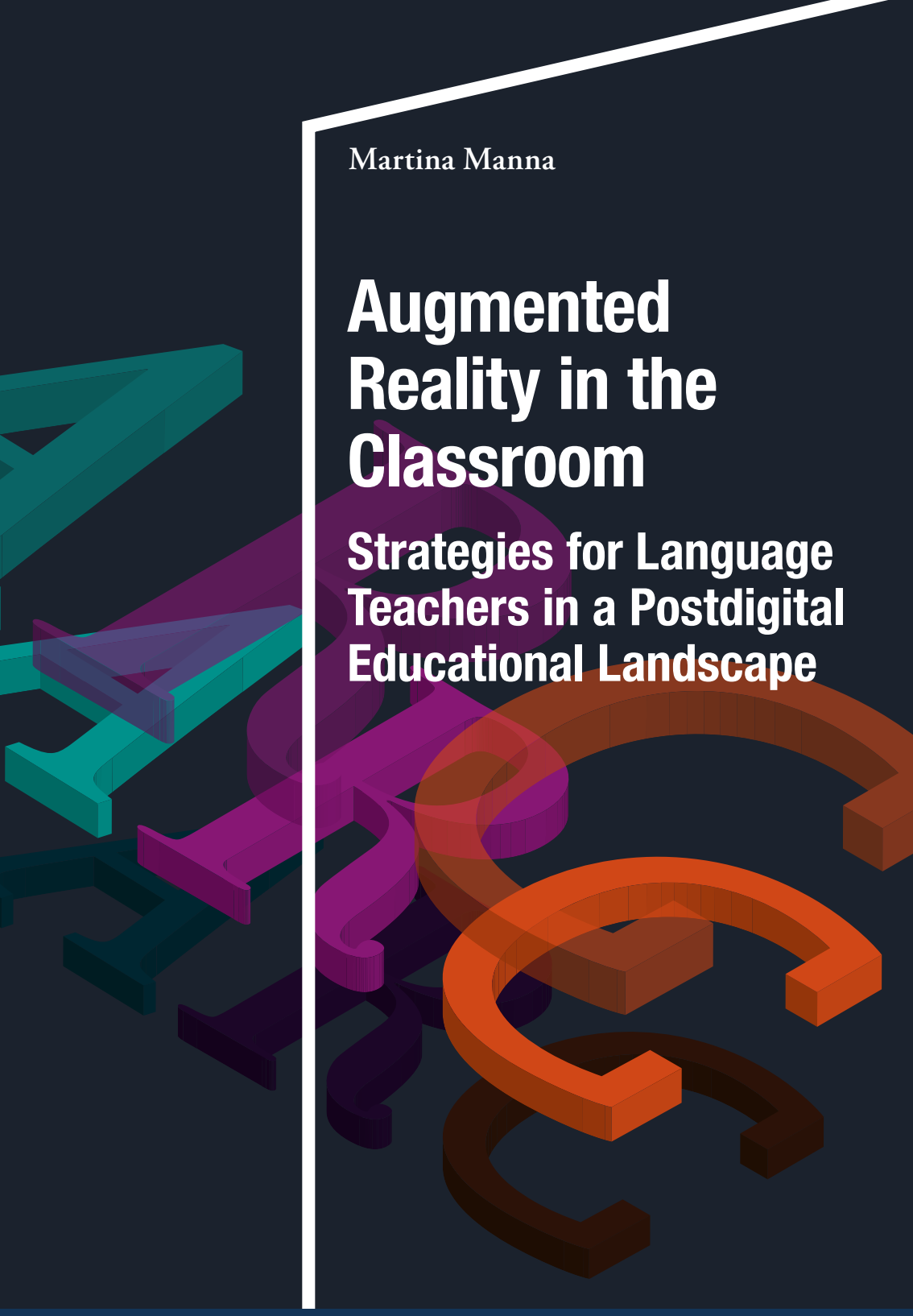
Martina Manna

Augmented Reality in the Classroom

Strategies for Language Teachers in a Postdigital Educational Landscape



Horizontes Universidad

Octaedro

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INTRODUCTION

Why This Book? Why MAR? Why Now?

This book is the result from a journey that began in 2017 at Carleton University, Ottawa, where I worked as an Italian language teacher within the Department of Applied Linguistics. There, I had the opportunity to participate monthly in workshops introducing language teachers to new digital tools and methodologies. It was in one of these sessions that I first encountered Mobile Augmented Reality (MAR). The potential of this emerging technology immediately caught my attention. Yet, at that time, most platforms were far from intuitive, required coding skills, and offered little in terms of open-source compatibility across operating systems. Despite my enthusiasm, I decided not to implement it in my classes, as the barriers were too high for sustainable use.

Two years later, while teaching at a bilingual secondary school in Rosario, Argentina, the idea of using MAR resurfaced. Together with my colleagues, we planned an end-of-year student project on Dante Alighieri that would integrate multimodal resources and creative interaction. This time, we embraced the challenge. The experience—rich in excitement, obstacles, and reflection—became the catalyst for a deeper inquiry. It raised urgent questions about access, infrastructure, the availability of teacher training, and the ways in which digital divides influence the feasibility of adopting emerging technologies in language education. The global pause imposed by the Covid-19 pandemic created the space to turn these reflections into research.

I decided to pursue a PhD that could help make sense of these insights and support other educators navigating similar tensions. I

conducted my study through a joint doctoral programme between the University for Foreigners of Siena and the University of Murcia, combining applied linguistics with educational technology. My research was driven not only by curiosity but also by a strong commitment to helping language teachers make informed, sustainable, and pedagogically grounded decisions about MAR.

Today, as a postdoctoral researcher and special education teacher in Italy, I continue to witness firsthand how much work is still needed to bridge the gap between technological potential and pedagogical reality. This book aims to be more than a personal narrative; it is intended as a practical and reflective resource for educators, teacher trainers, and learning designers seeking to integrate MAR into language teaching practices. Across the different phases of my journey—from experimenting in well-equipped universities to fieldwork in diverse classroom realities—, I have observed recurring challenges faced by language teachers across borders. These include not only the technical barriers of implementing MAR, but also deeper pedagogical and institutional issues: insufficient training opportunities, the undervaluation of teacher agency in digital design, and the persistent disconnect between innovation and everyday teaching.

This book does not claim to provide universal solutions. Instead, it aims to shed light on what is still missing in our collective approach—and what we might begin to address. Drawing from grounded experiences, research-informed practices, and collaborative reflection, the following chapters offer concrete pathways and provocations for integrating MAR in meaningful, sustainable, and context-sensitive ways into language education. Emerging technologies such as MAR are reshaping the educational landscape, offering new opportunities to engage learners, design authentic tasks, and bring cultural, linguistic, and creative learning experiences that would have been hard to imagine a decade ago.

However, as the field of educational technology evolves, one central insight becomes increasingly evident: tools alone do not improve learning. What ultimately matters is how teachers — guided by their values, professional expertise, and reflective judgement—design, adapt and integrate these technologies within the complex realities of their specific teaching contexts.

This book does not provide simple 'recipes' or ready-made solutions. Rather, it invites readers to critically engage with:

- The complex and situated nature of classroom implementation.
- The reflective decision-making processes that teachers continually navigate.
- The tensions, opportunities, and responsibilities inherent in postdigital education.

To support this engagement, the book includes worksheets for reflective practice, checklists for teachers, example activities, and lesson plans. Grounded in original empirical research, it draws on 'Entangled Pedagogy' (Fawns, 2022) and postdigital scholarship to offer both theoretical insight and practical guidance for those exploring MAR and other emerging technologies in language education. In doing so, it underlines not only the potential of MAR but also the central importance of teacher agency, professional values, and pedagogical adaptability within complex educational ecosystems. These considerations are particularly timely in the context of current debates on educational technologies, including the growing influence of Generative Artificial Intelligence (GenAI) on teaching and learning.

Ultimately, this book aspires to guide educators, researchers, and designers through the shifting waters of today's educational technologies—offering not recipes, but informed ways of thinking and acting.

STRUCTURE OF THE BOOK

This book is conceived as a hybrid resource that integrates theory, empirical insight, and actionable tools for those interested in the thoughtful use of Mobile Augmented Reality (MAR) in education. Its structure reflects the conviction that educational innovation does not arises from tools alone, but from how educators reflect, adapt, and act within complex teaching and learning environments.

Who Is This Book For?

While grounded in the field of language education, this book is intended for a broader community of educational actors who engage with emerging technologies. It speaks to multiple audiences:

- **Language Teachers**: seeking to explore how MAR can enhance motivation, cultural engagement, and multimodal practice in the classroom.
- **Students in Language Teaching or Teacher Education Programmes**: gaining a practical-theoretical entry point into digital pedagogies, MAR-based learning design, and teacher agency.
- **Master's and PhD Students in Educational Technology or Language Education**: looking for research frameworks, field-based insights, and methodological tools to investigate emerging technologies in context.
- **Educators in General**: interested in the postdigital dynamics of integrating mobile and immersive technologies into real-world educational settings.

- **Learning Designers and Instructional Developers**: aiming to create situated, learner-centred MAR experiences grounded in real teacher practices and needs.
- **MAR Platform Designers and Developers**: gaining access to teachers' perspectives, design priorities, and pain points to inform more responsive and sustainable tool development.

Whether you are preparing to teach with MAR, designing professional development, or conducting research on the intersection of pedagogy and technology, this book offers you both critical orientation and practical guidance.

The book is organised into three interconnected parts, each combining theoretical grounding, empirical insight, and practical guidance to support the meaningful integration of MAR into pedagogical practice. Each part plays a distinct role in guiding the reader from conceptual understanding to classroom application.

Part I – Foundations

This first part provides the conceptual and pedagogical grounding for the book. It introduces the postdigital education landscape, the theory of 'Entangled Pedagogy', and the significance of teachers' values, beliefs, and agency in integrating educational technologies. MAR is presented not as a neutral tool, but as a situated and relational pedagogical medium.

Structure and Purpose:

- Key theoretical lenses (e.g., postdigital education, teacher agency, tinkering).
- A contextual focus on Italian language teaching and the Argentinian school system. The book examines Italian language teaching in Argentina for two main reasons. First, Argentina represents one of the most prominent global contexts for Italian language learning, given the deep historical and cultural ties between the two nations. Second, the Country's infrastructural and teacher-training constraints provide a valuable lens for assessing the feasibility of Mobile Augmented Reality (MAR) in resource-limited educational environments.

- These two contexts were chosen for two main reasons which are discussed throughout the book. On the one hand, Argentina is nowadays one of the main markets in the entire world for the Italian language teaching and learning, since the history of the Country and its cultural identity is strictly connected to the Italian history. Argentina is, therefore, a significant context to observe when conducting studies on Italian language teaching. On the other hand, the infrastructural and training challenges of the Country shed light on the feasibility of MAR in less resourced settings, making Argentina a very significant case study.
- Boxed definitions to clarify core concepts (e.g., 'Entangled Pedagogy', 'Tinkering').
- Reflective questions at the end of each chapter to foster critical engagement.

Part II – Teachers at the Centre: A Case Study

This section presents the empirical core of the book, based on a field study with Italian language teachers experimenting with MAR. It explores how teachers interpret, adapt, and 'tinker' with MAR tools in real classroom contexts.

Structure and Purpose:

- Narratives of teacher experiences across four phases: pre-design, design, implementation, and reflection.
- Exploration of tensions between beliefs, constraints, and innovation.
- Identification of cross-cutting themes such as design tensions, teacher growth, and values in action.
- Reflective prompts after each chapter to deepen practice-based insight.
- Use of teachers' voices and real examples that situate theory in practice.

Part III – Guidelines for Practice and Future Directions

This final part translates the empirical findings into actionable knowledge for both teachers and learning designers. It offers a suite of resources and tools to support the integration of MAR in situated, flexible, and pedagogically aligned ways.

Structure and Purpose:

- Practical guidelines for both teachers and platform designers.
- Three MAR-based lesson plans for language teaching.
- Micro-scenarios illustrating contextual challenges and creative responses.
- A table of common pitfalls and adaptive strategies for 'tinkering through' difficulties.
- A platform selection checklist to help teachers choose appropriate MAR tools.
- A Reflective Practice Worksheet to align design with professional values.
- A final chapter on conclusions and future research pathways, tying together empirical and theoretical contributions.

Pedagogical Features which you will find Across the Book

- Boxes throughout the text highlight key concepts, theories, and definitions for easy access and review.
- Reflective questions at the end of each chapter prompt readers to connect the content to their own teaching contexts and beliefs.
- Practical tools and templates are provided in Part III to support real-world experimentation and sustained reflection.
- Tables and diagrams clarify processes and frameworks (e.g., the 'Entangled Pedagogy' model, teacher development pathways).

How to Use This Book

Whether you are a language teacher, teacher educator, learning designer, or researcher, this book is designed to be modular and flexible. You may read it linearly or go directly to the section most relevant to your needs. Theoretical chapters provide conceptual clarity; empirical ones offer grounded narratives; and the final section equips you with practical tools and ideas to apply in your own classroom or project.

PART I
FOUNDATIONS

CHAPTER 1

Teaching, Learning, and Educational Technologies in the Postdigital Era

The 21st century is witnessing one of the most profound educational transformations in history—one unfolding not merely through the introduction of new tools, but through the radical reshaping of the ecosystems in which we learn, teach, and interact. While technologies have always accompanied human lives—from the first written documents (Bates, 2019) to blackboards, textbooks, and computers—the crucial difference today lies in the unprecedented pace of technological development and the far-reaching consequences it generates across every dimension of society (Rahm & Rahm-Skågeby, 2023).

Brand-new Information and Communication Technologies (ICTs) continuously emerge: robotics, Virtual and Augmented Reality (VR/AR), Generative AI, wearable devices, often with short life spans, quickly replaced or integrated by subsequent innovations (Bates, 2019). These rapid transformations are not neutral: they influence economic and political systems, social relations, and profoundly affect how we communicate, acquire knowledge, and redefine education itself (Castañeda & Selwyn, 2018).

As a result, educational systems —many still rooted in models designed for industrial-age societies —struggle to adapt to these dynamic and unstable conditions (Fawns, 2022; Prendes Espinosa, 2018). The Covid-19 pandemic dramatically accelerated this digital shift, forcing policymakers, educators, and learners to adapt to fully virtual ecosystems almost overnight (Eradze et al., 2021), while also exposing deeper inequalities in access, infrastructure, and preparedness (Castañeda et al., 2020).

Recovery efforts, such as the *Next Generation Europe plan*[1], continue to promote the digitalisation of educational ecosystems, embedding technology more deeply into the core of teaching and learning. At the same time, this digital acceleration coexists with global challenges such as climate change, mass migration, economic disparity, and cultural divides—raising urgent questions such as:

How can we ensure that technology serves democratic, inclusive, and sustainable educational goals? What is, today, the real nature and role of educational technology?

These complex questions cannot be answered through simplistic or deterministic frameworks that see technology as either the inevitable solution or the unavoidable problem. Instead, this book adopts a *postdigital and 'entangled pedagogy'* perspective, where technology and pedagogy are understood as mutually shaping forces embedded within wider sociomaterial systems. Within this context, we focus on one emerging technology in particular—*Mobile Augmented Reality (MAR)*—to explore how teachers, operating in real classrooms, navigate the affordances, constraints, and pedagogical possibilities of technological innovation.

1.1 Understanding Postdigital Education and 'Entangled Pedagogy'

In many mainstream discourses, digital technology in education is still often presented either as an external 'add-on' or as a neutral tool supporting pre-existing pedagogies. The postdigital perspective decisively rejects these simplifications. In a postdigital era, digital technologies are no longer perceived as a discrete or separate layer within education. Rather, they are deeply and permanently entangled in the sociomaterial, cultural, and institutional fabric of educational systems (Jandrić et al., 2018, 2023; Fawns, 2022; Lamb et al., 2021). Postdigital scholars emphasise that education today unfolds within complex configurations where the digital, the social, the biological, and the material are inseparably intertwined. Learning environments are no longer simple physi-

1. The Next Generation Europe plan, officially known as *NextGenerationEU*, is the European Union's recovery instrument launched in 2021 to support member states in rebuilding from the COVID-19 crisis through investments in green and digital transformation

cal spaces or virtual platforms, but rather assemblages—dynamic networks of human and non-human actors that include students, teachers, technologies, devices, infrastructures, policies, cultures, values, and histories (Lamb et al., 2021).

This sociomaterial ontology shifts educational analysis away from linear, deterministic models toward a relational understanding of how learning and teaching emerge within complex systems. Instead of asking whether technology drives learning or merely supports pedagogy, postdigital research asks how technologies, pedagogical designs, cultural practices, and institutional structures co-shape each other over time (Fawns et al., 2021; Jandrić et al., 2023).

At the heart of this book's pedagogical foundation lies 'Entangled Pedagogy' (Fawns, 2022), which offers a highly valuable lens to understand and navigate these complexities. 'Entangled Pedagogy' rejects both technological determinism (the view that technology drives educational change) and pedagogical determinism (the view that pedagogy alone governs outcomes with technology as a neutral tool). Instead, it highlights that pedagogy is dynamically constituted through interactions among multiple interdependent dimensions. As Fawns (2022, p. 13) states:

'Education is not simply influenced by technology; it is with technology, as part of complex and situated sociomaterial systems'.

Through this lens, educational practice is no longer reducible to simple cause-and-effect chains. Instead, learning outcomes emerge from the ongoing negotiation of intentions, constraints, affordances, and contingencies across many interacting dimensions.

The Five Entangled Dimensions

To unpack this complexity, Fawns (2022) identifies five key dimensions that always interact within 'entangled pedagogy':

1. Technology

Technology is not understood as isolated devices or platforms, but as networks of tools, systems, and practices embedded in specific cultural, infrastructural, and institutional settings (Dron, 2022; Bardone et al., 2023). Technology does not exist 'before' its use; its meaning is always shaped by the specific educational activity in which it is embedded.

2. Teaching Methods

Pedagogical methods are themselves a form of technology, materialising specific ideas about how learning happens. Methods are not neutral; they convey implicit values and assumptions about learners, knowledge, and power (Biesta et al., 2015; Dron, 2022).

3. Purposes

Purposes refer to the goals, intentions, and aspirations guiding both teachers and institutions. While teachers may design tasks to foster language proficiency or cultural awareness, institutions may pursue other priorities such as accreditation, visibility, or funding (Fawns, 2022).

4. Values

Values represent the beliefs, ethical commitments, and educational ideals that educators bring into their practice (Biesta et al., 2015; Lee, 2021; Dron, 2022). These influence decisions at every level: curriculum design, technology selection, assessment choices, and classroom interactions.

5. Context

Context encompasses all the material, cultural, social, and institutional conditions that shape educational activity. It includes not only the availability of resources (devices, infrastructure) but also students' backgrounds, policies, economic inequalities, and historical legacies (Goodyear & Carvalho, 2019). It is crucial to underline that context is never static or fully knowable in advance. It emerges and transforms through educational practice itself (Fawns, 2022).

Box 1.1 — Key Concept
Postdigital & 'Entangled Pedagogy'

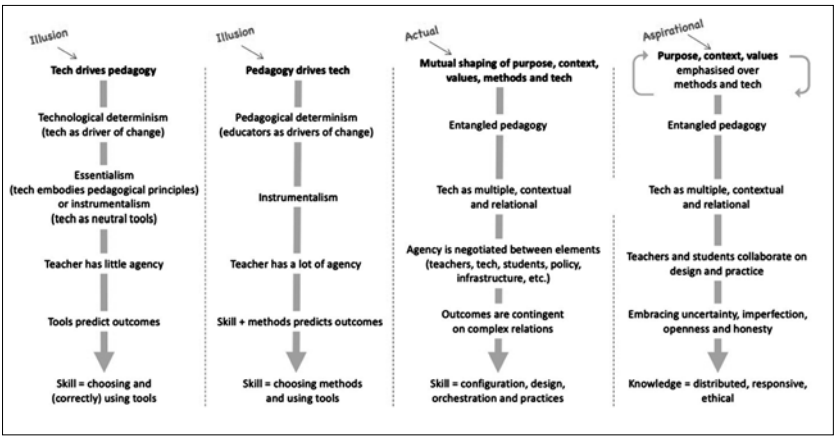
- Technology and pedagogy are **mutually constituted**.
- Learning outcomes emerge from **complex**, **situated interactions**.
- Teachers, students, technologies, and institutions **co-shape educational practice**.
- Purposes and values guide design choices but are always **negotiated in context**.
- Educational activity is **emergent and relational**, not linear or fully predictable.

An Aspirational Model for Teachers

The aspirational view of 'entangled pedagogy' proposed by Fawns (2022) encourages teachers and institutions to collaboratively revisit and negotiate purposes, values, and contexts as part of an ongoing design dialogue. This requires embracing uncertainty, reflection, and professional agency, while recognising that no single element fully determines educational outcomes. In such a framework, educational design becomes a collective and adaptive process in which both teachers and learners participate in shaping their learning environments. This approach foregrounds teachers' professional agency, while also acknowledging the influence of sociomaterial conditions, power dynamics, and institutional policies on everyday classroom practice (Lamb et al., 2021; Jandrić et al., 2023).

Such a model (see Fig. 1) is particularly valuable when introducing emerging technologies like MAR, which do not arrive in classrooms as neutral tools, but as complex social practices requiring teacher expertise, design thinking, and ethical reflection.

Figure 1. The 'Entangled Pedagogy' model proposed by Fawns, including the aspirational view (Fawns, 2022, p. 718)



In order to show how the model unfolds and how its five dimensions interweave in classroom practice, I will refer to my personal experience teaching Italian at a bilingual secondary school in Argentina. As mentioned in the introduction of this book, for an end-of-year project, my colleagues and I decided to explore Dante Alighieri's life and work through a multimodal approach using MAR. Our goal was to go beyond traditional methods and create an immersive, participatory learning experience.

Technology played a central role—not merely as a tool but as an enabler of a different kind of engagement. We used an open-source MAR platform that allowed students to geolocate MAR experiences around the school. The 'technology' was not just the app itself, but the whole system of practices, troubleshooting routines, mobile devices, connectivity, and digital literacy scaffolding that grew around it.

Our **teaching method** shifted from a frontal, teacher-led model to a more exploratory and multimodal one—though still entirely designed and implemented by us. Unlike many innovation scenarios where students co-create content, in our case challenge was precisely to develop meaningful and engaging materials ourselves, aligning the use of MAR with curricular goals, multimodal

resources, and differentiated needs. This placed a considerable creative and logistical load on teachers, especially in terms of planning, content adaptation, and technical preparation.

The **purpose** of this activity was not simply to teach literature. It aimed to cultivate creativity, critical digital literacies, and intercultural awareness, all within a collaborative framework. But institutional purposes also surfaced. The project was showcased as part of the school's innovation agenda, revealing tension between pedagogical goals and institutional visibility.

Values were constantly negotiated. While I valued inclusivity, multimodality, and co-agency, some of my colleagues prioritised discipline, clarity of outcomes, and curriculum coverage. The need to coordinate and compromise revealed how values are enacted, aligned, or contested in day-to-day pedagogical decisions.

Finally, **context** shaped everything: the socioeconomic background of students (affecting device access), time constraints, infrastructural limitations, and the cultural perceptions of educational innovation. The 'success' of the activity was not determined by the technology or the design alone, but by our continuous adaptation to these contextual forces.

This experience shows how educational practice, especially with new educational technologies is never linear or isolated. It is an ongoing negotiation between what we hope to achieve, what we are allowed to do, what is feasible in the moment, and what we believe education should be. It's this entanglement—of technologies, values, purposes, methods, and context—that this book seeks to illuminate and help teachers and practitioners to navigate.



In the framework of this book, 'Entangled Pedagogy' is not simply a theoretical reference — it is the foundational lens through which we analyse, understand, and support teachers' real-world experiences with MAR, as we will discover throughout the journey!

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Augmented Reality in the Classroom

Strategies for Language Teachers in a Postdigital Educational Landscape

This book explores how teachers navigate the promises and challenges of emerging technologies within real classrooms. Centred on Mobile Augmented Reality (MAR), it examines how digital innovation intersects with pedagogy, values, and teacher agency in a rapidly evolving educational world.

Drawing on the author's doctoral research and fieldwork with Italian language teachers in Argentina, the book bridges theory, empirical insight, and practice. It situates MAR within the framework of Entangled Pedagogy, offering a nuanced understanding of how technology, teaching methods, purposes, values, and contexts co-constitute learning. Far from treating MAR as a neutral tool, it explores how teachers *tinker* with technology, adapt to constraints, and design situated, meaningful experiences for their students.

The book is organised in three parts: the first outlines the postdigital foundations of education and the complex relationship between teachers and technology; the second presents teachers' lived experiences and reflections on integrating MAR; the third offers **practical guidelines, lesson plans, and reflective tools** for educators and designers.

Combining scholarly rigour with an accessible narrative, this volume speaks to teachers, researchers, and learning designers seeking to integrate innovation in thoughtful, context-sensitive ways. It invites readers to move beyond recipes and embrace reflection, creativity, and professional judgement, all key ingredients for navigating the future of language education in a postdigital age.

Martina Manna is a postdoctoral research fellow at the University of L'Aquila and an Italian as a second language teacher in primary and secondary schools. She lived in different countries worldwide, developing a background in foreign languages and extensive experience of teaching Italian in different international institutions. Her expertise is in linguistics, language didactics and education, with a focus on educational technologies and teacher agency. Other research interests concern intercultural and multilingual education, as well as the study of linguistic landscapes and of their implications for language education. For her postdoctoral research she is currently working on the implementation of Generative Artificial Intelligence and Large Language Models to improve pragmatic competence skills in sequential bilinguals children with special educational needs.



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