapter 7).

In the case of this thesis, failure was about holism. If the desire was to fulfil a holographic lack with STEM, then its failure was the recognition that STEM would not achieve that wholeness – or at least, not at that moment. However, the choice of staying with the promise rather than with the facts of its shortcomings (c.f. Ames 2020) was not the only reason why state representatives remained enchanted with the techno-solutionist promise of STEM. In the case of my ethnography, that choice did not involve the omission of its shortcomings and limitations. Instead, it involved the *redistribution* and the

revaluation of failure into a reason to fulfil the ethical will to participate in improving education. Chapters 3 and 4 foregrounded a process of responsabilisation (Trnka and Trundle 2017) that targeted public schoolteachers mainly – although it also involved other state representatives like contractors (Chapter 7). Chapter 4 delved into that responsabilisation process and showed that it was crafted and performed through framings (Bateson 1972) such as ludic activities. Furthermore, the chapter showed that a useful element of depicting teachers from ‘lacking individuals’ into ‘participants’ involved showing STEM at times as the ‘solution’ for the teachers’ lack and other times as ‘needing’ teachers’ capacities to realise the promise of an integral intervention. The responsabilisation did not imply distributing full responsibility for lacks and limitations from STEM to teachers – only partially. Chapter 5 showed that teachers did not fully challenge the responsabilisation and redistribution process. Instead, they revalued the limitation as something that showed how the work towards improving students’ lives kept happening despite the structural limitations of working as a representative of the Colombian state. Both chapters showed how, in the hope of staying with STEM’s promise, failure did not disappear but was valued differently.

Here is where the technomoral imagination comes at hand analytically. The revaluing of STEM’s limitations to fulfil the desire of holism (integrality) acquired value through how moral orders triggered personal ethical action. However, triggering a will to participate in improving education started at the limit of STEM’s apparent ability to realise those moral orders. Where STEM’s power faded, public servants’ power started to shine. Such a process did not mean state managers or public schoolteachers entirely dismissed STEM’s potential; instead, they measured or de-scaled that integral potential (Chapter 5). They recognised that STEM had a limited power but was worth keeping nonetheless. They saw their own work as a complement: a way to fill the holographic lack of STEM. State managers understood it as the chance to work (or show others how to work) impartially and judiciously. Teachers understood it as the call for the heroic duty to pay off the Colombian state’s debt with the students of public educational institutions. The limitation of STEM became the public servant’s opportunity to keep showing and fulfilling their

commitment to an ethos of doing 'good.' So, here is why states keep being enchanted by techno-solutionist projects in education amid failures, limitations, and shortcomings: the state keeps enchanted because failure justifies reproducing itself through further 'integral interventions.'

Beyond STEM

Although this thesis focused on Colombia's public state education, the analysis has implications for other contexts and places. Let me provide an example that speaks beyond the Colombian context. In February 2024, *Platzi* – one of Latin America's most prominent online teaching platforms – posted a video about education in the so-called 'post-AI' era on YouTube. Freddy Vega, Platzi's CEO and Colombian techno-guru, claimed in the video that AI technologies such as ChatGPT have become popular amongst students, and such popularisation has brought very positive, but also some negative, effects on education. He then asked what children should be learning in this 'era' in which AI chatbots have apparently changed the rules of the game in education. In the video, Vega said he travelled to the Education Leaders Forum (ELF) to find an answer to his question. The ELF is an international conference and networking event held in London. It follows a format where 'experts' and 'leaders' share their opinions as best practices, just as in the case of *Educa Digital* in Chapter 6 (see also Chan 2019). The video shows a few short extracts of Vega's interviews about 'education in the post-AI era.' One of the interviewees was the young CEO of an educational NGO in Brazil. Another of the interviewees was the (equally young) representative from an educational social enterprise in India. The Brazilian CEO replied that governments, state policies, and societies must focus less on AI and more on social responsibility, environmental solutions, and care towards others to live in a post-AI world. The Indian representative said that, in a post-AI era, governments needed to stimulate critical, humanistic, and technical skills.

I bring this YouTube video as an example because, when watching it, I saw a close resemblance between what Vega's international interviewees were saying and what my interlocutors (Colombian state managers and teachers) said to me during my time in the field. Both in the video and my ethnography, educators claimed some holistic or integral intervention to the problems that currently afflict the world, and in both cases, appealing to a holistic approach involved ethics and care in some way. But this time, the video was not about STEM, but about the 'trendy' fashionable buzzword – AI – and not about Colombia, but other Global South countries as close as Brazil and as far as India. The regime of representation (see Rojas 2002 in Chapter 1) is not exclusive to Colombia. The supremacist self-depiction of Europe and the US as possessing civilisation, development, or prosperity was (and still is) a mechanism that encompasses the entire world. The faith that technology as a transformative force has travelled the world over through the international development industry (Escobar 2011), through the dissemination of Open Software Movements and other techno-enthusiasts since the 1980s (Ames 2020), and more recently, with the expansion of Silicon Valley as a socioeconomic model (McElroy 2024; Greene 2021). If, as the video has shown, we can see the presence of claims towards more-than-technology interventions in education, can we see them as technomoral interventions? And if so, what shapes do those technomoral imaginations take there? I am inclined to think that failure would take similar protagonism, in the sense that it would not necessarily be ignored but instead cast as a consequence of the lack that Global South countries supposedly have and revalued as an opportunity for further work.

Finally, we could expand the analysis beyond education. In a world menaced by global pandemics, environmental decay, genocides funded and supported by global superpowers, and extreme-right groups rioting the streets and winning elections, it is not surprising that the modernist, neoliberal, and technophilic model of development from the Global North adopts an explicitly moral lexicon to reproduce the need for further intervention. There are anthropological accounts of technomoral politics in development (Bernstein and Sharma 2016), in the way neoliberal organisations seek to achieve a 'public good' (Bear and Mathur 2015), how community participation becomes the

buzzword of all types of governmental organisations (Vollebergh et al. 2021) , and how neoliberalism absorbs religious values to create welfare-providing individuals instead of welfare-providing states (Muehlebach 2012). I believe these research paths could be enriched by the insight that this thesis provided: technomoral governance is not only effective because of the ethical justifications it places on individuals but also because of the way failure becomes revalued and how that revaluating implies that individuals – and not structures – need to keep changing and enhancing themselves.

Coda: Positionality, critique, and post-conflict

I want to end with a thought on the implications of the technomoral imagination for me as an ethnographer, for there is another angle of technomoral buzzwords such as STEM in producing a ‘magic’ to endure within the policy sector. Adding moral injunctions to technological solutions implies a challenge to position oneself critically against it. In Pollitt and Hupe’s (2011) words, magic concepts like STEM “have an overwhelmingly positive connotation; it is hard to be against them” (2011, 643). One question condenses the situation well: how can you disagree with a project that wants to give skills, improve lives, stimulate collaboration, and 'pay the debts' (so to speak) of a violent and exclusionary state? As an anthropologist, I approach that question with another one. What can we learn from Colombian public servants – specifically, from schoolteachers – to approach that challenge?

As I stated in the Introduction’s methodology section, the inflexion point for this ethnography was the realisation of specific affective reactions I had while doing fieldwork. There were moments in which I recognised both negative and positive effects when attending STEM capacity-building workshops, events, and policy meetings. Several times, I felt the enchanting power of how public servants performed and gave shape to the promises of STEM (like in Chapters 2 and 4). I also felt the will to participate in the process through the collaborative experiments of prototyping (Chapter 7) and policy co-creation

(Chapter 2). Nonetheless, I cannot say I felt entirely comfortable and convinced with the promise of STEM and how the Colombian state implemented it. I could not put that discomfort into words until a few weeks before ending my fieldwork period. Chapter 5 captures that moment: I finally decided to speak with Rosario, one of my closest interlocutors, about those feelings. By doing so, I had two realisations. Firstly, my interlocutors in the field also had a sense of discomfort in one way or another. I have explored that realisation at length in Chapter 5, so I want to focus on the second one. Mainly, my discomfort came from my reluctance to align ideologically with some of the precepts of STEM that some state representatives had – for example, that the state uses STEM to reduce all types of social problems to skills and employability.

However, my discomfort also related to the context's inability to accept my (and others') reservations about assumptions and actions around STEM. The few times that I expressed my reservations in public, the reaction of the STEM enthusiasts was to reject them through the idea that the only type of comments or criticisms had to be "positive." For example, in one of the policymaking sessions of San Carlos' STEM+ policy that I described in Chapter 2, I wrote in a post-it note that public schoolteachers had to deal with the (physical and psychological) violence that students received in their homes and neighbourhoods. I based my comment on several interviews with teachers all over the city. However, instead of questioning the validity of the evidence, the person leading the session did by saying, "Well, isn't that a bit too strong? (*¿eso no está como muy fuertecito?*)." Her reaction triggered other public servants to translate my comment into a more amicable euphemism. They suggested changing my post-it for one that said "social problems." Instantly, my comment was dismissed because it did not trigger the normative affective reaction of positivity.

I see this politics of enthusiasm (*sensu* Ahmed 2019) as pointing to an underlying ethnographic problem. This is because, even if STEM policymakers and I used similar terms and expressed similar moral aims, in many instances, we were not talking about the same things. In other words, there is a disjunction problem: the terms I use as an ethnographer and the terms that people in the field use are the same, yet they point to

different meanings. Enunciating a moral aim (say, reducing inequality) either means what policymakers mean by it (i.e., reducing inequality by giving skills), or it simply cannot exist. Here is where the challenge of critique appears: either you are part of an 'us' by expressing enthusiasm for STEM, or you are outside of the conversation. In terms of Alberto Corsín Jiménez (2013), STEM enthusiasm points to a political ethics in which the actors that pertain to the 'commons' (the collective 'us') are the ones that want to do 'good' (i.e., that are ethical). Given that implementing STEM equates with doing good in the official narrative, disagreeing with the implementation of STEM means being unethical and, therefore, being excluded.

So, how to (at least try to) overcome this problem? In this thesis, I took the path of asking what people in the field did with it. By realising that public servants such as teachers felt uncomfortable like me with the promises of STEM, I kept the question of what this discomfort led them towards in terms of their positionality. As I showed in Chapter 5, their discomfort pointed to their view of themselves as part of the problem. In other words, teachers did not deny that they were state representatives, so the state's shortcomings also limited them. Simultaneously, that partial positionality meant that teachers and the state sought a common moral goal through STEM. Teachers' way of navigating the hard-to-scape politics of enthusiasm was to enunciate their enthusiasm towards STEM in public. However, privately, they de-scaled or measured their considerations of what STEM could do as a state project.

That insight has implications in terms of positionality and critique. I contend that critique takes a different shape in the context of techno-solutionist buzzwords. Critique becomes something different than taking a detached position that allows one to unearth, reveal, and question power relationships between governments, corporations, social classes, or groups that control and exploit other groups or classes. I am certainly *not* saying that these dynamics of oppression disappeared, nor that they are not important to unearth anymore. I am saying that the position to denounce it as critical scholars becomes more challenging to find in policy settings such as STEM policies. There are probably other paths to find an alternative critical stance. However, the one I took was to show how

closing a critical position is an efficacious way to keep the supremacy of technology as the preferred tool of state intervention. My argument is about showing that failure can only lead to further action. Therefore, it must always be positive – even if that implies the reproduction of techno-solutionism. That critical position also allows us to see more nuances in the process – how (at least some) actors in the field develop their way of being partially critical. In short, what we could learn as anthropologists from my interlocutors in the field with regards to the positionality of critique is that ‘we’ (as ethnographers) are also entangled with the affective and ethical politics of the technomoral – but that does not mean that, as my interlocutors, we cannot craft our critical views within that politics.

Post-conflict

I want to finish this thesis with the question of whether this learning could help us navigate beyond techno-educational buzzwords such as STEM. I will briefly take the example of post-conflict, a buzzword directly affecting me as a Colombian anthropologist. When I started the project, I was interested in the relation between techno-utopianism and the post-conflict period that Colombia was (and is) experiencing since 2016. However, because of the political changes that emerged when a new right-wing president took office (Iván Duque; see Introduction), the topic of post-conflict promptly faded from my observations and, thus, from my analysis. This situation led to a question that haunted me throughout this thesis: if not (post-)conflict, then what makes my thesis an ethnography of Colombia and the Colombian state rather than an ethnography that could happen everywhere? I first tried to keep hold of post-conflict, searching for it everywhere I could to avoid losing the ‘Colombianness’ of my ethnographic material. However, that was harder than I expected because of the political dismantling I mentioned. I slowly realised that post-conflict was not the only element that I could identify as specific to Colombia, and the importance and value that my interlocutors gave to the term ‘integral intervention’ became something that distinguished my observations from ethnographies elsewhere

(although the specificity does not mean that the holographic desire is unique to Colombia). Yet, a question remains: why was I (and other people reading my chapter drafts) so inclined to reduce the value of Colombia only to its recent history of armed conflict and peace accords?

Again, I find it useful to ask firstly what the people in the field did and what we can learn from them. When I was in the field, I found it difficult to establish the connection between STEM and post-conflict because of the political context of the new government, but also because, when I asked teachers and state officials about this connection, most of them seemed confused as to why I was putting those two things together. The only cases I saw any connection between both topics was when teachers or public servants came from a conflict-affected area – like Gabriel, the teacher in Chapter 6 who participated in Educa Digital's contest. However, because my research focused on Bogotá and Medellín, two cities that nowadays do not usually experience explicit consequences of the conflict, the connection was less clear. For most public servants I talked to, post-conflict pointed to guerrilla fighters' reincorporation or the reparation of conflict-related victims – in other words, institutionalised policies directly related to war. Why was I – they seemed to wonder with their looks – asking about it when the interview was about STEM? Their confusion was so evident that I started to feel silly asking the question, so I dropped it in subsequent interviews.

However, with hindsight I realised that their difficulty in recognising a connection between armed conflict and STEM did not mean that violence was absent in their narratives of STEM. That recognition is evident in Chapter 2 with the narratives of politicians about Medellín's past violence or in Chapter 4 with Cristian's references to that history as well. There were also references in teachers' narratives to drug and interpersonal violence in their accounts of their students' neighbourhood contexts. I realised that, in a way, the topic of violence, conflict, and peace was still present, and my interlocutors managed it by casting it as a 'past' or as a negative background in which the action of STEM became valuable. STEM's moral promise was powerful because it proposed an alternative to a negative, conflict-related context. This is where I find it

interesting to compare my interlocutors' experiences with my own ones about post-conflict. The background-foreground relation between conflict and STEM made me ask about the relation between conflict and post-conflict. Could it be that post-conflict is a buzzword similar to STEM? Could the enchantment that my interlocutors felt for STEM be comparable to the enchantment I (and other academics) feel for post-conflict?

For a start, post-conflict is not just a word neutrally describing a thing 'out there.' Instead, like STEM, post-conflict is also a buzzword that states and other governmental organisations have crafted and advertised as an exemplar of state intervention in conflict-affected countries (c.f. Lane 2023). Moreover, post-conflict also brings a considerable moral force rooted in its relation to conflict – its object of intervention. Conflict and armed violence are the background through which post-conflict shines as a solution. The relation makes post-conflict something vital, urgent, and incredibly relevant. As a Colombian citizen-anthropologist (Jimeno and Arias 2011), that relation, of course, affected me, making clear how a moral force triggered my ethical and political commitment to contribute to the process of post-conflict with my research – in a similar way to many Colombian friends and colleagues working in the topic inside and outside academia. Finally, post-conflict is also alluring and 'magic' because it attracts funding and international attention, which was also reflected in my personal case. Choosing post-conflict as one of my research topics helped me find funding and get my research proposal accepted by the prestigious Department of Anthropology at UCL. Thus, in a way, STEM and post-conflict are similar in that they are both policy buzzwords with an enchanting moral (and marketable) force.

So, what are the implications of this analysis? In the case of my interlocutors, there are grounds for a critique of how they cast armed violence as the 'past' and STEM as the solution for a future that overcomes that violent present. Cristina Rojas (2002), who I heavily draw from in Chapter 1, has the key to this critique. For her, there is a distinguishable feature in the case of Colombia and its history of violence. Mainly, national and international commentators have framed violence and conflict as only involving physical and armed actions. In contrast, other types of violence, such as symbolic or

epistemic, have been rendered invisible. The definition of violence only as physical violence creates an epistemic trick in which the 'Colombian reality' only takes shape as having to do with military confrontation, guerrillas, and paramilitarism. Rojas' reflection is important because it gives meaning to how STEM becomes powerful: if violence can only be defined as physical violence, it means that STEM is devoid of it, and therefore, it is useful for repairing the social contexts in which violence is still present – in other words, it becomes an anti-political tool of government (Barry 2001; Ferguson 1994). Furthermore, it allows the expulsion of critique using the terms 'violence' and 'conflict' because violence and conflict can only appear as 'outside' – not as part of STEM. One could argue, for example, that contrary to the idea that violence is outside STEM, techno-solutionist interventions like STEM do indeed rest on violence, only that it is epistemic. That violence appeared in Chapter 4: the power and qualities of STEM appear when teachers, students, and other public servants get depicted as morally and technically insufficient individuals, incapable of knowing or improving by themselves – and Chapter 5 showed how that is not true.

There is one final implication in the case of myself (and others) enchanted by the moral promises of post-conflict. That implication is the possibility of asking how we are, as committed anthropologists with a moral promise of peace, reproducing the same logic that underlies the enchantment of my interlocutors towards STEM. Is the fixation with conflict and physical violence a way to reinforce the idea that it is only one type of violence worth examining and critiquing? What are we leaving out when reducing Colombia's problems only to armed confrontation or related processes? I am *not* using these questions to deny that armed violence has undoubtedly brought problems and suffering, nor to undermine the critical task of making those types of violence visible. Political actors are trying to banalise and hide the conflict's history and repercussions in Colombia, so the dozens (if not hundreds) of anthropologists who have studied this phenomenon are making an invaluable contribution. I suggest a more reflexive approach to how we are entangled with the problem that concerns us and how that reflection can help us better understand other forms of violence and where they hide.

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