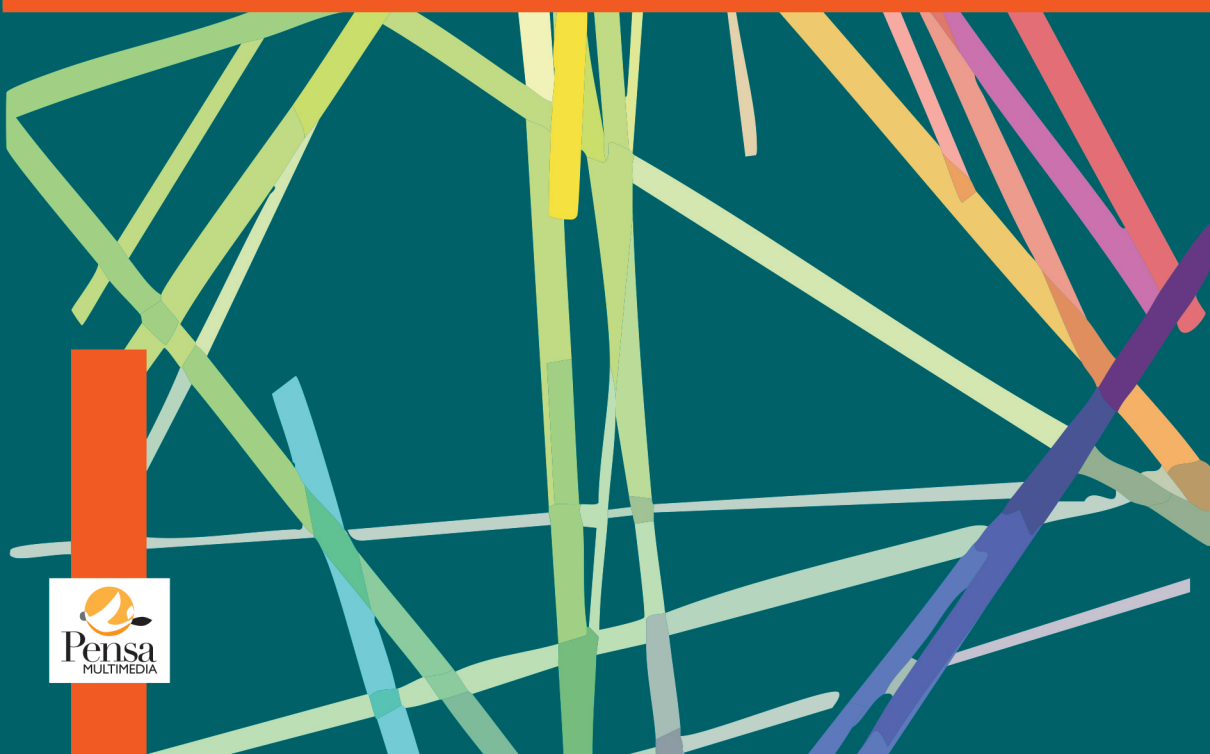
University, Teaching & Research

Impact Study on Pupils' Key Competences with eTwinning

Alexandra Tosi
[edited by]



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Jacopo Condò is a Research Fellow at the Italian eTwinning Unit (INDIRE). His work focuses on competence-based education, educational innovation, and evidence-informed evaluation of school interventions. In this volume, he contributed to the study's implementation and led the quantitative design, data collection workflow, and statistical analysis. His contribution to the volume is grounded in the conviction that eTwinning is a significant learning environment: it supports competence development in transparent, collaborative, relationally meaningful, and situated ways, making it an ideal ecosystem for studying and strengthening the pedagogical dynamics that sustain it.

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Foreword I

Deirdre Hodson
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I am pleased to introduce this impact study by the Italian National Support Organisation (NSO) INDIRE, on building competences through eTwinning. In my role as team lead of eTwinning at the European Commission, it is inspiring to see in this study how the commitment shown by educators enhances educational opportunities and enriches learning experiences for students.

Developing competences lies at the heart of meaningful education and is reflected in this year's eTwinning annual theme, *"Skills for life"*. In a world that continues to change at pace, it is essential that learners acquire skills that help them think critically, collaborate, adapt and participate in democratic life. Developing basic skills of maths, literacy, science, digital and citizenship is at the heart of our education policy work at the European Commission. By connecting countries to share and learn from each other's experience and funding projects, research, exchanges and many other actions through our Erasmus+ programme we strive to boost levels of basic skills, from early years right through to adulthood, enabling individuals to approach new challenges with confidence and resilience throughout their lifetime.

Since its launch in 2005, eTwinning has created countless opportunities for connection and cooperation among educators and pupils across Europe and beyond. Within this dynamic community, the development of foundational skills happens through project work, intercultural exchange, creativity and shared goals. It is this combination of collaboration and innovation that makes eTwinning such a powerful educational setting, and I am pleased to see once again that this has been confirmed by INDIRE's research work. As you explore its findings, I hope that you will be inspired

by the scope of eTwinning's contribution to educational practice: strengthening competences, encouraging innovation and connecting students and teachers across Europe and beyond.

I would like to express my sincere appreciation to INDIRE for leading and carrying out this study. Their expertise, dedication, and continuous work in both research and day-to-day support to eTwinning teachers play a vital role in ensuring that eTwinning remains a meaningful and accessible resource for schools.

I also extend thanks to all the teachers who volunteered to take part in this study and share their insights on competence development through eTwinning. Your willingness to contribute your time, experience and perspectives is invaluable. It is this commitment from educators that keeps the eTwinning community vibrant and ensures it continues to respond to the real needs of teachers and spark the curiosity of learners.

To all educators involved in eTwinning: Thank you for your continued engagement! Your openness, energy and dedication bring fresh perspectives into classrooms and help students develop skills that will serve them well beyond their school years. Together, you are helping to shape education systems that are open, forward-looking and rich in opportunity for every learner.

Foreword II

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Over the last two decades, the concept of "competence" has gradually become central to European and national educational discourse. However, this prominence has not always been matched by equal conceptual and methodological depth. All too often, competences have been treated as self-evident entities that can be measured in a linear fashion and reduced to lists of indicators or certification devices, which risks impoverishing their educational significance.

By offering a rigorous, nuanced and non-simplistic interpretation of competence on theoretical, empirical and evaluative levels, this volume deliberately challenges these trends.

A significant contribution of the work is its clear acknowledgement of the complex nature of competences. Rather than being reduced to simple 'transferable skills' or standardised outcomes, they are understood as multidimensional, dynamic and situated constructs that intertwine knowledge, skills, dispositions, metacognitive, relational and emotional dimensions. They only take shape in action and social recognition. This assumption runs through the chapters of the volume and constitutes its shared epistemological matrix.

From this perspective, competences are never considered in isolation from the learning contexts in which they manifest themselves. Constant attention to contexts – such as school, project, organisational and relational contexts – is one of the work's strongest elements. eTwinning is neither presented as a product to be marketed as "teaching innovation" nor analysed as a standardised 'intervention'. Rather, it emerges as a complex pedagogical environment characterised by heterogeneity, authentic project practices, and significant digital mediation. This interpretative approach avoids causal

simplifications and allows us to more effectively question the conditions that facilitate the development of competences.

A second defining feature of the volume concerns the way in which the issue of assessment is addressed. Competence assessment is not viewed as a mere technical operation or narrow measurement here. This work contrasts the crude and naïve inductivism that characterises many assessment practices with a vision of assessment as an interpretative practice based on explicit criteria, transparent processes and the intentional use of triangulation. Integrating learners' self-assessment, teachers' judgements and process analysis tools provides a multifaceted picture capable of capturing development trajectories and differences in perception and meaning.

The choice to adopt a construct of heuristic and communicative competence is particularly relevant in this sense. Rather than being interpreted as a quantitative increase, the transition from one level to another is seen as a transformation in the ways of acting, taking responsibility, transferring learning and participating in shared practices. This enables assessment to fulfil its authentic educational function. Rather than producing labels or classifications, it makes progress visible, supports reflection and guides improvement processes.

Another strength of the volume is its ability to combine plurality and consistency. This plurality concerns both the competences investigated and the theoretical sources and European reference frameworks utilised. Rather than simply applying existing frameworks mechanically, they are put into dialogue with each other, critically examined, and reset in a solid, operational conceptual architecture. Consistency, on the other hand, emerges from the consistent alignment of definitions, tools, and interpretations of results, which avoids the frequent discrepancies between declarative plans and actual practices in competences research.

Finally, this volume also makes a significant contribution to the cultural and political aspects of education. At a time when competences are at risk of being reduced to buzzwords that serve the purposes of reporting or instrumental adaptation, this work restores their educational significance, demonstrating their potential as a powerful lens through which to view student development in its entirety. The competencies that emerge from these pages are never disembodied; they speak of participation, responsibility, agency, openness to others and the ability to act in complex and uncertain situations.

The volume implicitly proposes an idea of school and assessment that

recognises the complexity of educational processes and rejects simplistic shortcuts. It invites us to consider competences not as a quick-fix solution, but as an area of research and practice requiring time, rigour, a variety of perspectives, and ongoing attention to the educational implications of our decisions. This invitation is more necessary than ever today for anyone who wants to approach the education, assessment and training of younger generations seriously.

Introduction

Alexandra Tosi

For years, those of us supporting the eTwinning community have listened to teachers share extraordinary stories of classroom transformation. We have extensively studied how these international projects enrich methodological repertoires, foster peer collaboration, and break the professional isolation that too often characterizes the teaching profession. Yet, whenever we listen closely to an educator recounting their eTwinning experience, the true protagonist of their story is never a digital tool or a pedagogical framework: it is always a student.

Until now, our knowledge of these learners has been mostly indirect. They reach us by reflection, through the gaze and the words of their teachers. We glimpse their progress in the traces that projects leave behind – a shared digital artefact, a screenshot of a videoconference, or the honest, sometimes messy documentation that accompanies real, everyday teaching. In these traces, we repeatedly encounter profound transformations that risk remaining invisible in ordinary school routines: the dip in motivation when a partner suddenly disappears, and the surge of energy the day before an international exchange; the student who usually drifts away but suddenly becomes central because they can coordinate a task, edit a video, or mediate a disagreement.

We meet them in small, quiet victories: a timid voice that finally takes the floor; a newcomer who gains confidence because a different linguistic resource becomes an asset; a learner with a disability whose contribution becomes essential to the group; a "difficult" class that finds dignity and pride in producing something worth showing beyond their classroom walls.

"I was proud of some students who often struggle, because they showed creativity, organisational skills, tenacity, and care when the work became real." (Teacher logbook, anonymised)

These scenes are deeply familiar to anyone inside the eTwinning community. We know that this methodology works. But knowing it in our hearts – and seeing it in our classrooms – is no longer enough. The challenge, and the driving reason for this volume, is turning that familiar, experiential knowledge into robust evidence that can travel beyond the circle of those who already believe in it.

Building on this trajectory, the present volume deliberately shifts the analytical lens directly onto the students. We set out to answer a question that has become increasingly central – and urgent – in European education policy and school systems across our continent: whether, and to what extent, participation in structured collaborative projects like eTwinning can contribute to students' development of Key Competences for Lifelong Learning.

This question is not just an academic exercise. It responds to two interconnected needs. The first is evidential: we need to go beyond positive perceptions and test, as rigorously as possible in the complex reality of real school conditions, whether student competences measurably change. The second need is deeply strategic and, I would say, human: we want to give teachers and schools a stronger, evidence-based language to recognise, defend, and value their competence-oriented work in dialogue with school leaders and institutions. In this sense, this research is ultimately a form of recognition. It aims to make visible, and scientifically valid, what so many dedicated teachers already build, often quietly and with immense effort, in the daily complexity of classroom life.

A major obstacle to competence impact research is that transversal competences are multidimensional and context-dependent. Measuring them requires careful operationalisation and instruments that are both theoretically grounded and feasible for school use. For this study, the research team developed a dedicated measurement system grounded in existing European competence frameworks: student self-assessment questionnaires based on closed-ended Likert items and teacher assessments based on analytic rubrics, complemented by qualitative sources including open-ended student responses and teacher logbooks. The decision to build instruments from scratch was not a purely technical choice: it was necessary precisely because ready-to-use tools for this purpose were largely unavailable, and because we wanted the outputs of this work to be reusable and comparable beyond a single national context, while remaining aligned with European competence frameworks.

A contextual note concerns the evolution of the European digital

competence framework. When this study was designed and the instruments were finalised, DigComp 3.0 had not yet been released; for this reason, the digital competence measures were aligned to DigComp 2.2. The subsequent publication of DigComp 3.0 does not undermine this choice, since the updated framework retains DigComp's core conceptual architecture while mainly revising and reorganising some specific competence descriptors and summarising progression into four broader proficiency levels rather than eight. In the present study, this difference does not affect the validity or interpretation of results because all comparisons are conducted within a single coherent measurement system (pre–post change within students and between-group contrasts), and the main reporting is anchored at competence-area and key-competence level rather than at the finest descriptor level. If anything, the eight-level proficiency scale adopted here provides a more fine-grained scale, making it possible to capture smaller shifts and nuances in proficiency that would be partly compressed when using four broader bands.

On this basis, the study focuses on students aged 14-16 and examines five competences from the European framework: Personal, Social and Learning to Learn; Cultural awareness and expression, Citizenship; Entrepreneurship; and Digital competence. The design adopts a quasi-experimental approach, comparing matched eTwinning and non-eTwinning classes through pre-post measures and triangulating quantitative and qualitative evidence.

The analytical strategy is explicitly mixed-methods and triangulated. Quantitative evidence is derived from student self-assessment questionnaires and teacher rubrics; qualitative evidence comes from open responses and from monthly teacher logbooks documenting project activities, observations, and contextual factors. This triangulation is important because competence development is not only an outcome but also a process: the numbers show patterns of change, while the narratives help interpret what in classroom life may have made that change possible, or difficult.

Because this work is anchored in real school conditions, it also surfaces practical constraints that are central for future sustainability and scale. The workload required by rigorous pre-post measurement is substantial, and in practice only a subset of participating class contexts could complete all components consistently. This is not a weakness to be hidden, but a lesson to be used: if competence-oriented tools are to be adopted beyond motivated pioneers, they must be simplified and their use must become a

shared responsibility within schools, supported by leadership and collegial routines, rather than carried by individual teachers alone.

"I am satisfied with the results, even if the tiredness is starting to be felt. If someone asked me to start again from scratch, I might hesitate, but I already know that next year I will be ready to step back in".

Against this backdrop, the findings provide a clear answer to the guiding question of this volume: participation in eTwinning projects does support the development of key competences, with effects that are stronger and more consistent in contexts characterised by higher project quality and more coherent implementation conditions. The evidence also reinforces a practical message that matters for dissemination: for those already inside the community, it strengthens confidence in the direction taken; for those outside, it suggests that eTwinning can act as a scaffold for competence-oriented innovation, helping translate competence aims into authentic tasks and meaningful products, and making learning more meaningful for students.

The publication is articulated into six chapters. Chapter 1 introduces the rationale for studying eTwinning in relation to key competences, reviews the state of evidence, and clarifies the added value of the present study design. Chapter 2 presents the conceptual and methodological framework, including the mapping model, the measurement instruments, and the quasi-experimental architecture. Chapter 3 portrays eTwinning projects as pedagogical cases, using Quality Label applications and evaluations to show how design, participation and constraints shaped implementation across contexts. Chapter 4 presents the main quantitative findings at the aggregated level, discussing competence-specific patterns and robustness checks. Chapter 5 offers a complementary cross-case triangulation across contexts, connecting outcome patterns to project quality and implementation conditions. Chapter 6 synthesises conclusions and translates them into key messages for different stakeholders, outlining implications for practice, support strategies, and future research.

Taken together, the chapters aim to support both understanding and action: they provide evidence on outcomes, but also a clearer picture of the pedagogical and organisational conditions that can enable competence development through eTwinning. In this sense, evidence matters not only to confirm what many educators within the community have long experienced, but to make that knowledge sharable and actionable beyond the circle of those who already believe in it, across schools, leadership teams, and the wider educational ecosystem.

The volume therefore closes by distilling the findings into one clear key message for each stakeholder group, pointing to concrete next steps for strengthening competence-oriented practice and support. While this work is not addressed directly to learners, it keeps students in view as the ultimate beneficiaries of educational innovation: in a time of global uncertainty, and of growing pressure on the school's social mandate, the evidence gathered here is intended to help schools and teachers create learning experiences that can restore meaning, agency, and motivation, and make competence development tangible rather than an abstract promise.

To ensure readability, the full collection of tables, graphs, and supporting materials is too extensive to be included in the printed volume and is therefore made available online through a dedicated repository accessible via QR code.

https://etwinning.indire.it/ricerca/etwinning-e-lo-sviluppo-delle-competenze-degli-alunni/

Chapter 1
eTwinning and Key Competences: Theoretical Framework and Research Design

Alexandra Tosi
Maria Chiara Pettenati
Elena Bettini
Jacopo Condò
Sara Martinelli

1.1 Introduction

Across Europe, competence frameworks have been widely embedded in national curricula and policy steering, reflecting a gradual shift – at least in principle – toward competence and skills-oriented teaching (European Commission/EACEA/Eurydice, 2012; European Parliament & Council of the European Union, 2006; Council of the European Union, 2018). At the same time, the translation of these frameworks into everyday classroom practice remains uneven across countries, and assessment represents one of the most critical and challenging areas, particularly when attention shifts from subject-based attainment to transversal key competences (European Commission/EACEA/Eurydice, 2012; Siarova et al., 2017). Eurydice (2012) links this gap to the concrete demands of competence-based curricula: transversal goals are often framed as cross-curricular, requiring systematic teacher collaboration across subjects, shared planning, and aligned criteria, supported by targeted initial/in-service training and enabling organisational conditions such as time and structures for collegial work. More recently, this picture is complemented by European Commission/EACEA/ Eurydice's 2023 monitoring of key "horizontal enablers" of competence development – most notably cross-curricular learning and active student participation – together with policy supports and quality-assurance mechanisms that can sustain these approaches[1]. In

1 Eurydice has also produced a series of comparative thematic reviews that describe how

light of these challenges, learning environments that structurally embed collaboration, cross-curricular work and digital mediation offer a particularly informative setting for examining how competence-oriented ambitions may be enacted under authentic school conditions.

Within this landscape, eTwinning constitutes a significant educational context for systematic investigation. As a long-standing European initiative, it operationalises cross-border collaboration, digital mediation, and project-based learning as structural components of the learning environment rather than occasional enhancements.

This chapter has two main objectives. First, it introduces the conceptual rationale for studying eTwinning as a context conducive to key-competence development and summarises the state of evidence from the literature, including its recurring limitations. Second, it introduces the logic of the present impact study and clarifies its added methodological value, outlining the quasi-experimental architecture (matched experimental and control classes), the pre-post measurement strategy, and the mixed-methods triangulation (student self-assessment, teacher assessment, and teacher logbooks) designed to strengthen interpretability under authentic school conditions. It also anticipates how the study operationalises the five targeted competences through structured, reusable assessment instruments that combine framework-informed rubrics with standardised test components. For digital competence, the rubrics draw directly on DigComp, while for the other competences competence-specific grids were developed through cross-mapping of existing European frameworks. This approach improves transparency, comparability, and the potential for replication and reuse in future research and evaluation.

1.2 From European key competences to the Italian educational framework

The notion of Key Competences for Lifelong Learning has progressively become a central reference point for European education systems, following a policy trajectory that has unfolded over more than two decades. At European level, the first formal articulation of key competences dates back

selected transversal priorities linked to key competences (e.g., sustainability, entrepreneurship, digital education) are addressed in national curricula and policy frameworks across European education systems.

to the Recommendation of the European Parliament and of the Council of 18 December 2006, which identified a set of transversal competences deemed essential for personal fulfilment, active citizenship, social inclusion and employability. This framework was subsequently updated and expanded in the Council Recommendation of 22 May 2018**,** which refined the conceptualisation of competences, strengthened their connection to lifelong learning, and explicitly addressed emerging societal challenges such as digitalisation, globalisation and sustainability.

While the European policy framework has remained remarkably consistent in its emphasis on competences as a guiding principle for education systems, its translation into national curricula and regulatory documents has followed diverse trajectories across Member States. In this respect, the Italian case is characterised by a gradual, indirect and at times fragmented integration of the European competence-based paradigm (see Fig. 1.1).

In the Italian education system, references to competences began to appear relatively early, particularly in connection with the fulfilment of compulsory education and with broader debates on learning outcomes. In fact, Law 296/2006 and Ministerial Decree 139/2007 established 10 years of compulsory education based on four cultural areas, aimed at promoting personal and social development, combating school dropout, and laying the foundations for key competences and lifelong learning, while ensuring the coherence of acquired knowledge and skills and the educational equivalence of all pathways, in respect of the identity of the educational offer and the objectives of the different types and levels of study. Key milestones include Ministerial Decree No. 139 of 22 August 2007, which for the first time defined both the "basic competences" at the end of compulsory schooling and the citizenship key competences to be acquired by students, and Ministerial Decree No. 9 of 27 January 2010, which introduced a national model for the certification of competences at the end of compulsory education (age 16), based on cultural areas (languages, mathematics, scientific-technological, historical-social) and levels (basic, intermediate, advanced). These early instruments, however, were primarily focused on minimum learning standards rather than on a comprehensive competence-oriented vision of education.

A more explicit engagement with competences emerged in the following decade, especially through reforms related to assessment and certification. In this context, the Legislative Decree No. 62 of 13 April 2017 (Rules on assessment and certification of competences in the first cycle and state

exams) reforms the evaluation and certification of learning for primary and lower secondary students and regulates the first-cycle final exam, emphasizing the formative role of assessment and the transparency of learning outcomes. It also introduced competence certification at the end of the first cycle of education, which was subsequently operationalized through Ministerial Decree No. 742/2017. Meanwhile, transversal initiatives such as Civic Education (Law No. 92/2019) and the Guidelines for Pathways for Transversal Skills and Orientation (PCTO), issued by Decree No. 774 of 4 September 2019, frame national policies around transversal competences, orientation, and life skills. They adopt a competence-based approach that connects school learning to real-world experiences and fosters active citizenship, problem-solving, collaboration, and personal initiative. Nevertheless, these developments remained sectoral and instrument-specific, resulting in the coexistence of multiple certification models and heterogeneous approaches across educational levels and pathways.

Against this background, the Council Recommendation of 2018 represented a renewed and more demanding European reference point, addressing the need to update key competences in response to economic, social, and technological changes, while promoting active citizenship, inclusion, and lifelong learning. Although it was not immediately transposed into a single, unified national framework, the Recommendation's influence progressively permeated the Italian policy debate, particularly regarding orientation, lifelong learning, and the recognition of transversal competences.

In the same year as the European Recommendation, the Italian Ministry of Education released the document "Le Indicazioni Nazionali e Nuovi Scenari"[2] for the curriculum of early childhood and first-cycle education, introducing a competence-based, integrated, inclusive approach focused on the overall development of students, with particular attention to orientation, citizenship, sustainability, digital, and transversal competences.

This process became clearer with the adoption of the Guidelines for Orientation (Ministerial Decree No. 328/2022), which explicitly frame orientation as a competence-based process. These guidelines – resulting from a long-standing reflection in Italy on the theme of orientation – link

2 Document prepared by the National Scientific Committee for the National Guidelines for the Curriculum of Early Childhood and First Cycle Education. https://-www.mim.gov.it/documents/20182/0/Indicazioni+nazionali+e+nuovi+scenari/

the development of competences to students' ability to define and redefine personal and professional goals, construct a life project, and make informed and autonomous choices throughout their educational pathways, beginning in early childhood education and continuing within a framework of lifelong orientation.

A decisive step towards the formal alignment with the European framework was taken with the adoption of Ministerial Decree No. 14 of 30 January 2024, which introduced a new, harmonised set of national models for the certification of competences. For the first time, the decree explicitly identifies the European Key Competences for Lifelong Learning (2018) as the common reference framework underpinning all certification models across the Italian education system, including primary education, lower secondary education, compulsory schooling within upper secondary education, and adult education pathways. Rather than replacing existing instruments, the decree aims to reconcile and harmonise previously fragmented models, while recognising the structural diversity of the Italian second cycle of education.

Importantly, the DM 14/2024 reinforces the orientative function of competence certification, particularly during key transition phases between educational cycles. In doing so, it aligns with broader European policy orientations that emphasise competences as a tool for supporting learning pathways, mobility and lifelong development, as reflected in initiatives such as Europass and the European Qualifications Framework (EQF). At the same time, the detailed analytical descriptions of competences included in the annexes of the decree highlight an ongoing tension between normative clarity and operational complexity, especially with regard to assessment practices.

Overall, the Italian trajectory illustrates how European Key Competences have entered national educational policy through a progressive layering of regulatory instruments, rather than through the immediate adoption of a single, coherent national competence framework. While recent reforms mark a significant step towards alignment with European references, challenges remain in translating competence-oriented policies into consistent curricular practices and robust assessment models. It is within this evolving policy and regulatory landscape that innovative educational experiences, such as eTwinning projects, acquire particular relevance as contexts for the enactment and observation of key-competence development in authentic learning environments.

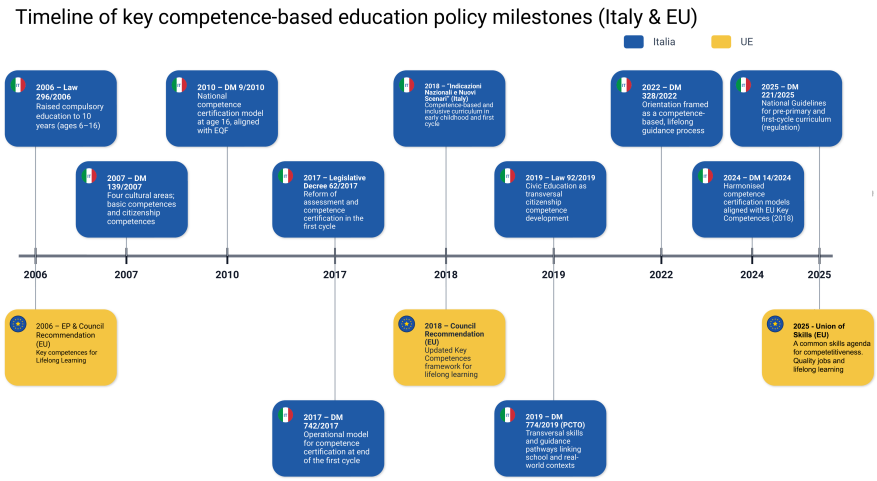


Fig. 1.1 – Policy timeline (Italy & EU)

Timeline illustrating the gradual adoption of the European competence-based paradigm into the Italian education system (2006-2024). The figure highlights the coexistence of sectoral reforms and fragmented instruments over time, followed by a recent move towards system-level harmonisation explicitly aligned with the European Key Competences framework.

1.3 eTwinning as a pedagogical and learning environment for competence development

eTwinning is a long-standing European initiative designed to support cross-border collaboration between schools through digitally mediated projects. Since its launch in 2005, eTwinning has progressively expanded in scale and scope, involving several hundred thousand teachers and millions of pupils across Europe and beyond. Rather than constituting a standardised curriculum or a prescriptive instructional model, eTwinning operates as a flexible pedagogical environment, within which teachers autonomously design and implement collaborative projects embedded in ordinary school curricula.

From a pedagogical perspective, eTwinning can be described as a project-based, technology-enhanced learning context, structured around international collaboration, sustained interaction through digital platforms,

and the co-production of shared outputs. Studies commissioned by the European Commission consistently highlight that eTwinning projects are characterised by authentic tasks, learner-centred pedagogies, and a strong emphasis on collaboration and communication, both within and across classrooms (European Commission, 2013; European Commission, 2016). These features align closely with educational approaches commonly associated with competence-oriented learning, particularly with regard to transversal, social, and intercultural dimensions.

At the organisational level, eTwinning provides a digital infrastructure that supports communication, collaboration, and the documentation of learning processes, while leaving substantial pedagogical autonomy to teachers. Operationally, this infrastructure is complemented by ongoing support and professional learning opportunities coordinated by the eTwinning NSO and sustained through a dense network of eTwinning Ambassadors – experienced teachers selected to provide training, mentoring, and localised guidance to schools and colleagues. Teachers' autonomy within the eTwinning context is repeatedly identified in institutional reports as a defining feature, enabling them to adapt projects to local curricular requirements, student characteristics, and school contexts (European Commission, 2013b). At the same time, this flexibility results in a high degree of heterogeneity across projects in terms of duration, intensity, disciplinary focus, and pedagogical design, making eTwinning a non-uniform intervention (Jauregi et al., 2015).

eTwinning does not prescribe specific competence targets or assessment models. Instead, competence development is an emergent property of participation in project activity, mediated by task design, teacher guidance, and contextual factors. This means that the same structural features – international collaboration, digital mediation, and project-based work – can give rise to different learning trajectories depending on how projects are designed and implemented.

As a result, eTwinning should be conceptualised not as a homogeneous intervention, but as a pedagogical space in which competence development is not only plausible but fostered, even if not automatically. A partial way to address this heterogeneity is offered by the eTwinning Quality Label mechanism, which functions as a shared European quality reference. Projects are evaluated – following teachers' voluntary submission for recognition – against five common criteria: collaboration between partner schools, use of technology, pedagogical approaches, curricular integration, and results/documentation. Taken together, these criteria

define minimum standards for what can be considered a "quality" eTwinning project, regardless of differences in duration, intensity, thematic focus, or disciplinary domain. Building on this, the European Quality Label can be interpreted as a stronger quality framework, as it is awarded to projects that receive highly positive evaluations across more than one participating country, indicating not only that minimum standards are met but that the project is recognised as exemplary by multiple national evaluation processes.

Over more than two decades, eTwinning has been the object of systematic institutional monitoring and evaluation commissioned at European level. Alongside evidence-oriented monitoring and evaluation reports, eTwinning also produces thematic annual books that curate and comment on selected good practices; these volumes are valuable for documenting pedagogical approaches and practitioner perspectives, but they naturally tend to foreground the positive aspects reported by participating teachers[3].

Overall, the institutional evidence base has so far focused more consistently on teachers' professional learning and practice than on directly measured student outcomes. Large-scale monitoring based primarily on teacher surveys repeatedly documents perceived changes in teaching practice and professional development (e.g., greater use of project-based, collaborative and cross-curricular approaches), suggesting plausible downstream benefits for learners that are nonetheless indirect and harder to attribute in the short term (Kearney & Gras-Velázquez, 2015, 2017; Pateraki, 2018; Gilleran, 2019). Student-related outcomes are correspondingly reported mainly through teachers' perceptions – most often in terms of enhanced motivation, engagement and collaborative dispositions – rather than through standardised competence measures (Kearney & Gras-Velázquez, 2017; Gilleran, 2019).

Direct institutional evidence on pupils is comparatively limited. An important institutional reference point remains the European impact study, which combined multiple sources of evidence (a literature and document review, cross-country school case studies – including interviews with

3 A consolidated list of eTwinning publications is available on the European School Education Platform, with a dedicated catalogue for titles published between 2006-2019 and an updated list for publications since 2020: https://school-education.ec.europa.eu/en/discover/publications/etwinning-publications-2006-2019; https://school-education.ec.europa.eu/en/discover/publications/etwinning-publications

participating pupils – and a large survey of registered eTwinners), indicating that learner-related benefits have been an explicit object of evaluation and not only a pedagogical aspiration. At the same time, this study is explicit about the methodological constraints typical of "light-touch" voluntary actions – most notably the reliance on self-reports and the limited availability of baseline measures, control groups and standardised assessment tools (European Commission, Directorate-General for Education, Youth, Sport and Culture, 2013b).

A core issue in interpreting eTwinning within competence-oriented education is therefore the need to separate two levels of evidence: (a) the pedagogical potential suggested by programme features and project designs, and (b) robust evidence demonstrating measurable competence gains that can be credibly attributed to participation. eTwinning brings together learning features aligned with contemporary competence frameworks – collaboration, meaningful use of digital tools and intercultural exchange – at an unusually large scale for a school-based international initiative. Yet, as the institutional evidence itself recognises, these features alone are not sufficient to substantiate strong causal claims about students' competence development (European Commission, Directorate-General for Education, Youth, Sport and Culture, 2013; Gilleran, 2019).

1.4 Italian National Support Organisation (NSO) pilot on competences and assessment 2016

Within the framework of the changes introduced by the National Guidelines and related curricular provisions which, from the mid-2000s and with renewed emphasis in the following decade, had consolidated in Italy an orientation towards competence-based teaching, many eTwinning teachers had reported persistent difficulties in translating competence-based approaches into routine classroom practice and in implementing coherent procedures for competence assessment. In response to these needs, and given the limits of perception-based evidence in this area, the eTwinning NSO in Italy launched in 2016 a targeted initiative aimed at understanding and supporting the potential contribution of eTwinning to the development and assessment of students' competences. The programme had pursued a dual purpose: it had sought, on the one hand, to collect descriptive evidence on teachers' perceptions and practices in relation to competence-based teaching within eTwinning projects and, on the other,

to design and field-test tools intended to facilitate observation and assessment in collaborative, project-based learning contexts.

The initiative had developed through structured dialogue with the eTwinning professional community, with the involvement of a task force of experienced teachers and eTwinning Ambassadors[4]. At that stage, assessment had emerged not only as a technical requirement, but also as a cultural and organisational issue: the perceived educational richness of eTwinning projects coexisted with the difficulty of making learning outcomes legible and recognisable within shared assessment practices compatible with ordinary schooling. The focus had therefore shifted from generic claims about competence development to the identification of reference points and criteria enabling more systematic observation, more robust justification of judgement, and more coherent documentation of learning outcomes associated with typical eTwinning activities.

A central component of this work had consisted in administering a questionnaire addressed to eTwinning teachers, which had collected over two thousand responses. The survey had indicated a strong perceived alignment between eTwinning project work and competence-oriented pedagogy, with teachers frequently associating participation with learner-centred approaches, collaboration, project-based work, and meaningful uses of digital technologies. These elements had been interpreted as conditions plausibly supportive of transversal competences, including communicative, social, and intercultural dimensions, alongside domain-specific competences depending on curricular integration.

At the same time, the findings had highlighted a persistent gap between positive appraisals of eTwinning's educational potential and the extent to which this potential had been translated into systematic assessment and, especially, certification practices. Many teachers had reported limited experience in using structured procedures to assess competences developed in relation to eTwinning activities. This gap had been understood as reflecting practical constraints: in the absence of shared instruments,

4 The authors of the 2019 final report were Tiziana Cippitelli, Marina Marino, Cinzia Masia, Silvia Minardi, Francesca Minaudo, and Vittoria Volterrani. Beyond this group of authors, the work had benefited from the contribution of further teachers as contributors and reviewers: Mariangela Bielli, Silvana Rampone, Francesca Panzica, Maria Teresa Rughi, Carmela Pietrangelo, Sara Brunno, Maria Rosaria Fasanelli, Clara Elizabeth Baez, Francesconi, and Castiglione. Particular thanks were also extended to all 29 teachers who had participated in the classroom piloting, contributing through the application of the tools and through feedback collected in authentic teaching contexts.

feasible timelines, and explicit alignment between project activities and assessment criteria, eTwinning-related learning tended to remain implicit within broader classroom evaluation. The survey had therefore underscored a substantial demand for assessment-ready tools, particularly rubrics and descriptors capable of linking typical eTwinning activities to key competence dimensions in a way that could support both ongoing observation and subsequent reporting.

On the basis of this evidence, the task force had developed practical assessment-oriented rubrics intended to be usable across school levels and compatible with national competence frameworks and school documentation requirements. The tools had been conceived to avoid adding extra administrative burden and instead to offer support that could be integrated into existing practices. They had sought to facilitate alignment between observable learning processes – such as participation, collaboration, communication, production of shared artefacts, and project management – and competence dimensions, by providing descriptors designed to increase transparency of evaluative judgement and communicability of outcomes.

A subsequent phase had been devoted to classroom piloting of the tools. In this context, 29 eTwinning teachers had applied the rubrics in authentic school settings, using them to assess competences of 589 students involved in eTwinning projects. The piloting had served primarily an exploratory and developmental function: it had enabled the collection of feedback on the clarity of descriptors, the feasibility of procedures, and recurring difficulties in implementation across different school levels. In parallel, it had produced descriptive indications regarding competence profiles most frequently observed in relation to eTwinning activities, coherently with the collaborative and digitally mediated nature of the projects.

Although the work had not resulted in a definitive editorial output or in fully developed institutional dissemination, the experience had nonetheless generated a substantial set of outcomes beyond simply demonstrating sustained interest in competence-based teaching and assessment. In addition, interim findings and the associated assessment tools were disseminated through face-to-face national events (Minardi, 2023).

The pilot helped clarify the extent of teachers' demand for tools capable of making learning outcomes more observable and documentable, while also bringing into sharper focus the practical constraints that limited the routinisation of structured assessment procedures in everyday classroom

work. Importantly, the initiative had suggested that, when questions of impact were at stake, perception-based evidence alone was insufficient: the coexistence of broadly positive appraisals and limited assessment uptake had pointed to the need for approaches that combined educational interpretability with more robust forms of evidence and with feasible instruments that could be used in ordinary school practice.

In this sense, eTwinning constituted a particularly relevant context for empirical research not because its impact on competence development had already been established, but because it combined strong pedagogical plausibility, large-scale implementation, and sustained monitoring alongside persistent limits in attributional evidence. This positioning made eTwinning a valuable case for investigating under which conditions participation in international collaborative projects might contribute to the development of key competences in authentic school settings, and for identifying how such potential could be documented and assessed in ways that were both methodologically sound and practically adoptable.

Against this backdrop, the following section turns to academic empirical research to examine what evidence existed on competence development in innovative and international learning contexts, and where significant gaps remained.

1.5 Evidence on competence development in international and innovative school-based practices

Empirical research on the impact of innovative and international educational practices on students' competence development has grown substantially over the last decade, particularly in response to policy agendas emphasising transversal competences, global learning, and digitally mediated collaboration. However, the strength of the available evidence varies considerably depending on the competence domain considered, the type of intervention, and the methodological design adopted. Rather than offering uniform conclusions, the literature presents a differentiated picture that calls for careful interpretation.

Across empirical studies conducted in lower and upper secondary education, strong and consistent evidence concerns competences related to intercultural and global learning (Deardorff, 2006; O'Dowd & Lewis, 2016). Multiple studies report significant or substantively meaningful gains in students' intercultural awareness, openness, and communicative

competence following participation in international collaborative projects or virtual exchange programmes (Helm, 2016; Jauregi, 2015; Lee & Song, 2019; Hackett et al., 2023; Robinson & Manegre, 2025; Arias Cifuentes, & Solano Cahuana, 2025). These findings are relatively robust across contexts and are supported by both quantitative pre–post designs and qualitative triangulation.

A second cluster of competences for which moderate but recurrent evidence is available includes digital competence (Vuorikari et al., 2022) and personal, social, and learning-to-learn competences (Sala et al., 2020). Recent studies reporting improvements in students' ability to use digital tools purposefully, to regulate their learning, and to collaborate effectively with peers (Fernández-Rodríguez & Sganga Forero, 2023; Remmerswaal et al., 2025; Hämäläinen et al., 2019).

Evidence related to citizenship and civic competence (Council of Europe, 2016) is more heterogeneous. Some studies document positive effects on civic engagement, sense of belonging, and participatory attitudes in projects involving democratic practices or socially oriented challenges (Yashenkova, 2025; Hoskins et al., 2012), whereas others report more ambiguous or context-dependent outcomes.

By contrast, entrepreneurship competence (Bacigalupo et al., 2016) remains less represented as explicit outcome variables in school-level empirical research (Martínez-Gregorio & Sánchez Oliver, 2023). Although these competences are frequently mentioned in policy documents and conceptual discussions, they are seldom operationalised and measured in impact-oriented studies, particularly in compulsory education (Lackéus, 2015).

When considering types of educational interventions, the literature shows clear differences in terms of strength and consistency of evidence. Studies on telecollaboration and virtual exchange, including Collaborative Online International Learning (COIL), tend to display the most methodologically robust designs, often combining pre–post measures with comparative groups and mixed methods (Hackett et al., 2023; Chan, 2025). These interventions are repeatedly associated with gains in intercultural, communicative, digital and collaborative competences.

Research on project-based learning (Bell, 2010) in international contexts also reports generally positive outcomes, particularly when projects are structured around authentic tasks and sustained collaboration (Kokotsaki et al., 2016; Zhang & Ma, 2023; Kokotsaki et al., 2016; Zhang & Ma, 2023).

Evidence related specifically to European school programmes, such as Erasmus+ partnerships and eTwinning projects, is more uneven. While descriptive and exploratory studies highlight high levels of student engagement and perceived competence development (Donà dalle Rose, 2015; Baranowski, 2017; Cîmpean et al., 2024), comparatively few studies adopt quasi-experimental designs or include control groups. A recent French evaluation by Perrin adds a valuable, complementary perspective by examining eTwinning in relation to academic performance (Perrin, 2025). The study reports measurable gains in the project's subject area, while also suggesting that benefits may differ across student profiles. Importantly, Perrin also notes that conventional school marks are an imperfect proxy for learning, as they are shaped by assessment context and may not capture broader competences. While aligned with our aim to move beyond perception-based evidence, the study remains centred on subject performance, while our work focuses on transversal key competences across five domains, assessed through framework-aligned instruments within a paired-class design (same teacher, same school; eTwinning vs control group).

The methodological quality of studies in this field varies widely, particularly with regard to competence assessment. The majority of empirical investigations rely primarily on student self-report instruments, often complemented by interviews or reflective writing (Chan, 2025). While these tools are valuable for capturing perceived change and subjective learning experiences, they are inherently limited when used as the sole source of evidence.

A smaller but significant group of studies integrates teacher assessments, rubric-based evaluations, or performance tasks, which allow for a more externalised observation of competence enactment. Portfolio-based approaches and artefact analysis are also reported as promising strategies, particularly in project-based and international learning contexts, although their use remains methodologically demanding and unevenly standardised.

Taken together, the empirical literature points to several persistent gaps. First, there is a scarcity of quasi-experimental impact studies in authentic school settings, particularly those combining pre–post measures with control groups. Second, evidence related to eTwinning projects is predominantly descriptive, with limited use of comparative designs capable of supporting stronger inferences. Third, certain competence domains – most notably entrepreneurship competence and cultural awareness and expression – remain marginal in empirical assessment despite their

prominence in European policy frameworks. Moreover, across the literature, alignment with shared competence frameworks – including European reference models – is often partial or implicit, reducing comparability across studies and limiting cumulative knowledge building.

Finally, few studies adopt a multi-competence perspective, systematically analysing how different competence domains may develop in parallel within the same educational intervention. Addressing these gaps requires research designs that are simultaneously framework-informed, methodologically robust, and sensitive to contextual complexity, especially within ordinary school environments.

1.6 Research Design, Sample, and Data Collection Procedures

This study uses a comparative, quasi-experimental pre–post design embedded in a mixed-methods framework to estimate whether participation in eTwinning projects is associated with stronger development of key competences than ordinary school activities. The design was built to respond to recurrent gaps in the eTwinning evidence base – most notably the predominance of single-group or post-only approaches, limited comparability across contexts, and weak alignment between outcome measures and European competence frameworks.

The study was conducted in Italian upper-secondary education and involved schools located across multiple regions, ensuring variation in geographical and institutional contexts while remaining within the same educational level. Participating institutions included predominantly general upper secondary institution (Licei, spanning different tracks) alongside a smaller number of IVET upper secondary institutions (e.g., ITI/IIS/IISS). Schools were recruited among eTwinning/Erasmus + School Ambassadors by the Italian eTwinning NSO.

The recruited school network included the following institutions: Liceo N. Machiavelli (Rome); Educandato Statale SS. Annunziata (Florence); Liceo classico e linguistico "G. Mazzini" (Genoa); Liceo "Angela Veronese" (Montebelluna, TV); Liceo scientifico "Attilio Bertolucci" (Parma); Liceo "Laura Bassi" (Bologna); IIS "Santorre di Santarosa" (Turin); Liceo scientifico e delle scienze umane "O.M. Corbino" (Siracusa); Liceo Linguistico "Lombardo Radice" (Catania); Liceo "Giulia Molino Colombini" (Piacenza); IIS "L. da Vinci-Fascetti" (Pisa); IISS "Ettore Majorana" (Brindisi); ITI "G. Ferraris" (Naples); Liceo "Giolitti-Gandino"

(Bra, CN) and IIS "Acciaiuoli-Einaudi" (Ortona, CH). The school from Turin withdrew prior to baseline data collection; therefore, it did not contribute data to the study.

Fifteen experienced eTwinning teachers volunteered to participate, with the key inclusion requirement that each teacher could provide two comparable classes: one implementing an eTwinning project (experimental condition) and one following ordinary schooling without structured international collaboration (comparison condition). Since random assignment is rarely feasible in authentic school settings, groups were not formed through allocation by the research team: each participating teacher autonomously identified, based on organisational constraints and teaching planning, which of their classes would implement eTwinning and which would act as a comparison class. To mitigate teacher-related variance, the study adopted a paired-class structure in which the same teacher worked with both conditions within the same institution, strengthening internal comparability by reducing the likelihood that observed differences are driven primarily by teacher style, expectations, or assessment practices while preserving feasibility. During implementation, one school/teacher withdrew, resulting in 14 analysable class pairs.

Fig. 1.2 – Participating schools

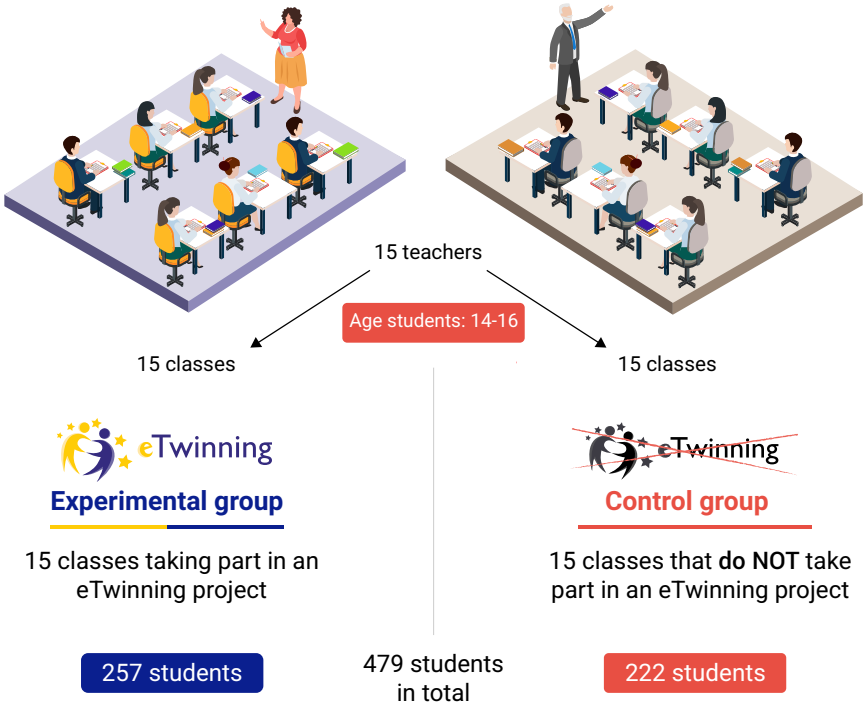


Fig. 1.3 – Experimental setting

The study focuses on students aged 14-16, with participation spanning the first three years of upper secondary school and at least one second-year class per teacher. Where possible, the comparison class was selected from the same grade as the experimental class; when this was not feasible, a nearby grade was used to form the pair. Class grade (first, second, or third year) was recorded for each paired set and later treated as a control variable in the inferential analyses together with baseline competence level and school.

The present study focuses on students aged 14-16 because this developmental window offers a particularly favourable balance between curricular comparability (lower vs. upper secondary transitions) and the likelihood that key competences are sufficiently formed to be detected with the available instruments. Mid-adolescence is also a phase of marked cognitive and social maturation, which supports the emergence and articulation of more complex competences as students become increasingly capable of reflective thought, self-regulation and perspective-taking

(Icenogle, 2019; Ward, 2020; OECD, 2025). Several competence domains, notably entrepreneurship competence and cultural awareness and expression, presuppose indeed a minimum level of accumulated experience. In early adolescence, these domains may still be emerging and harder to observe reliably; by mid-adolescence, students more often have the cognitive and social maturity to articulate competence enactment, to recognise growth across contexts, and to connect it to concrete episodes of collaboration, initiative, and decision-making. Selecting the 14-16 range therefore increases the plausibility of capturing meaningful variation and change – especially in competences that depend on practice and reflection – while remaining close to the target population for European school-based international and innovative programmes.

The study involved 14 teachers, each with one pair of classes. The final quantitative dataset includes 479 students overall, with 257 in eTwinning classes and 222 in comparison control classes, 28 classes in total, distributed across grade levels as follows: 6 first-year classes, 20 second-year, and 2 third-year. As described in Chapter 2, outcome analyses relying on pre–post change scores were conducted using complete-case procedures at the level of the specific measure, meaning that only students with both baseline and endline data for a given competence and instrument were included in the corresponding delta-based analysis; open-ended responses were retained for qualitative analyses even when only a single measurement point was available. Consequently, the effective sample size varies across competences and between questionnaires and teacher evaluations.

Intervention exposure consisted of teacher-designed eTwinning projects implemented autonomously in experimental classes. Although projects differed in themes, pacing, duration, and frequency (see Chapter 3 for an overview of project characteristics and implementation variability), they shared structural features that are intrinsic to eTwinning as a learning environment: sustained international collaboration, systematic use of digital platforms and tools to coordinate activities and co-produce outputs, and the development of shared final products intended for an audience beyond the local classroom. On the other hand, comparison classes continued with ordinary curricular instruction and used the standard digital infrastructure of schools, but did not engage in structured transnational project work. This diversity of project formats was treated as an integral characteristic of real-world eTwinning implementation rather than as a deviation from protocol; accordingly, the study aims to estimate the association between participation in eTwinning as an educational environment and competence

development, while the qualitative strand supports interpretation of how implementation unfolded across contexts (see Chapter 5 for the cross-case qualitative analysis of implementation processes and conditions).

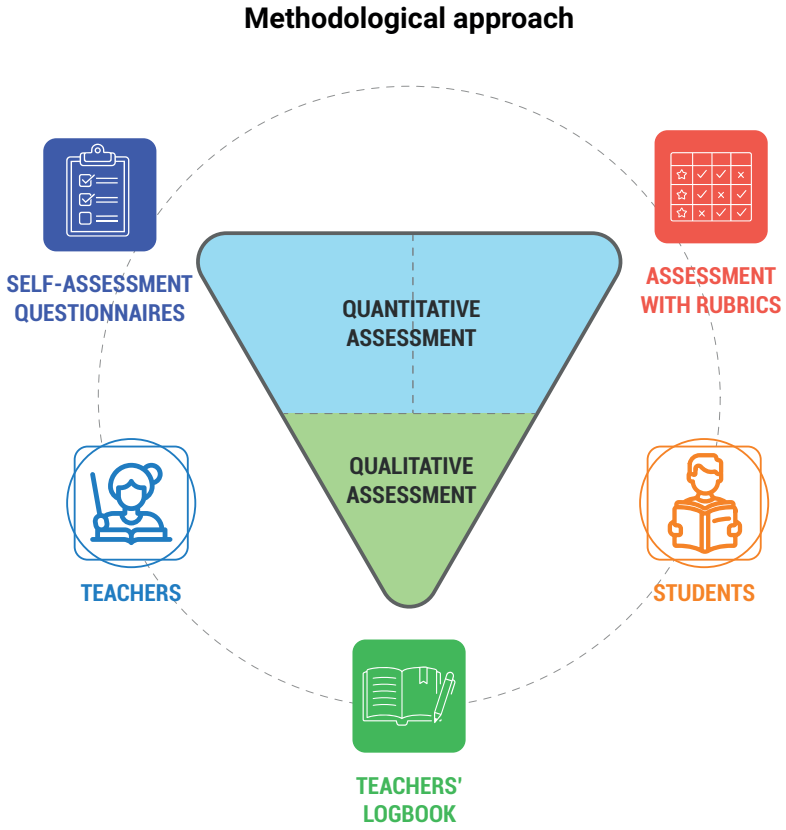


Fig. 1.4 – Triangulation

To capture competence development through complementary perspectives and reduce reliance on a single method, the study triangulates multiple sources of evidence aligned to a shared competence taxonomy derived from European frameworks. The quantitative component combines student self-assessment questionnaires based on closed-ended Likert items and teacher assessments based on analytic rubrics; the qualitative component combines open-ended responses from student questionnaires and monthly teacher logbooks documenting project activities, observations, and contextual factors. All instruments were developed ad hoc for the

present study. In particular, the teacher rubrics were designed ex novo by drawing on European competence frameworks – using DigComp 2.2 as the main modelling reference – as will be detailed in the next section. The dual-source approach is also methodological: neither student self-reports nor teacher judgements can be assumed fully reliable in isolation for transversal constructs, especially when competence expression is context-dependent and not reducible to right-wrong responses. Using both perspectives increases robustness and interpretability, particularly when findings converge across sources or when divergences highlight meaningful differences in perception versus observed performance. This convergence/divergence is examined in the results (Chapter 4) and discussed in relation to interpretation and measurement (Chapter 6).

Data were collected at two time points using identical instruments, enabling direct longitudinal comparison. Pre-intervention measurement took place between November and December 2024, while post-intervention measurement took place between early May and the 7th of June of the same school year. During the project period (approximately November to May), teachers completed monthly reflective logbooks to document implementation and observed competence-related behaviours in both eTwinning and control classes. Quantitative analysis was centred on change between time points, operationalised as Δ = post-pre for each competence and instrument, and group differences in change were examined both through independent-sample comparisons and through ANCOVA models that adjust for baseline competence levels and key contextual covariates such as school, grade, and starting levels of competence. In this context, ANCOVA serves to strengthen inference by estimating whether the eTwinning condition is associated with greater competence development when comparing students (or classes) starting from similar baseline levels and accounting for systematic differences across schools and year groups; this helps reduce bias due to initial group imbalances and provides a more rigorous estimate than a simple comparison of raw gains. Qualitative data were analysed through a structured thematic workflow and used in a sequential explanatory manner to interpret and contextualise quantitative patterns, documenting processes, conditions, and implementation features that can clarify why competence development may differ across settings. Overall, the methodological approach is designed to balance rigour and feasibility: it increases comparability through paired classes, repeated measures, and framework-informed instruments, while preserving fidelity to the complexity of school-based eTwinning projects implemented in diverse contexts.

1.7 European Key Competences and the Competence-Mapping Model Adopted in This Study

Competence motherboard

DigComp								
Area 1: Information an Data Literacy	3	0	0	3	0	0	0	0
Area 2: Communication and Collaboration	0	1	0	6	2	3	0	0
Area 3: Digital Content Creation	0	0	1	4	0	0	1	2
Area 4: Safety	0	0	0	4	1	2	0	0
Area 5: Problem Solving	0	0	2	4	1	0	0	1
LifeComp								
Area 1: Personal	0	0	0	0	3	0	0	0
Area 2: Social	0	1	0	0	3	2	0	0
Area 3: Learning to learn	0	0	1	0	3	1	2	0
EntreComp								
Area 1: Ideas and opportunities	0	0	0	0	2	2	5	2
Area 2: Resources	0	0	1	0	4	0	5	0
Area 3: Into Action	0	0	1	0	4	0	5	0
GreenComp								
Area 1: Embodying Sustainability Values	0	0	0	0	0	3	0	2
Area 2: Embracing Complexity in Sustainability	0	0	3	0	3	0	0	0
Area 3: Envisioning Sustainable Futures	0	0	0	0	2	1	3	0
Area 4: Acting for Sustainability	0	0	0	0	0	3	1	0
Competence Framework for a Democratic Culture								
Area 1: Values	0	0	0	0	2	3	0	3
Area 2: Attitudes	0	0	0	0	2	4	0	1
Area 3: Skills	0	1	1	0	7	3	0	0
Area 4: Knowledge and Critical Understanding	0	1	1	0	3	1	0	1
Total	**3**	**4**	**11**	**21**	**42**	**28**	**22**	**12**

Fig. 1.5 – Competence motherboard

This impact study is anchored in the Council Recommendation on Key Competences for Lifelong Learning (European Commission, 2018), which provides the shared European reference for competence-oriented curricula and for policy expectations around competence development and assessment. In line with this framework, the study focuses on five competences, using the official labels: personal, social and learning to learn competence; citizenship competence; entrepreneurship competence; cultural awareness and expression competence; and digital competence (European Commission, 2018). Three competences from the European set were not included – literacy competence, multilingual competence, and mathematical competence and competence in science, technology and engineering – reflecting both scope and feasibility. Literacy and STEM-related competence domains were excluded to keep the study focused on those competences that are most plausibly and directly mobilised by typical eTwinning project features (collaboration, digital mediation, co-production of outputs). Multilingual competence was excluded for a more specific reason: language proficiency is already commonly assessed through established and standardised certification pathways, and integrating official language-level testing within this design would have required additional procedures and organisational demands that were not feasible at scale for participating teachers and classes.

A second layer of conceptual anchoring concerns operationalisation. While the Council Recommendation defines key competences at a reference level, an impact study requires descriptors that can be translated into observable indicators and assessable criteria. For digital competence, the study adopts DigComp 2.2 as a direct reference, given its explicit structure of competence areas and descriptors that lend themselves to rubric-based assessment (Vuorikari, Kluzer, & Punie, 2022). For personal, social and learning to learn competence, LifeComp provides a coherent set of competences and descriptors developed to support shared understanding and the design of curricula and assessment (Sala, Punie, Garkov, & Cabrera Giraldez, 2020). For entrepreneurship competence, EntreComp offers a structured model that can inform assessment parameters (Bacigalupo et al., 2016/2017). For citizenship competence, the study draws on European competence models that operationalise democratic culture and civic participation into assessable descriptors, including the Council of Europe's Reference Framework of Competences for Democratic Culture (Council of Europe, 2018), used here as a complementary conceptual resource within the cross-mapping process.

Importantly, with the exception of DigComp 2.2, no single European framework maps one-to-one onto each competence label while also providing a fully assessment-ready set of descriptors for school-based impact evaluation. The study therefore adopts a competence-mapping model that functions as a reconstruction procedure: competence-relevant descriptors were identified across the selected European frameworks and reorganised into a coherent architecture in which each key competence is articulated into competence areas and, within each area, a set of specific competences. For four of the five competences, this reconstruction led to a standard structure of three competence areas per competence, chosen both for conceptual clarity and for practical manageability in real school settings. Digital competence constitutes the exception: because DigComp 2.2 already defines five competence areas with associated specific competences and descriptors, it was treated as the "ready" model and, at the same time, as the template that informed the overall architecture of the mapping work (see Chapter 2 for the measurement framework and the construction of the instruments and rubrics).

Fig. 1.6 – Personal competence structure

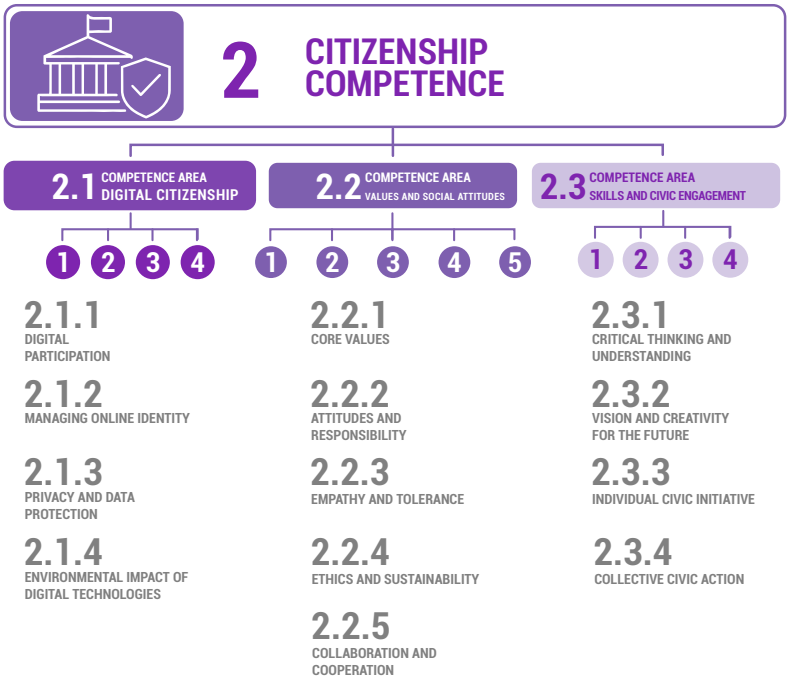


Fig. 1.7 – Citizenship competence structure

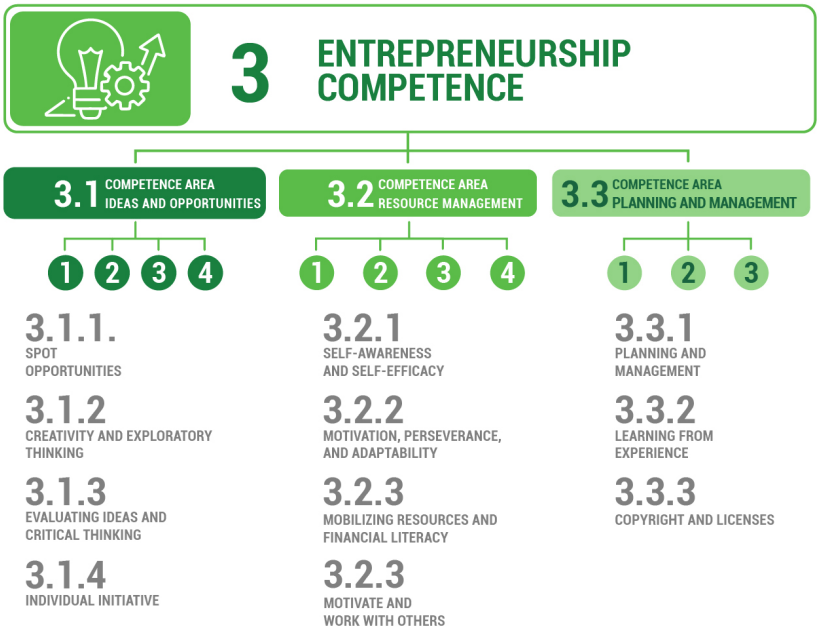


Fig. 1.8 – Entrepreneurial competence structure

Fig. 1.9 – Cultural competence structure

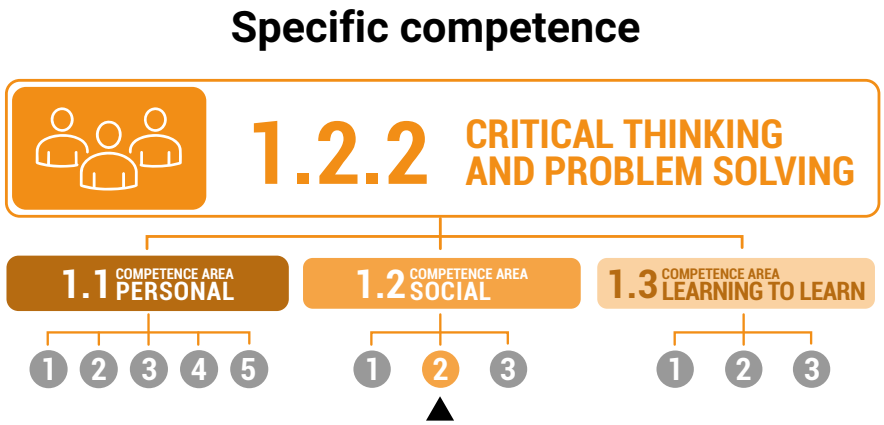


Fig. 1.10 – Specific competence structure

Within this model, indicators are specified both as framework-derived competence descriptors and as observable, levelled assessment descriptors. The associated eight-level proficiency progression (A1-D2), aligned with

DigComp's logic and interpreted for consistent school-based use across competences, is outlined and explained in full detail in Chapter 2 (2.3.2).

In this sense, competence mapping plays a dual role. It is a measurement framework, because it defines how the five key competences are operationalised into areas, specific competences, indicators, and proficiency levels that can be assessed through multiple instruments. At the same time, it is an interpretive device, because it provides a unitary and framework-grounded lens through which the meaning of "key competences" is articulated, reconstructed, and made comparable across schools – anchoring the study's constructs explicitly to European competence frameworks while producing coherent, reusable assessment structures for a school-based impact evaluation.

1.8 Ethical aspects and study limitations

The study was conducted in compliance with applicable regulations on personal data protection and with established ethical guidelines for educational research involving minors. Participation by schools and teachers was voluntary and followed an explicit invitation issued by the Italian NSO, with formal enrolment by the participating institutions. Students and their families were informed – through the designated teachers and schools – about the aims of the research, the nature of the planned activities (including the completion of questionnaires, the use of teacher assessment rubrics, and the collection of teachers' reflective logbooks), and the purposes for which the data would be used. The study adhered to the principles of transparency, voluntariness, and non-penalisation, ensuring that non-participation or partial participation had no consequences for students' school evaluation or educational pathways.

All data were processed in anonymised form. Questionnaires and assessment rubrics did not contain students' names, but only internal identification codes that were not directly traceable to individual identities. Any potentially identifying information related to classes or schools was accessible exclusively to the research team and only for technical data-management purposes. Research findings are reported solely in aggregated form, preventing any attribution of results to individual participants, classes, or schools. Teachers' reflective logbooks were anonymised prior to qualitative analysis. The overall data collection, storage, and analysis procedures were designed to minimise risks for participants, ensuring that

neither students nor teachers could be identified or individually evaluated outside the scope of ordinary internal educational practices within schools.

1.9 Research questions and hypotheses

The overarching research question guiding the study is: What effect does the participation in eTwinning have on the development of selected key competences among students aged 14 to 16, compared with comparable control classes?

In line with the European Reference Framework, the impact study focuses on five competences, using the official labels: personal, social and learning to learn competence; citizenship competence; entrepreneurship competence; cultural awareness and expression competence; and digital competence (European Commission, 2018).

This general question is articulated into competence-specific questions for each of the five target competences: To what extent does the participation in eTwinning contribute to measurable change in each competence, relative to matched control classes, between baseline and endline assessment? Given the state of the literature outlined above, the study advances cautious, testable expectations rather than deterministic predictions. Existing evidence suggests that the most plausible competence gains associated with digitally mediated, project-based and cross-border collaboration are likely to emerge in domains where (i) digital mediation is structurally required (digital competence), (ii) collaboration and communication are necessary for successful completion of shared tasks (personal, social and learning to learn competence; aspects of citizenship competence), and (iii) intercultural exchange and meaning-making are embedded in project activity (cultural awareness and expression competence; intercultural dimensions of citizenship competence) (Hauck et al., 2020; Dooly & Vinagre, 2022). At the same time, entrepreneurship competence is comparatively under-represented as an explicitly measured outcome in the screened evidence base; therefore, any observed impact in this competence would be particularly informative, both empirically and methodologically (Stevens Initiativ, 2020). The results in Chapter 4 show which parts of this expected profile are supported at key-competence and area level, and where patterns are more mixed.

In addition to the main impact question, the study addresses a set of secondary research questions aimed at understanding heterogeneity of

effects and the conditions under which competence development may be stronger or weaker. First, it asks which of the five competences is most strongly influenced by participation in eTwinning, rather than assuming uniform effects across domains. Second, it investigates whether competence development is related to selected variables associated with project characteristics and quality (including evidence derived from project documentation and expert evaluation linked to Quality Label processes), teacher-related factors (such as profiles emerging from competence balance instruments and indicators of eTwinning experience), and contextual characteristics. These secondary questions are not framed to claim causal attribution for each factor; rather, they aim to explore whether patterns of competence growth systematically co-vary with project, teacher, and contextual features in ways that can inform interpretation and future programme design.

The following chapters will operationalise these constructs and examine their relationship to competence development as a secondary analytic strand, complementing the main quasi-experimental comparison between experimental and control classes and providing a richer account of how and under which conditions eTwinning may contribute to students' key-competence development.

1.10 The notion of competence and the meaning of impact

A competence is a complex educational construct composed of an integrated set of knowledge, skills, and attitudes. Since the early reflections of the DE.SE.CO – OECD Final Research Report (1997), competence has been characterised by its intrinsic complexity.

Research has consistently highlighted the multidimensional nature of competence, which cannot be reduced to a purely cognitive component since it concerns the person as a whole. For example, Pellerey defines competence as "the ability to face a task, or a set of tasks, managing and orchestrating one's internal resources – cognitive, affective, and volitional – and to use available external resources in a coherent and fruitful way" (Pellerey, 2004). Along similar lines, Corsini argues that the competence construct "presents seven fundamental dimensions: cognitive, active, metacognitive, emotional, social, situated, and dynamic" (Corsini, 2023, p. 82). Corsini also underlines that many tools commonly used to observe competences tend to focus primarily on the first two dimensions –

knowledge and its application – whereas the remaining dimensions require more complex forms of observation and interpretation, as they involve reflective processes, emotional regulation, and interaction with others (*ibidem*).

Moreover, competence cannot be separated from its field of application and necessarily involves the perspective of others. As Batini stresses, "Every competence is purposeful (or functional) and context-dependent: it cannot therefore be separated from the conditions in which it is enacted, and it is not possible to observe a competence in a purely theoretical way. Competence is a capacity to act (or react) that is recognized. For any competence to exist, it requires the judgment of others, with a certain degree of social recognition, at least within a group" (Batini, 2015, p. 31. Translated by the author). In this sense, competence is both situated and socially recognisable: it emerges in action, within contexts, and through criteria that are shared – at least to some extent – within a community of practice.

Within the scope of the present study, the main challenge was therefore the design of an assessment system capable not only of drawing on multiple sources of information (triangulation), but also of capturing the plurality of competence dimensions – both within each competence and across multiple competences that relate to different aspects of student development. The competences analysed – Personal, Social, Learning to Learn, Citizenship, Entrepreneurship, Cultural Awareness and Expression, and Digital – concern different domains of the individual and, taken together, provide a holistic view of student growth.

Consistently with this framing, the competences investigated in this study are treated as complex constructs whose development can only be understood by recognising their multidimensional nature. Each competence involves a combination of constitutively interconnected dimensions: cognitive (knowledge, understanding, problem-solving, and use of information), relational (interaction, collaboration, respect, responsibility, and participation), dispositional (interest, engagement, self-efficacy, persistence, and willingness to take initiative), metacognitive (self-awareness, self-regulation, and improvement strategies), and identity-related (self-worth, voice, belonging, and cultural positioning). Some competences foreground specific dimensions more explicitly than others; nonetheless, these components are best understood as inherent to competence development rather than as optional additions or peculiarities of selected areas.

From this perspective, "impact" cannot be understood as a simple gain in a single measurable quantity. Competences are not physical entities that can be measured with the precision of metres, kilograms, or seconds. Yet the fact that a construct does not admit that kind of measurement does not imply that it should remain unmeasured, or that any attempt to evaluate it is meaningless. Educational practice continuously relies on forms of judgement and evaluation that are not reducible to physical units, but are nevertheless valid, consequential, and actionable: we routinely distinguish between "emerging", "developing", and "consolidated" abilities; between a student who is becoming autonomous and one who is not; between occasional performance and stable capability. The challenge, therefore, is not whether competences can be measured "like length", but whether they can be assessed in ways that are transparent, coherent, educationally interpretable, and meaningful.

This is why the study operationalises impact primarily as movement along competence levels. The level structure does not claim to provide a perfect metric; rather, it offers a structured way to represent meaningful differences in how students position themselves and are evaluated with respect to a competence. The idea is close to a family of distinctions deeply familiar to educational contexts: progress is captured not as a continuous physical quantity, but as a change in degree, quality, and stability of competence-related behaviours, attitudes, and understandings. Levels thus function as a pragmatic bridge between conceptual definitions and observable indicators that can be collected in school settings.

Many concepts that matter in ordinary life do not have rigid, instrument-like boundaries, and yet they remain meaningful because their use is embedded in shared practices and criteria. An "exact" measure in such contexts would not only be unnecessary, but could also be problematic. Consider, for instance, pain: there is no objective unit of pain, nor a fully instrument-based way to measure it. What can be accessed is perceived intensity, typically through self-report and contextual indicators. Yet the absence of an objective metric does not prevent pain assessments from being consequential and actionable – for example, in decisions about treatment, support, or functional adjustment. In such cases, the aim is not perfect precision, but an estimate that is sufficiently reliable and interpretable within a shared evaluative framework. Moreover, an illusion of objectivity could be counterproductive if it displaced lived experience and contextual evidence – for instance, by discouraging appropriate relief when an "objective" reading fails to capture the patient's perception. In

short, while some questions require highly precise measurement in physical units, others require evaluative judgements grounded in transparent criteria and converging evidence.

Competence constructs are of this latter kind. Their assessment is necessarily approximate, not because of a weakness of the inquiry, but because of the nature of the object assessed. What matters, then, is not the illusion of perfect precision, but the quality of the evaluative framework: clarity of constructs, coherence between definitions and indicators, and the use of converging sources of evidence.

Accordingly, in this volume "impact on competences" refers to detectable, interpretable shifts in students' competence-related profiles as represented through level-based measures and interpreted in light of educational practices and learning conditions. The purpose is not to reduce competence to a single number, but to make competence development visible enough to be discussed, compared, and improved, while preserving the richness and multidimensionality that make it educationally meaningful in the first place.

Chapter 2
Instruments and Measurement Framework

Jacopo Condò
Alexandra Tosi

2.1 Overall logic of the instrument set

Building on the conceptual framework and the discussion of what "impact on competences" means in educational research presented in Chapter 1, this chapter describes the measurement framework and research instruments adopted in the present study. As argued in the previous chapter, assessing competence development requires moving beyond single indicators or purely subject-based measures, and calls for instruments capable of capturing the multidimensional, context-dependent and process-oriented nature of key competences.

In response to these challenges, the study adopts a competence-oriented measurement strategy designed to document change over time while remaining grounded in ordinary school practice. The instruments presented in this chapter were therefore developed not only to estimate students' perceived learning outcomes, but also to capture observable dimensions of competence enactment within authentic classroom and project-based activities.

The chapter outlines the conceptual assumptions underpinning the choice of instruments, the operationalisation of selected key competences, and the rationale for combining student self-assessment with teacher-based rubric evaluation. Particular attention is paid to the alignment between European competence frameworks and the indicators used, as well as to the methodological trade-offs involved in assessing complex and transversal constructs in real educational settings.

Finally, the chapter situates the measurement framework within the overall research design, clarifying how the selected instruments support the comparative, pre–post logic of the study and address some of the methodological gaps identified in the existing literature. In doing so, it provides the necessary foundation for the presentation and interpretation of the empirical findings in the subsequent chapters.

Given the multidimensional and context-dependent nature of key competences, the study adopted a multi-instrument assessment strategy (Hauck et al., 2020). Rather than relying on a single measure, the evaluation combines complementary sources of data that capture competences from different perspectives and at different levels of granularity. In line with the mixed-methods design of the study, the instrument set was designed to support both the quantitative estimation of competence development between pre and post measurement points and the qualitative interpretation of the mechanisms and contextual conditions underlying the observed patterns.

All instruments are grounded in the same, unified competence architecture. Starting from the integrated competence taxonomy described in chapter 1, and from the model of competence articulated in the DigComp 2.2, competences are organised hierarchically into key competences, competence areas, and specific competences, each associated with observable descriptors and examples of knowledge, skills and attitudes (Vuorikari et al., 2022). This shared structure ensures conceptual coherence across instruments and allows the outputs of different tools to be aligned and compared. In practical terms, it guarantees that student self-reports, teacher assessments, and qualitative data refer to the same underlying structure and can therefore be meaningfully triangulated.

Within this framework, the study employed three main instruments:

1. Student self-assessment questionnaires provide structured quantitative information on perceived competence development through Likert-scale items anchored to the taxonomy, complemented by open-ended questions; overall, each questionnaire section follows an approximate 2:1 ratio of closed-ended to open-ended items.
2. Teacher assessment grids are based on the same taxonomy of competence and consist in analytic rubrics with proficiency levels (A1-D2) and relative descriptors, producing an external, quantitative estimate of students' competence levels in both pre and post phases.
3. Finally, teacher logbooks offer a diachronic qualitative record of project implementation, classroom dynamics and competence-related evidence,

collected on a monthly basis to document processes that may not be visible in numerical scores.

Together, these three instruments form the core of the student-focused measurement strategy.

The instrument set was conceived not only as a measurement apparatus but also as an interpretive device. Quantitative outcomes are complemented by qualitative materials and text-based indicators that help characterise the nature of students' experiences and teachers' observations.

This chapter therefore serves as a bridge between the conceptual model in chapter 1 and the analytic strategies and results presented in later chapters, detailing how competence development was observed, recorded and transformed into research evidence.

2.2 Instrument development and validation

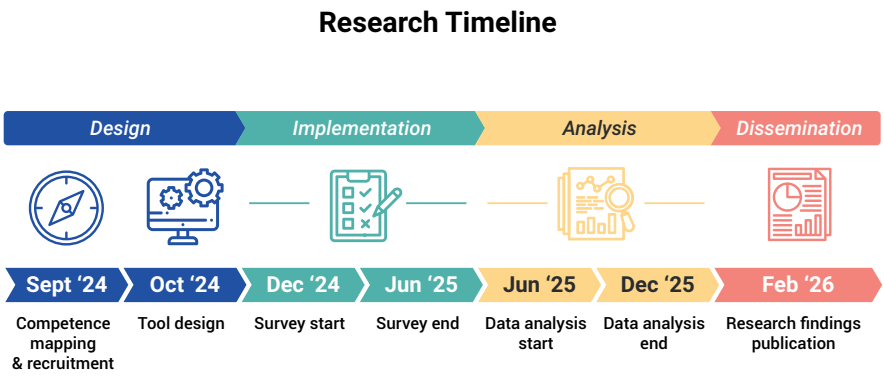


Fig. 2.1 – Research timeline

The instruments were developed through an iterative design process aimed at ensuring conceptual alignment with European competence frameworks, internal coherence across tools, and applicability in ordinary school settings (Helm & Beaven, 2020). Development was guided by three overarching requirements: 1) traceability, meaning that constructs and items could be systematically linked back to the underlying competence taxonomy and its European sources (Council of the European Union, 2018); 2) comparability, ensuring that the same constructs could be measured consistently across schools, classes and time points; and 3)

usability, so that instruments could be administered and applied by teachers and students without excessive burden or ambiguity.

The starting point of this process was the competence taxonomy described in chapter 1, which integrates descriptors extracted from multiple European frameworks into a unified structure of key competences, competence areas and specific competences. This taxonomy served as the common backbone for all instruments, ensuring that student self-assessment, teacher judgements and qualitative data collection referred to the same conceptual entities.

Instrument construction proceeded in parallel across tools, following a shared workflow. First, an initial draft was produced for each instrument by translating taxonomy descriptors into operational prompts: Likert-type items and reflective open questions for the student questionnaires; levelled behavioural descriptors for the teacher assessment grids; and questions for monthly teacher logbooks. Second, drafts were reviewed internally to check coverage of the competence areas, redundancy across items, and consistency in wording and conceptual scope. Particular attention was paid to ensuring that items and descriptors captured not only knowledge, but also skills and attitudinal dimensions embedded in the taxonomy.

A key step in the validation process was expert review with the participating teachers. Because instruments had to be manageable for students aged 14-16 and usable by teachers in real classroom conditions, the study relied on an iterative refinement phase conducted with the full group of involved eTwinning-experienced teachers (Icenogle et al., 2019; Ward, 2020). During this phase, items and descriptors were examined to identify unclear formulations, excessive abstraction, age-inappropriate language, and potential sources of misunderstandings. The review resulted in targeted edits to simplify wording and remove unnecessary technical terminology, while preserving conceptual fidelity to the original framework descriptors.

In addition to this validation process, the research team implemented further strategies to improve reliability and consistency of implementation. For the teacher grids, guidance materials and a dedicated training session were provided to clarify the rubric structure, the underlying competence model, and the meaning of the proficiency levels. To support students' participation, an animated video was developed specifically for the participating classes. The video introduced the study aims and procedures in accessible language and explained, more broadly, how scientific research works (e.g., why pre–post measurement, why a comparison control group, and why the same instruments are administered twice). This resource served

both an ethical and methodological function: it supported students' informed participation and helped ensure that the study rationale and design were communicated in a standardised way across schools, thereby reducing potential variability due to differing explanations or expectations at classroom level.

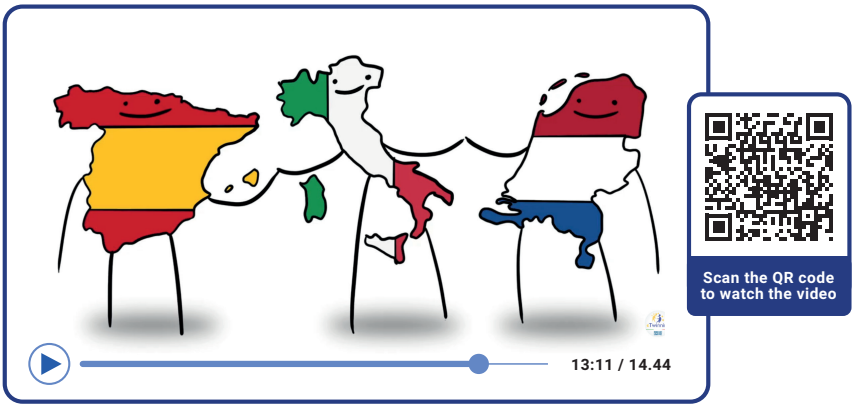


Fig. 2.2 – Animated Student Guide to the Research Project
https://www.youtube.com/watch?v=SQGG6CxfJ38

2.3 Teacher assessment grids

2.3.1 Purpose and contribution to the study design

To assess students' development of key competences in a way that is both comparable across schools and meaningful within classroom practice, the study adopted teacher assessment grids structured as analytic rubrics. The use of rubrics responds to the nature of key competences, which are multidimensional, context-dependent and expressed through observable behaviours, strategies and dispositions rather than through single right–wrong responses (Leutner et al., 2017). Rubrics make these constructs assessable by translating the competence framework into explicit criteria and progressive proficiency levels, offering behavioural anchors that support consistent judgement. Teacher rubrics complement student self-assessment by providing an external, practice-based perspective grounded in evidence accumulated through daily instruction and project activities. This dual-source approach strengthens the measurement, reducing the risk that findings are driven by a single method or respondent perspective.

The rubrics were directly derived from the competence taxonomy developed for the study and aligned with European reference frameworks (Council of the European Union, 2018). Each key competence is broken down into competence areas and specific competences, which are described across eight proficiency levels (A1-D2). Level descriptors reflect increasing complexity, autonomy and transferability of performance, enabling both a fine-grained snapshot of students' competence profiles and a structured way to quantify change over time.

The teacher grids were particularly appropriate for the paired-class design of the study. Each participating teacher assessed both an eTwinning class and a comparison control class within the same school context. Using the same rubric framework across both classes helps mitigate teacher-related variance and supports a fairer comparison between groups, while preserving validity in real classroom assessment contexts.

2.3.2 Structure and proficiency level logic

Each specific competence is presented on a dedicated rubric layout with three main components, which are kept constant across the entire instrument set. First, the rubric header identifies the competence hierarchy (key competence, competence area, and specific competence) and provides a short operational description of what the specific competence entails in practice.

Second, the centre of the rubric contains the proficiency ladder, articulated into eight levels (A1-D2). These levels represent a developmental progression from foundational performance to advanced mastery. In the grids, levels are grouped into broader bands corresponding to increasing autonomy and sophistication, and each level is associated with concise "can-do" descriptors that function as behavioural anchors. This allows the teacher to select, for each student and for each specific competence, the level that best fits the available evidence, based on classroom and project-related observations.

Third, the rubric includes complementary reference descriptors organised into knowledge, skills, and attitudes. These descriptors provide contextualised examples of what the specific competence may involve and help teachers interpret level choices in a coherent way. Together with the levelled "can-do" statements, this structure links observable classroom evidence to the underlying competence model and supports both interpretation of results for classroom use (profiles, strengths and areas for

Competence
Personal, Social, and Deutero-learning Competence

Competence Area
1* **Personal**

Specific Competence
1.1* **Self-awareness and self-efficacy**

Reflect on one's own needs, aspirations, and goals. Assess strengths and weaknesses, and believe in one's ability to influence events and self-determine. Have (justified) confidence in one's ability to achieve goals and overcome obstacles. Be able to reflect on one's beliefs, tendencies, motivations, and socio-cultural affiliations in order to develop and calibrate one's identity.

COMPETENCE LEVEL			
A FOUNDATIONAL	1	At a basic level, with guidance, can:	•Identify their basic needs and aspirations. •Recognize some strengths and weaknesses. •Recognize that their beliefs and motivations influence their actions.
	2	At a basic level, independently and with appropriate guidance when necessary, can:	•Reflect on their personal needs, aspirations, and simple goals. •Describe their strengths and the areas in which they can improve. •Begin to believe in their ability to achieve simple goals.
B INTERMEDIATE (AUTONOMY)	3	Independently, with support where necessary, while solving simple problems, can:	•Assess their strengths and weaknesses in familiar contexts. •Set personal goals and develop basic plans to achieve them. •Demonstrate basic confidence in their ability to overcome obstacles. •Reflect on how their beliefs and motivations influence their behavior and actions.
	4	Independently, with support where necessary, while solving well-defined but non-routine problems, can:	•Critically assess their personal needs, aspirations, and goals. •Shape their goals on the basis of self-assessment. •Demonstrate self-efficacy in changing and/or problematic circumstances. •Critically reflect on how their beliefs and motivations influence their behavior and actions.
C ADVANCED (RELATIONALITY)	5	Independently and in complex situations, can:	•Help others reflect on their strengths and weaknesses and/or achieve their goals. •Inspire confidence in others. •Demonstrate strong self-efficacy grounded in concrete abilities.
	6	Independently, while paying attention to their own needs and those of others, in complex situations, can:	•Overcome obstacles through resilience and self-efficacy. •Guide others in developing self-awareness and self-efficacy. •Critically analyze and recognize how their beliefs, motivations, and cultural affiliations influence their actions.
D SPECIALIZED (INNOVATION)	7	Independently, while paying attention to their own needs and those of others, in complex and changing situations, can:	•Approach self-criticism, personal development, and self-awareness in an original way. •Guide others in complex contexts to develop their self-awareness and self-efficacy. •Integrate knowledge from various disciplines to improve understanding of self-awareness and self-efficacy.
	8	Independently, while paying attention to their own needs and those of others, in complex, changing, or exceptional situations, can:	•Generate new theories and practices on self-awareness and self-efficacy. •Establish relationships that integrate and promote personal and intrapersonal development. •Inspire others to make a difference in complex and unpredictable situations. •Take the initiative to expand their knowledge and skills.

KNOWLEDGE	•Understands the importance of self-awareness in personal, educational, and professional development. •Knows methods and tools for self-reflection and self-assessment. •Is aware of how personal beliefs, motivations, and cultural affiliations shape identity and behavior. •Understands the concept of self-efficacy and its impact on motivation and goal achievement. •Knows strategies for setting realistic, measurable, and achievable personal goals. •Is aware of psychological theories related to self-concept, self-esteem, and motivation. •Understands the role of resilience in overcoming obstacles and difficulties. •Knows how cultural contexts can influence perspectives and interactions.
SKILLS	•Ability to reflect on and articulate personal needs, aspirations, and goals. •Can objectively assess personal strengths and weaknesses. •Can set personal goals and develop concrete plans to achieve them. •Skilled in adapting personal beliefs and behaviors on the basis of self-reflection, new information, and feedback. •Ability to inspire and support others in developing their self-awareness and self-efficacy. •Can recognize and manage the influence of cultural affiliations on their personal perspectives. •Can seek and use feedback for continuous self-improvement.
ATTITUDES	•Shows openness and willingness to engage in self-reflection and personal growth. •Demonstrates confidence in their ability to achieve goals and overcome challenges. •Believes in the ability to make a positive difference. •Exhibits resilience and perseverance in the face of obstacles and difficulties. •Values personal development and learning. •Maintains a positive attitude and is motivated to pursue their aspirations. •Understands and respects cultural diversity and its impact on themselves and others.

Fig. 2.3 – Example of a teacher assessment grid for a specific competence (Self-awareness and self-efficacy – Area of competence: Personal – Key Competence: Personal, Social and Learning-to-Learn).

improvement) and scoring for research purposes (conversion of levels to an ordinal 1-8 scale and aggregation to area and key competence).

The full collection of tables, graphs, and materials is too large to be printed in the book without compromising readability; for this reason, it has been stored in a dedicated online repository, where figures and supporting material are freely accessible and downloadable via the QR code reported.

https://etwinning.indire.it/ricerca/etwinning-e-lo-sviluppo-delle-competenze-degli-alunni/

Regarding the level logic, while the eight-level scale (A1-D2) is adopted from the DigComp 2.2 logic, the practical meaning of these levels is not fully explicit in the original framework and therefore needed to be operationalised for consistent classroom-based use (Vuorikari et al., 2022). In this study, levels are interpreted as a developmental progression defined by multiple, complementary dimensions: the objective complexity of the tasks a learner can manage; the degree of autonomy versus need for guidance; the ability to transfer learning to new contexts and to move beyond routine problem-solving; the capacity to collaborate effectively, including shifting from receiving support to providing support to others; and, at higher levels, the ability to introduce innovation (e.g., experimenting with new strategies, tools, or approaches and contributing to improvement of shared practices). This multi-dimensional interpretation was used to write level descriptors across all specific competences and to support teachers in applying the A1-D2 scale consistently at pre and post assessment points

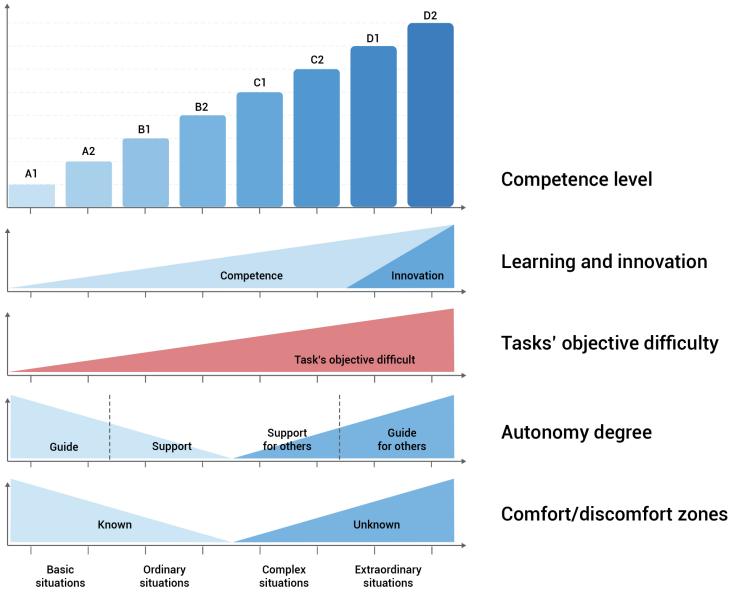


Fig 2.4 – Competence levels

2.3.3 Administration and scoring procedures

Teachers used the grids as both an observation framework and a structured assessment tool. Throughout the implementation period, the rubrics served as a reference to guide ongoing observation of students' behaviours. Formal scoring was then performed at two time points (pre – T1 – and post – T2 – intervention), using the same rubrics, so that change could be quantified on an identical measurement scale. At each time point, teachers assigned a proficiency level to each student at the level of the specific competences (the most granular layer of the taxonomy). Competence-area scores and overall key-competence scores were not directly judged "globally" by the teacher, but were derived downstream by aggregating the levels attributed to the underlying specific competences, ensuring that higher-level indicators remained traceable to concrete, item-by-item level assignments.

To make completion faster and reduce cognitive load, teachers were provided with dedicated Excel files designed as streamlined data-entry versions of the rubrics. For each student, the file included one worksheet per key competence. Within each worksheet, teachers selected the student's

level for each specific competence via a constrained drop-down menu (A1-D2), preventing invalid entries and standardising the encoding of levels. Once a level was selected, the file automatically displayed a short, level-specific descriptor (via an internal lookup table), so that teachers received immediate confirmation of the meaning of the chosen level without having to navigate the full rubric text. The same templates were used at T1 and T2, saving separate versions for each measurement wave and enabling clean pre–post comparisons. Completed files were finally collected by the research team and centralised for analysis. This procedure ensured that the same teacher applied the same rubric logic to both the experimental and the control class within each school, and that scoring was performed in a consistent, time-bounded manner across schools, while remaining feasible under real classroom conditions.

2.3.4 Strengths and limitations

A major strength of the teacher assessment grids is their strong construct alignment with the study's competence taxonomy and, by extension, with European reference frameworks. The rubrics translate broad competence definitions into specific competences and levelled descriptors, which increases transparency and supports interpretability: teachers can justify level assignments through observable evidence, and aggregated scores remain traceable to specific and contextualised judgements rather than to undifferentiated overall ratings.

A second strength is its strong grounding in ordinary classroom practice. Because the grids are designed for use in ordinary school settings, they capture competence development as it manifests in authentic classroom and project activities. This is particularly relevant for key competences that are expressed through behaviours, strategies, collaboration, and the quality of students' products. The paired-class design further enhances the usefulness of the tool: the same teacher applies the same rubric logic to both an eTwinning class and a comparison control class within the same institutional context, helping to reduce teacher-related variability and supporting more robust group comparisons.

From an implementation perspective, the use of dedicated, structured Excel templates constitutes an additional strength. It reduces administrative burden, standardises data entry, and minimises coding errors, making systematic assessment feasible at scale while maintaining consistency across

teachers and time points. The training session and guidance materials also contributed to a shared understanding of the competence structure and of the A1-D2 progression, supporting more reliable interpretation of the levels.

As with any rubric-based approach, there are also limitations to consider, although several were explicitly addressed in the study design. Teacher assessments inevitably involve a degree of professional judgement, and teachers may differ in how strictly they interpret descriptors or in the types of evidence they prioritise. In the present study, this risk was mitigated through shared training, common materials, standardised templates, and the within-teacher paired-class structure, which reduces the likelihood that differences between groups are driven primarily by individual teacher rating styles.

2.4 Student self-assessment questionnaires

2.4.1 Purpose and methodological role

To capture students' perspectives on their own competence development, the study used student self-assessment questionnaires administered pre and post intervention. Self-assessment is particularly suitable for key competences because many of their relevant components – such as self-regulation, learning strategies, sense of agency, perceived self-efficacy, and awareness of one's role in collaboration – are partly internal and external assessment alone could misunderstand them. In this sense, self-assessment provides access to learners' metacognitive monitoring of their skills and dispositions, and it supports a competence-oriented view of learning in which students are encouraged to reflect on how they approach tasks, challenges, and interactions (Sala et al., 2020). Beyond producing quantitative indicators, the act of responding can promote awareness of competence-related behaviours and can help students articulate examples of what they have learned or changed over time. This aligns with formative principles of competence-based education, while remaining compatible with the research aim of estimating pre–post differences.

From a measurement perspective, self-assessment is not treated here as a proxy for objective skill in isolation, but as a component of key competences – especially those centred on self-regulation, agency, and reflective judgement. This positioning is consistent with competence

frameworks such as LifeComp, which explicitly emphasise self-awareness, self-efficacy, and metacognitive monitoring as an indispensable dimensions of competence development (Sala et al., 2020). Accordingly, students' self-reports are taken into account as meaningful outcomes focusing on how learners perceive and narrate change, rather than as a simple substitute for external evaluation. To mitigate well-known limitations of self-report, we interpret effects conservatively and triangulate questionnaire findings with complementary evidence sources (Dooly & Vinagre, 2022; O'Dowd, 2021).

Methodologically, student questionnaires complement teacher assessment grids and strengthen the overall measurement strategy. Neither self-assessment nor teacher assessment can be assumed to be fully reliable on its own: self-reports may be influenced by response styles, confidence, or limited self-awareness, while teacher judgements may vary in interpretation, be influenced by cognitive bias, or depend on the visibility of behaviours in specific contexts. By collecting both perspectives on the same constructs, the study reduces reliance on any single source, increases robustness through triangulation (Leutner et al., 2017), and allows convergence – or divergence – between student and teacher views to be examined as part of the evidence base.

Student self-assessment offers a unique strength for transversal competences by capturing internal and often non-observable dimensions of learning like perceived agency, self-regulation, confidence, and metacognitive monitoring, which are central to several of the targeted frameworks. At the same time, self-report measures are vulnerable to response styles and social desirability, and students may over- or underestimate their competence due to confidence, limited self-awareness, or contextual factors unrelated to actual performance. For this reason, questionnaire results are interpreted cautiously and primarily as indicators of perceived change, and they are systematically triangulated with teacher rubric scores and qualitative evidence to strengthen validity and reduce single-method bias.

2.4.2 Questionnaire architecture and item mapping to the taxonomy

Student self-assessment was collected through five separate questionnaires, one for each key competence addressed in the study (Personal, Social and Learning to Learn; Citizenship; Entrepreneurship;

Cultural Awareness and Expression; Digital Competence). The use of parallel, competence-specific instruments ensured consistent coverage of the competence taxonomy while keeping each questionnaire focused and manageable for students aged 14-16. All five questionnaires followed the same overall layout and were administered in identical form in pre and post, enabling direct comparison over time.

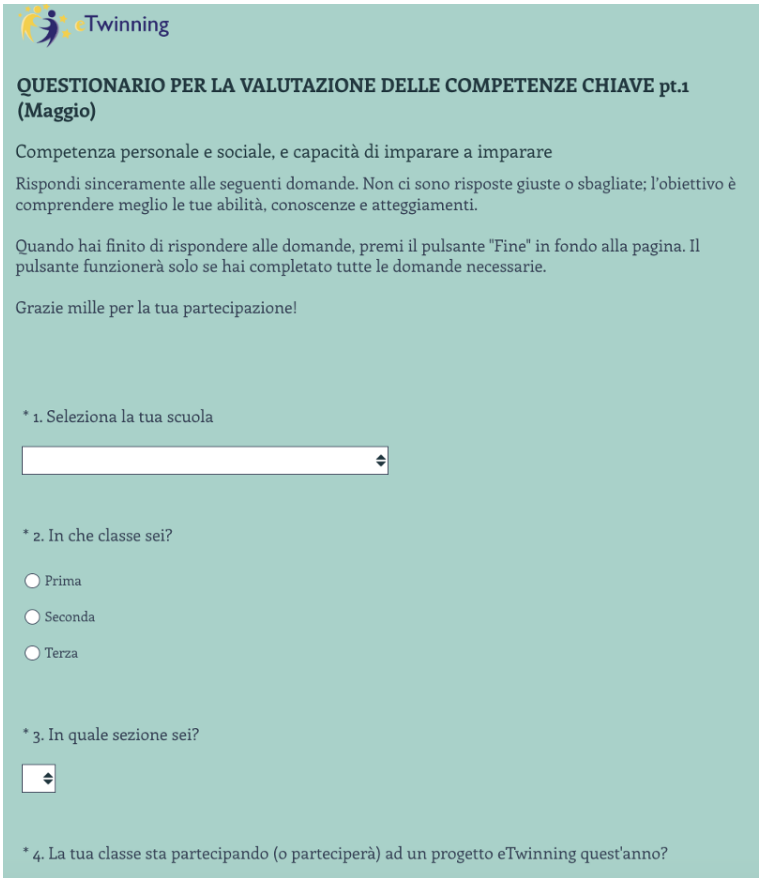
Each questionnaire combines closed-ended Likert items with open-ended prompts. The closed-ended section constitutes the core quantitative component. Items are organised to reflect the taxonomy structure: statements are mapped to specific competences (and, by extension, to competence areas and the overarching key competence), so that responses can be aggregated coherently from the most granular level to higher-level scores. Students indicate their agreement with each statement on a five-point Likert scale, providing a standardised measure of self-reported behaviours, strategies, and dispositions related to the targeted competence. Where relevant, items cover not only self-perceived ability, but also the knowledge and attitudinal dimensions implied by the underlying descriptors (e.g., awareness, responsibility, openness, critical orientation).

The open-ended component is positioned to capture contextualised evidence and reflection. Questions invite students to describe concrete examples, situations in which they applied the competence, and challenges encountered. These questions were designed to enrich the interpretation of the quantitative patterns, to capture aspects of the learning experience that cannot be fully represented by fixed-response items, and to support the mixed-methods integration by generating text data suitable for qualitative analysis.

2.4.3 Item development and links to reference instruments

Closed-ended items were developed through a structured translation of the competence taxonomy into student-facing statements. For each key competence, items were generated starting from the descriptors associated with specific competences (and their related knowledge, skills and attitudes). Each item was written to reflect a clearly identifiable behavioural or cognitive/affective indicator, using age-appropriate language while maintaining conceptual fidelity to the original framework-derived descriptors. This design allows responses to be traced back to the underlying taxonomy and supports coherent aggregation: item-level responses map to

specific competences, which then contribute to competence-area and overall key-competence scores.


eTwinning

QUESTIONARIO PER LA VALUTAZIONE DELLE COMPETENZE CHIAVE pt.1 (Maggio)

Competenza personale e sociale, e capacità di imparare a imparare

Rispondi sinceramente alle seguenti domande. Non ci sono risposte giuste o sbagliate; l'obiettivo è comprendere meglio le tue abilità, conoscenze e atteggiamenti.

Quando hai finito di rispondere alle domande, premi il pulsante "Fine" in fondo alla pagina. Il pulsante funzionerà solo se hai completato tutte le domande necessarie.

Grazie mille per la tua partecipazione!

* 1. Seleziona la tua scuola

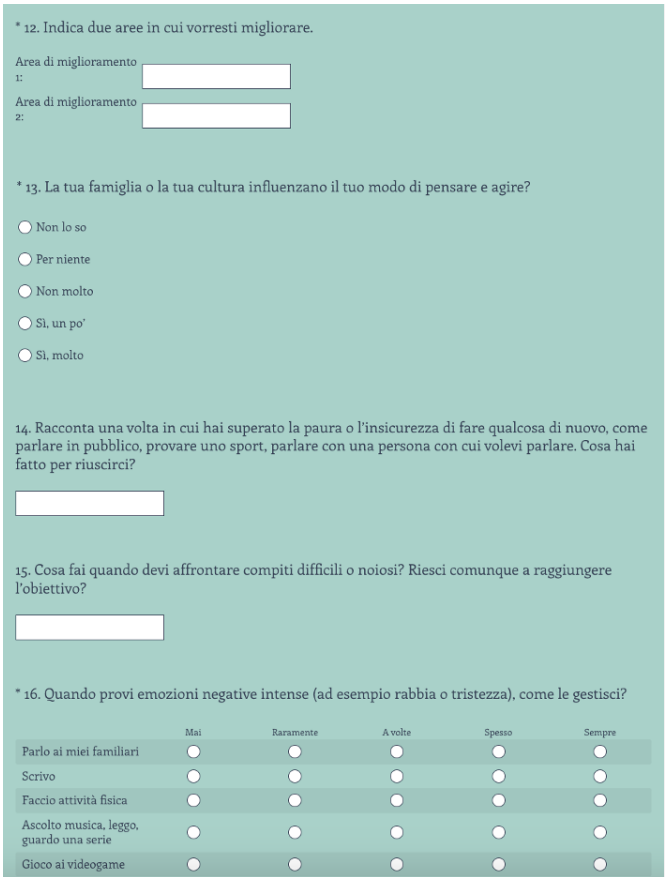
* 2. In che classe sei?

Prima
Seconda
Terza

* 3. In quale sezione sei?

* 4. La tua classe sta partecipando (o parteciperà) ad un progetto eTwinning quest'anno?

Fig. 2.5 – Extract from students' questionnaire part I


* 12. Indica due aree in cui vorresti migliorare.

Area di miglioramento 1:

Area di miglioramento 2:

* 13. La tua famiglia o la tua cultura influenzano il tuo modo di pensare e agire?

- Non lo so
- Per niente
- Non molto
- Sì, un po'
- Sì, molto

14. Racconta una volta in cui hai superato la paura o l'insicurezza di fare qualcosa di nuovo, come parlare in pubblico, provare uno sport, parlare con una persona con cui volevi parlare. Cosa hai fatto per riuscirci?

15. Cosa fai quando devi affrontare compiti difficili o noiosi? Riesci comunque a raggiungere l'obiettivo?

* 16. Quando provi emozioni negative intense (ad esempio rabbia o tristezza), come le gestisci?

	Mai	Raramente	A volte	Spesso	Sempre
Parlo ai miei familiari	○	○	○	○	○
Scrivo	○	○	○	○	○
Faccio attività fisica	○	○	○	○	○
Ascolto musica, leggo, guardo una serie	○	○	○	○	○
Gioco ai videogame	○	○	○	○	○

Fig. 2.6 – Extract from students' questionnaire part II

Item formulation followed a set of shared drafting rules across all five questionnaires to maximise comparability: consistent response format (five-point Likert agreement scale), avoidance of unnecessary technical terminology, preference for concrete and observable phrasing, and minimisation of double-barrelled statements. Where reverse-worded items were retained to reduce acquiescence bias, their polarity was carefully checked and later harmonised during coding to ensure a consistent direction of scoring.

In addition to the taxonomy-driven approach, item writing was informed by widely used self-assessment standardized tools and scales, which served as methodological references for structure, wording style, and coverage of relevant dimensions. In particular, the design drew on European

SELFIE (European Commission, 2018) for digital learning-related self-report formats, and on established instruments such as the Emotional and Social Competency Inventory (ESCI) (Boyatzis, Goleman, & Hay Group, 2007), the General Self-Efficacy Scale (GSE) (Schwarzer & Jerusalem, 1995), the Learning and Study Strategies Inventory (LASSI) (Weinstein, Palmer, & Acee, 2016), and the Intercultural Development Inventory (IDI) (Hammer, Bennett, & Wiseman, 2003) as benchmarks for how to operationalise constructs through short, comprehensible statements. These instruments were not adopted directly; rather, they provided design cues (e.g., item clarity, balance between behavioural and reflective statements, and questionnaire flow) to support the development of questionnaires consistent with the study's competence taxonomy and its European policy grounding.

Finally, draft items underwent iterative review collectively with the participating teachers, prior to administration, to ensure comprehensibility for students aged 14-16 and to refine wording without altering construct meaning. This step helped align student-facing items with classroom realities and reduced potential misunderstandings that could introduce measurement noise at pre and post administration.

2.4.4 Administration protocol and data quality

The student questionnaires were administered twice, at T1 (November-December 2024) and T2 (May-June 2025), using the same instruments in both cases. Administration usually took place during regular school time, in the classroom setting, under the supervision of the participating teacher, following shared instructions provided by the research team. Questionnaires were completed in digital format, and responses were collected centrally in a pseudonymised form to enable matching across the two questionnaires while preventing direct identification of individual students.

Several procedural measures were adopted to support data quality and comparability. First, the administration protocol was standardised through written guidance and shared timing windows. Second, since questionnaires targeted students aged 14-16, item wording and response formats were reviewed with the participating teachers prior to field implementation to minimise ambiguity and age-inappropriate phrasing, reducing the likelihood of systematic misunderstandings. In addition, the animated video developed for students provided a consistent explanation of the

study's purpose and procedures, helping to align expectations and reduce variability due to different classroom-level introductions.

Data quality checks were performed during preprocessing. Raw exports were inspected to verify variable integrity (e.g., duplicated fields, invalid values, inconsistent labels). Missing data were expected in a school-based longitudinal design and were mainly due to student absence or incomplete participation at one of the two questionnaires. For analyses based on pre–post change, only students with matched data at both time points for the relevant competence questionnaire were included, while open-ended responses were retained for qualitative analysis even when only one wave was available. This approach preserves the validity of delta-based comparisons while maximising the use of available qualitative information.

2.5 Teacher reflective logbook

2.5.1 Purpose within the mixed-methods design

Alongside the quantitative instruments, the study used a structured teacher reflective logbook (diary) to document the implementation process and to provide an interpretive layer for the observed changes in key-competence scores. The logbook functioned as a narrative trace of what happened in each class over time – what activities were carried out, which contextual events affected participation, and how teachers perceived competence-related behaviours emerging in authentic classroom and project situations. This is especially relevant in a school-based, quasi-experimental design where projects differ in timing, pacing, and classroom dynamics: the logbook captures information that is useful to understand how and under which conditions competence development may occur, beyond what can be inferred from pre–post scores alone.

Within the study's sequential explanatory mixed-methods logic, logbook entries were used after the quantitative phase to support interpretation. Specifically, they provide structured contextual evidence about the kinds of learning tasks and interactions that characterised the month, constraints and enabling factors (e.g., absences, organisational pressures, timetable issues), and teachers' observations related to the target key competences. The logbook template was intentionally designed to be comparable across sites and time while remaining feasible for teachers: it collects the same categories of information for both the eTwinning class and the matched

comparison control class each month, strengthening the usefulness of logbooks for within-school interpretation.

Overall, the teacher logbook is therefore not an additional measure of competence in the same sense as rubrics or questionnaires, but a complementary qualitative source designed to document implementation and context systematically, and support a grounded interpretation of quantitative findings by anchoring them to classroom realities and to teachers' accounts of processes occurring during the project period.

2.5.2 Structure and reporting cycle

The teacher logbook was designed as a structured monthly report compiled between January and May. The logbook follows a consistent internal structure and is completed separately for the eTwinning class and the matched comparison control class, so that teachers document both contexts using the same structure. For each class, the logbook begins with a brief description of the activities carried out during the month, including ordinary curricular work and a specific section dedicated to eTwinning tasks and interactions. Teachers then indicate objectives reached or in progress and report relevant events that may have affected learning or participation.

The core of the logbook consists of guided reflections on competence development: teachers are prompted to comment – competence by competence – on observed progress, difficulties, and noteworthy episodes linked to the key competences, using short narrative notes grounded in classroom evidence. The logbook is organised in labelled competence sections, enabling teachers to provide targeted observations rather than a single global account. The reflection section includes questions corresponding to the competence domains addressed by the project.

Diario di Bordo Mensile
Progetto di Ricerca Competenze Chiave ed eTwinning

Data:
Scuola:
Docente:

CLASSE ETWINNING:

Breve descrizione delle attività svolte nel mese:

Obiettivi raggiunti (o in via di sviluppo):

Eventi con impatto sulla formazione degli studenti (malattie, problemi specifici, ritardi, assenze giustificate o ingiustificate, episodi relativi alla classe, ecc.):

Riflessioni sullo sviluppo delle Competenze Chiave (progressi, problematiche, curiosità, spunti di riflessione, ecc.)

1) Competenza Personale, Sociale, e Imparare ad Imparare

2) Competenza Sociale e Civica in Ambito di Cittadinanza

3) Competenze Imprenditoriale

4) Competenza nella Consapevolezza e nell'Espressione Culturale

5) Competenza Digitale

6) Competenza Multilinguistica

Fig. 2.7 – Teachers' Logbook part I

CLASSE DI CONTROLLO

Breve descrizione delle attività svolte nel mese:

Obiettivi raggiunti (o in via di sviluppo):

Eventi con impatto sulla formazione degli studenti (malattie, problemi specifici, ritardi, assenze giustificate o ingiustificate, episodi relativi alla classe, ecc.):

Riflessioni sullo sviluppo delle Competenze Chiave (progressi, problematiche, questioni di rilievo, curiosità, spunti di riflessione, ecc.)

1) Competenza Personale, Sociale, e Imparare ad Imparare

2) Competenza Sociale e Civica in Ambito di Cittadinanza

3) Competenze Imprenditoriale

4) Competenza nella Consapevolezza e nell'Espressione Culturale

5) Competenza Digitale

6) Competenza Multilinguistica

Riflessione personale del docente:

Come ti senti rispetto al percorso svolto finora? Quali difficoltà hai incontrato e quali soddisfazioni hai tratto da questa esperienza?
In che modo queste attività stanno influenzando il tuo approccio didattico e il tuo sviluppo professionale?

Fig. 2.8 – Teachers' Logbook part II

Finally, each monthly entry closes with a "teacher personal reflection" block built around a small set of guiding questions (e.g., how the teacher feels about progress so far; difficulties encountered and satisfactions; perceived influence on teaching practice and professional development). This section was included to capture contextual and process-oriented information that may not emerge from competence-specific prompts, while keeping the format comparable across teachers and months.

2.5.3 Outputs and analytical use for integration

Logbook entries were treated as a structured qualitative corpus aimed at supporting thematic analysis and mixed-methods integration. After collection, each monthly logbook was prepared for analysis by isolating the relevant textual sections and organising them by teacher, month, and class condition (eTwinning vs control). This resulted in a set of clearly indexed text units that could be analysed consistently across schools and over time.

For the qualitative strand, the primary outputs were textual units suitable for thematic coding, such as short narratives, examples, and episodes reported by teachers in response to the template prompts. These segments were used as qualitative evidence to identify recurring themes related to implementation, classroom dynamics, contextual constraints or enablers, and competence-relevant behaviours.

Within the sequential explanatory logic of the study, logbook outputs were then used to link qualitative evidence to the quantitative strand without turning the qualitative component into a justification of outcomes. Specifically, the logbooks were used to document how the project unfolded across different contexts, clarify relevant differences in conditions, pacing, and constraints between classes and months, and provide process-oriented information that can be connected to quantitative patterns during integration. This linkage was operationalised by structuring the logbooks so that qualitative themes could be examined alongside the same competence domains measured quantitatively, enabling a coherent interpretation framework while keeping the two strands analytically distinct.

2.6 Teacher Professional Standards Framework

Teachers' professional profiles were documented through a competence self-assessment tool grounded in the Italian Teacher Professional Standards Framework, currently adopted nationwide within the induction year for newly hired teachers (Pettenati et al., 2024; 2025). In the context of this research design, the Teacher Professional Standards Framework was administered to the teachers involved in the pilot in November 2024 to encourage reflection on their own competences and to collect data on their perceived professional profile.

The Framework is structured into three Areas, eight minimum Professional Standards, and 36 indicators of professional competence.

ANNO DI FORMAZIONE E PROVA PER DOCENTI
NEOASSUNTI E DOCENTI CON PASSAGGIO DI RUOLO
Anno scolastico 2023/24

Bilancio iniziale delle competenze

Nome ..... Cognome .....

Istituto di appartenenza .....

Sede (città/regione) .....

Livelli di competenza

Ogni standard rappresenta la descrizione del livello ottimale atteso per ogni docente, sapendo che il criterio evolutivo è rappresentato dal passaggio da una situazione di esecuzione con supporto di tutoraggio ad una progressiva autonomia e padronanza, alla consapevolezza del proprio 'stile professionale', all'arricchimento creativo e personale, alla propensione/capacità di trasferire ad altri il proprio 'sapere professionale'.
Per una migliore comprensione degli indicatori di competenza si rinvia alla consultazione della *Legenda del Bilancio iniziale delle competenze*, strumento allegato al presente documento, allegato nel quale sono fornite puntuali e dettagliate spiegazioni per ciascun indicatore; il documento può rivelarsi utile sussidio per una migliore autovalutazione dei livelli di competenza attesi.

Nessuna = Livello 0 La competenza non è stata mai sperimentata.
Iniziale = Livello 1 La competenza è in fase di avvio del processo di acquisizione e di prima formazione.
In corso di formazione = Livello 2 La competenza è in via di consolidamento e in progressione verso gli standard attesi.
Standard atteso = Livello 3 La competenza è consolidata, consapevole e sicura.
Esperto = Livello 4 La competenza è matura e accreditata e può essere messa a disposizione dei/delle colleghi/e e della scuola.

Ministero dell'Istruzione e del Merito — DG PERSONALE SCOLASTICO — INDIRE ISTITUTO NAZIONALE DOCUMENTAZIONE INNOVAZIONE RICERCA EDUCATIVA

Fig. 2.9 – Competence self-assessment

The three Areas describe the main dimensions of teachers' professionalism: Didactics (teaching, methodological and relational competences), Institution & Community (participation in school life and relationships with the educational community and local context), and Professionalism (continuous professional development and professional responsibility).

The framework articulates the following eight Professional Standards:

1. Designing and managing learning situations oriented to the development of the European key competences for lifelong learning, including the use of digital and face-to-face/distance learning tools and documentation and assessment practices;
2. Adopting and adapting teaching strategies and methods, including inclusive and personalised approaches for students with disabilities and special educational needs;
3. Using assessment strategies to support learning, with a formative orientation;
4. Managing classroom relationships and behaviours to promote learning within a positive and collaborative climate;
5. Actively participating in the organised professional life of the school, including internal and external evaluation processes of formal, non-formal and informal learning;
6. Working collaboratively within the school professional community;
7. Building constructive relationships with families and institutional and social partners;
8. Engaging in continuous professional development and assuming new professional responsibilities, integrating disciplinary and didactic knowledge and flexibly managing learning groups to support personalisation and the development of transversal and communicative competences.

Area	Professional Standards	Indicators of professional competence
A. Didactics – area of teaching, methodological, and relational competences	Standard 1	Indicators 1-7
	Standard 2	Indicators 8-10
	Standard 3	Indicators 11-15
	Standard 4	Indicators 16-19
B. Institution & Community – area of competences related to participation in school life and the social context	Standard 5	Indicators 20-23
	Standard 6	Indicators 24-26
	Standard 7	Indicators 27-30
C. Professionalism – area of continuous professional development, care of professionalism, and the development of new responsibilities	Standard 8	Indicators 31-36

Tab. 2.1 – Competence self-assessment structure

For each indicator, teachers self-assess their level of competence on a five-level developmental scale:

- Level 0 (No competence) indicates that competence has not yet been experienced in practice.
- Level 1 (Initial) refers to early and exploratory engagement with the competence, typically supported by guidance or tutoring.
- Level 2 (In progress) describes a competence that is being consolidated through practice and reflection but is not yet fully stable.
- Level 3 (Expected standard) indicates a solid, autonomous and conscious mastery of the competence in routine professional situations.
- Level 4 (Expert) corresponds to a mature and recognised competence that can be transferred to colleagues and contribute to the professional development of the school community.

Chapter 3
eTwinning Projects as Documented Pedagogical Cases

Elena Bettini
Sara Martinelli

3.1 Purpose, corpus and qualitative analytical approach

This chapter presents a qualitative analysis of the eTwinning projects developed by the teachers involved in the study, with the aim of examining the pedagogical quality and design features of the learning experiences implemented in the experimental classes. The analysis is intended to complement the quantitative findings presented in Chapter 4 by offering an in-depth interpretation of the instructional contexts within which student competence development took place.

Rather than focusing on causal explanations or on the direct measurement of impact, this chapter adopts an interpretative and exploratory perspective, centred on the analysis of projects as documented pedagogical cases. The underlying assumption is that project design, implementation choices and pedagogical coherence constitute meaningful lenses for understanding the conditions that make competence development plausible in complex, international and digitally mediated learning environments.

The qualitative corpus analysed in this chapter consists of 14 eTwinning projects, all of which were awarded a National Quality Label following external evaluation by the Italian NSO. As part of the research design, participating teachers were invited to submit their projects for Quality Label recognition, thereby producing a structured and comparable set of documents describing project objectives, pedagogical approaches, collaboration models, use of technology, curricular integration and

outcomes. In addition to the project descriptions, the corpus includes quantitative scores and qualitative feedback provided by NSO evaluators, which constitute an external and independent assessment of project quality.

The analytical framework adopted in this chapter is therefore anchored in the Quality Label criteria, which articulate five core dimensions of project quality (Bettini & Mentuccia, 2023): collaboration between partner schools, pedagogical approaches, use of technology, curricular integration, and results and documentation. These criteria are not treated as a mere evaluative checklist, but as an analytical lens through which to identify recurring pedagogical patterns, strengths and sources of variability across projects.

Within the broader mixed-methods design of the study, this qualitative analysis serves a contextual and interpretative function. It does not aim to establish causal links between project features and student outcomes, but rather to clarify how different configurations of international project-based learning are enacted in practice, and how they align with pedagogical principles known to support the development of key competences. In this sense, the chapter contributes to the overall research by situating the quantitative evidence of competence development within a richer understanding of teaching practices, professional choices and learning environments.

3.2 The project corpus and Quality Label framework

The qualitative corpus analysed in this chapter is composed of 14 eTwinning projects developed within the research framework and submitted for evaluation through the National Quality Label process. All projects exceeded the minimum quality threshold required for awarding and were therefore recognised as quality projects, albeit with varying scores and differentiated qualitative evaluations. This variability provides a meaningful basis for analysing differences in pedagogical design and implementation within a shared institutional framework.

The Quality Label evaluation framework[1] constitutes the common

1 The National Quality Label is a form of recognition for teachers and pupils who have bene involved in an eTwinning project, all project are evaluated on five criteria published on ESEP website: https://school-education.ec.europa.eu/en/etwinning/-labels/etwinning-national-quality-label

reference system for analysing the projects. As defined by eTwinning, the framework articulates project quality along five core dimensions:

(1) collaboration between partner schools;
(2) pedagogical approaches;
(3) use of technology;
(4) curricular integration;
(5) results and documentation.

Each project was independently reviewed by trained evaluators from the Italian NSO, who assigned quantitative scores and provided qualitative feedback for each dimension. In the context of this study, these evaluations are treated as an external validation of pedagogical quality, rather than as a ranking mechanism or outcome measure.

Importantly, the fact that all projects received a Quality Label does not imply uniform quality or homogeneity in pedagogical design. On the contrary, the distribution of scores and reviewer comments highlights meaningful differences in how international project-based learning is conceptualised, structured and documented, even among experienced eTwinning teachers. This internal variability within a cohort of awarded projects is analytically valuable, as it allows the exploration of different configurations of pedagogical quality while controlling for basic participation and compliance with programme requirements.

The Quality Label framework is therefore used in this chapter not only as a criterion for corpus selection, but also as an analytical scaffold. It supports the identification of recurring pedagogical patterns, strengths, and limitations across projects, while maintaining a close connection to a quality framework that is widely recognised and institutionally embedded at European level.

3.3 Professional profile of participating teachers as a contextual condition

This section provides a contextual description of the professional profiles of the teachers involved in the study. Its purpose is not to explain differences in project quality or student outcomes, but to document the professional conditions within which the analysed eTwinning projects were designed and implemented. By making these conditions explicit, the analysis gains

transparency and interpretative robustness, while avoiding simplistic or deterministic readings.

3.3.1 Data source and framework

Teachers' professional profiles were documented through a competence self-assessment instrument grounded in the Italian Teacher Professional Standards Framework, currently adopted at national level within the induction year for newly hired teachers (Pettenati et al, 2024). The framework defines expectations for teachers across their entire professional career and is articulated into three main areas – Didactics, Institution and Community, and Professionalism – further specified through eight standards and 36 indicators.

Since the 2023/24 school year, this framework has been operationalised nationwide through mandatory self-assessment tools integrated into the digital teacher portfolio managed by INDIRE on behalf of the Ministry of Education (Pettenati et al, 2025). Within this system, teachers complete an Initial Competency Assessment at the beginning of the induction year and a Final Competency Assessment at its conclusion, both designed to foster structured reflection and professional growth rather than evaluation. For the purposes of this study, the instrument was administered to the participating teachers to document their self-perceived professional competence profiles.

3.3.2 Characteristics of the participating teacher group

The group of teachers involved in the study is characterised by high professional seniority and consolidated disciplinary expertise, and by a degree of institutional diversity in terms of school type. Most participants teach in General Upper Secondary Institution (10 teachers), alongside a smaller number from IVET Upper Secondary Institution (4 teachers). While remaining within the same educational level, this distribution reflects different organisational and curricular contexts within upper secondary education.

In terms of disciplinary background, most participants teach modern foreign languages – primarily English, but also Spanish, French and German – reflecting the close alignment between eTwinning projects and language-mediated, internationally oriented learning environments. The

group also includes teachers from other subject areas, such as mathematics, Italian language and literature, philosophy and human sciences, and design and technology, contributing to a moderate but meaningful disciplinary heterogeneity.

From a demographic perspective, teachers were born between 1959 and 1978, placing them predominantly in mid-to late-career stages at the time of the study. Teaching experience ranges from approximately 18 to 40 years, with the majority of teachers reporting more than two decades of service. This profile indicates a cohort of experienced professionals with well-established teaching identities and substantial familiarity with school organisation and curricular evolution.

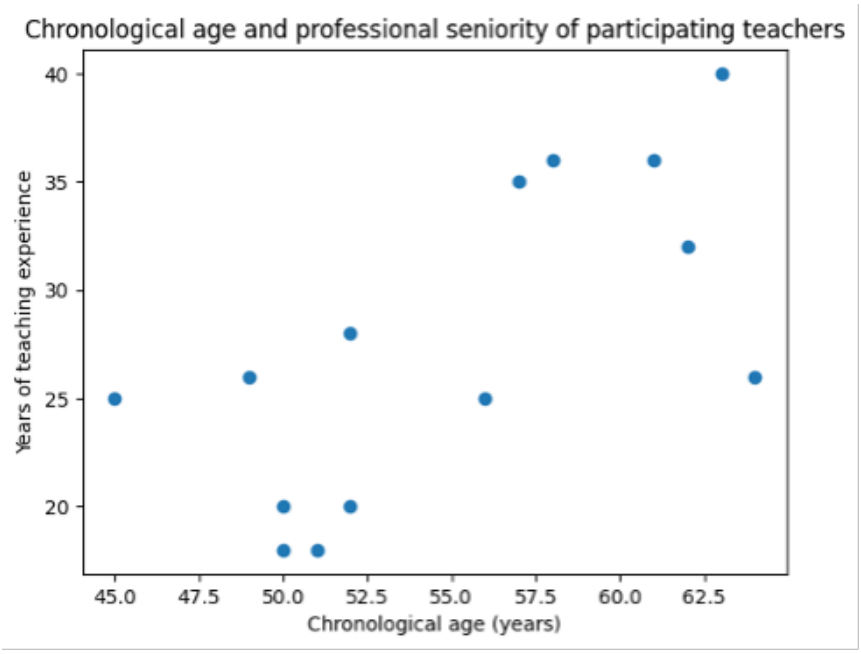


Fig. 3.1 – Teachers age

In terms of eTwinning participation, teachers display long-standing and intensive engagement with the programme, we selected them among eTwinning Ambassadors. Registration on the platform spans from 2006 to 2018, and the number of completed projects per teacher ranges from a dozen to nearly one hundred. Many teachers report an average project frequency exceeding one project per year, suggesting that international project-based

work is embedded in routine teaching practice rather than treated as an occasional innovation. All teachers have received at least one National Quality Label, with many accumulating multiple recognitions over time, a substantial proportion of which were also awarded at European level.

3.3.3 Perceived professional competences

The analysis of teachers' self-assessments reveals a consistently high perception of professional competence across all three areas of the framework, with most responses concentrated at Level 3 (expected standard) and Level 4 (expert). Within the Didactics area, teachers report strong perceived competence in designing and managing learning situations, regulating learning processes through formative assessment, and fostering collaborative classroom environments. Particularly high levels of perceived expertise emerge in the use of digital and didactic mediators, in adaptive instructional decision-making, and in the management of collaborative learning dynamics.

Within the Institution & Community area, teachers report high levels of competence in participating in school life and collaborating with colleagues, while engagement with families and external partners is perceived as less consolidated. This pattern suggests a professional orientation that privileges structured collaboration within institutional and pedagogical settings, rather than outward-facing networking activities.

The Professionalism area emerges as the most consistently strong dimension of the profile. Teachers report very high levels of perceived competence in continuous professional development, research-informed practice, and professional collaboration at national and international level. The ability to translate professional learning experiences into instructional redesign is particularly prominent, highlighting a strong orientation towards reflective practice and lifelong learning.

These findings resonate with previous research conducted in 2023 on the impact of long-term participation in eTwinning on teachers' continuing professional development in Italy (Fabbro et al., 2023). That study, which combined a large-scale questionnaire administered to 1,034 eTwinning teachers with a multiple case study design, investigated the extent to which sustained engagement in eTwinning activities influences teachers' perceptions of their competences in the areas of didactics, professionalism, and school participation, as well as the meanings teachers attribute to this relationship.

Across the three areas, the study highlighted consistent patterns. In the Didactics area, teachers reported improvements in co-design practices and in the adoption of project-based learning approaches, alongside a more diversified and intentional use of digital technologies. In the area of Professionalism, eTwinning participation was linked to the strengthening of a shared digital ethics within safe learning environments and to the central role of peer learning in supporting teachers' professional growth, particularly with regard to pedagogical uses of technology. Finally, in the area of School Participation, the study documented enhanced collaboration with international partners, stronger integration of projects within the curriculum, and, in some cases, increased involvement of families.

These earlier findings suggest that prolonged and intensive engagement in eTwinning may contribute to the consolidation of professional dispositions and competences that are coherent with those emerging from the self-assessment profiles of the teachers involved in this research. In this sense, the high levels of perceived competence observed – particularly in the areas of didactic design and professionalism – can be read as part of a broader trajectory of professional learning documented in previous national research, rather than as isolated or incidental characteristics of the present sample.

3.3.4 Methodological note on interpretation

From a methodological standpoint, it is important to emphasise that the professional profiles presented in this section are treated as contextual conditions rather than explanatory variables. Despite the overall high level of perceived professional competence within the group, the analysis of eTwinning projects presented in the following sections reveals meaningful variability in pedagogical design, collaboration practices and documentation quality.

Documenting the teachers' profiles therefore serves to delimit the analytical field and to support a more nuanced interpretation of the findings. By showing that the projects were developed by experienced teachers with strong self-perceived competences in key professional domains, the analysis can focus more confidently on pedagogical coherence, design choices and implementation strategies as the primary sources of variation across projects.

3.4 Overview of project themes and pedagogical orientations

The fourteen eTwinning projects included in the qualitative corpus cover a wide range of thematic areas, reflecting both European policy priorities and the diverse educational interests of the participating teachers. Despite this thematic variety, the projects share a common orientation towards the development of transversal competences through international, collaborative, and project-based learning experiences. You can find the complete list of projects and TwinSpaces on our website.

https://etwinning.indire.it/ricerca/etwinning-e-lo-sviluppo-delle-competenze-degli-alunni/

3.4.1 Main thematic areas

Several projects are explicitly grounded in European citizenship and civic education, focusing on issues such as democratic participation, equality, cultural diversity, and European identity (e.g. Be EU, Young Voices of Europe, L'Europe c'est nous). These projects typically aim to foster students' awareness of rights, responsibilities, and shared values through dialogue with peers from other countries.

Another prominent thematic cluster concerns sustainability and the Sustainable Development Goals (SDGs). Projects such as Mundo Verde and Power Up engage students in environmental and social challenges, combining scientific inquiry, problem-solving, and civic engagement. These projects often integrate ecological awareness with digital communication and collaborative action.

A third group of projects addresses well-being, personal development, and social-emotional learning, as Beyond Tomorrow – Wellbeing 2.0 and

Our aim: Well-being at school!. These initiatives focus on students' personal, social, and emotional competences, promoting reflection on mental health, relationships, and life skills within an international learning context.

Other projects explore disciplinary and cross-disciplinary themes, including literature and cultural exchange (Literary Bridges), artificial intelligence and digital ethics (AI: Friend or Foe?), financial education (M.O.N.E.Y. Matters), creative digital expression (Interactive pAIntings), gender equality (Equality is the Measure of Justice, the Foundation for Our Future!), freedom of expression (Speak up!) and application of mathematical models to reality (LifeModels). In these cases, subject-specific content is used as a vehicle for broader competence development, particularly in relation to critical thinking, communication, and digital literacy.

Overall, the thematic diversity of the projects illustrates how eTwinning can be integrated into different curricular areas while maintaining a strong focus on transversal competences and international collaboration. This wealth of topics is also linked to the profile of the teachers participating in the experiment as detailed in section 3.3.2.

3.4.2 Pedagogical approaches

Across the corpus, the projects are characterised by a consistent emphasis on active and student-centred pedagogical approaches. Twenty years of experience with eTwinning projects indicates that project-based learning (PBL) is undoubtedly one of the most suitable methodologies for developing an effective eTwinning project. Indeed, most initiatives adopt in fact most initiatives adopt forms of project-based learning (PBL), in which students work collaboratively over extended periods to produce shared outputs, such as digital artefacts, presentations, campaigns, or creative products.

Inquiry-based learning, problem-solving, and cooperative learning strategies are frequently employed, particularly in projects addressing sustainability, digital technologies, and civic education. In several cases, students are encouraged to conduct research, compare national perspectives, and propose solutions to real-world issues in collaboration with their international partners.

Some projects also integrate CLIL (Content and Language Integrated Learning) elements, using English or other foreign languages as the main medium of communication. This approach supports the simultaneous

development of subject knowledge, linguistic competence, and intercultural communication skills.

A recurring pedagogical feature is the assignment of active roles to students, such as journalists, researchers, digital designers, ambassadors, or project coordinators. These roles are intended to promote responsibility, initiative, and ownership of the learning process, reinforcing the student-centred nature of the projects.

3.4.3 Target groups and curricular contexts

All projects were implemented in upper secondary education, involving students aged approximately 14 to 16. Within this age range, the projects were adapted to different school tracks and curricular contexts, including lyceums, technical institutes, and interdisciplinary pathways.

In most cases, project activities were embedded within regular school subjects, such as languages, social sciences, science, technology, or civic education. Several projects explicitly adopted an interdisciplinary approach, combining content from multiple subject areas in order to address complex themes such as sustainability, citizenship, or digital transformation.

The integration of project activities into ordinary school timetables and curricula ensured that eTwinning was not treated as an extracurricular add-on, but as a meaningful component of formal learning. This curricular embedding is particularly relevant for competence-oriented education, as it allows transversal skills to be developed in connection with disciplinary learning objectives.

3.4.4 Shared orientations and distinctive features

Despite differences in themes, contexts, and disciplinary focus, the projects share several common orientations:

- an emphasis on international collaboration,
- the use of digital platforms for communication and production,
- a focus on student agency,
- and an explicit or implicit reference to transversal competences.

At the same time, the projects differ in the depth of pedagogical structuring, the intensity of collaboration, and the sophistication of the

learning activities. These differences, which are reflected in the Quality Label evaluations, provide the basis for the more detailed analysis of quality levels and pedagogical patterns presented in the following sections.

3.5 Quality levels and external evaluations

Although all the projects included in the corpus were awarded a National Quality Label, the external evaluations reveal meaningful variation in pedagogical quality. Rather than delineating a binary distinction between "quality" and "non-quality", the Quality Label framework supports a graduated reading of project design, highlighting different levels of coherence, depth and pedagogical intentionality within a shared institutional standard.

In this sense, quality emerges as a continuum, shaped by how consistently and integrally the core criteria – collaboration, pedagogical approaches, use of technology, curricular integration, and documentation – are enacted across the different phases of project design and implementation. This perspective is particularly relevant for the present study, as it allows the analysis to focus on qualitative differences within a corpus of recognised projects, rather than on compliance with minimum requirements.

The evaluation process conducted by the Italian NSO combines quantitative scores with qualitative, narrative feedback, providing a synthetic overview of each project's relative strengths and weaknesses across the five quality criteria. Alongside this qualitative judgement, the Quality Label evaluation produces a set of internal scores summarising how strongly a project aligns with the indicators for each criterion. In this study, scores are not reported at project level and are used only to assign projects to four practical macro-categories (from Satisfactory to Outstanding) for analysis and reporting (see fig. 5.1 in chapter 3).

Across the corpus, reviewer feedback consistently indicates that project quality is not determined by thematic focus or duration, but by the internal coherence of pedagogical design. Projects addressing very different themes – ranging from sustainability and citizenship to digital creativity, wellbeing or cultural heritage – received comparable evaluations when they demonstrated clear learning objectives, structured collaboration among partner schools, intentional use of technology, and robust documentation of processes and outcomes. Similarly, both short- and long-duration

projects could be evaluated positively or more critically depending on how systematically activities were planned and connected to curricular goals.

Variability across projects becomes especially visible in relation to collaboration models and documentation practices. Reviewer comments point to differences in the extent to which students are positioned as active co-constructors of knowledge rather than as recipients of information, as well as in the degree to which collaborative activities lead to tangible shared outputs. Likewise, the quality and completeness of documentation – covering planning, implementation, evaluation and reflection – emerges as a key discriminator among projects that otherwise meet formal quality criteria.

Taken together, the external evaluations confirm that even within a group of experienced eTwinning teachers and awarded projects, pedagogical quality is unevenly distributed. This internal differentiation provides a crucial analytical leverage for the following section, which examines the cross-cutting pedagogical patterns underlying higher and lower levels of project quality, and explores how specific design choices contribute to the plausibility of competence development in international, project-based learning contexts.

3.6 Cross-cutting pedagogical patterns

The qualitative analysis of the fourteen eTwinning projects reveals a set of recurring pedagogical patterns that cut across thematic areas, school contexts, and disciplinary domains. These patterns concern the ways in which collaboration is structured, how digital technologies are used for learning, how students are positioned as active agents, and how projects are integrated into the curriculum. At the same time, the projects differ in the depth and coherence with which these elements are enacted, reflecting varying levels of pedagogical intentionality and design quality.

3.6.1 Models of international collaboration

Across the corpus, international collaboration is a defining feature of all projects, yet it takes different forms and levels of intensity, which are realistically shaped by students' linguistic competences. In many cases, collaboration is necessarily constrained by limited proficiency in the

language of communication, affecting both the depth and the sustainability of interaction. As a result, collaborative activities often rely on structured exchanges of information – such as sharing national perspectives, presenting local contexts, or commenting on partners' work – rather than on fully integrated joint tasks. While these forms of interaction primarily position students as recipients of information, they nonetheless support the development of intercultural awareness and basic communication skills.

At the same time, several projects show that engaging in collaborative tasks despite linguistic limitations constitutes a learning opportunity in itself. The need to communicate meaningfully, negotiate understanding, and carry out shared tasks in a non-native language fosters students' ability to adapt, simplify messages, and rely on multimodal forms of expression. In this context, the teacher's pedagogical mediation plays a crucial role: higher-quality projects are characterised by the careful design of tasks that are linguistically accessible, progressively structured, and feasible within the constraints of students' language proficiency.

In higher-scoring projects, collaboration is therefore more clearly organised around joint tasks and shared goals, even when full mixed-group work is not systematically achievable. Instead of permanent international groupings, these projects often rely on micro-collaborative activities, phased interactions, or partial co-construction processes, which cumulatively contribute to deeper engagement. The presence of tangible shared outcomes – such as co-authored documents, multimedia products, or joint presentations – emerges as a key indicator of this more deliberate and pedagogically mediated form of collaboration. These outputs not only make learning visible, but also require sustained coordination and negotiation, reinforcing both social and communication competences.

3.6.2 Technology as a pedagogical enabler

Digital technologies are central to all projects, yet their pedagogical function varies considerably. In some cases, technology is primarily used as a communication and dissemination tool, enabling students to share information, publish results, or present final products. While this supports basic digital skills, it does not necessarily transform learning processes.

In more pedagogically coherent projects, digital tools are integrated into the core learning activities. Platforms such as TwinSpace, collaborative documents, interactive applications, and creative software are used to

support inquiry, co-construction, feedback, and reflection. For example, students may use digital tools to jointly analyse data, compare national contexts, simulate real-world scenarios, or design shared solutions to common problems.

In these cases, technology functions as a mediator of learning, facilitating interaction, creativity, and problem-solving rather than merely serving as a container for content. This approach aligns with a competence-oriented perspective, in which digital competence is developed through meaningful use in authentic tasks.

3.6.3 Student agency and active learning roles

A strong emphasis on student agency characterises many of the projects. Students are often assigned active roles such as researchers, journalists, designers, ambassadors, or project coordinators. These roles are intended to promote responsibility, initiative, and ownership of the learning process.

Projects that articulate these roles clearly and link them to specific tasks tend to foster more structured forms of active learning. Students are not only engaged in producing outputs, but also in planning activities, making decisions, and reflecting on their work. This supports the development of transversal competences such as collaboration, communication, and learning to learn.

In contrast, when student roles are described in more general terms, without clear links to learning objectives or assessment criteria, agency remains more symbolic than substantive. In such cases, students participate actively, but the pedagogical rationale behind their engagement is less explicit.

3.6.4 Curricular integration and interdisciplinarity

All projects are embedded within formal school curricula, yet the degree of curricular integration varies. Some initiatives are closely aligned with specific subjects, such as languages, science, or civic education, and clearly articulate how project activities contribute to disciplinary learning goals. Others adopt a more interdisciplinary approach, combining content from multiple subjects to address complex themes such as sustainability, citizenship, or digital transformation.

Projects with stronger curricular integration tend to make explicit

connections between project activities, learning objectives, and competence development. This clarity supports both teachers' instructional planning and students' understanding of the educational purpose of the project. In contrast, projects with looser curricular links may offer rich learning experiences, but with less explicit alignment to formal learning goals.

Interdisciplinary projects, in particular, create opportunities for students to apply knowledge across domains, fostering higher-order thinking and problem-solving competences. However, they also require careful pedagogical design to ensure coherence and avoid fragmentation.

3.6.5 Documentation, reflection, and pedagogical coherence

A final cross-cutting pattern concerns the quality of documentation and reflection. Projects that received higher Quality Label scores typically provide detailed descriptions of planning phases, learning activities, assessment strategies, and student involvement. These projects make learning processes visible and allow for clearer interpretation of how competences are fostered.

In contrast, projects with more limited documentation tend to focus on general aims and final products, offering less insight into the pedagogical processes underlying student learning. From a research perspective, this affects not only the evaluation of project quality, but also the interpretability of potential learning outcomes.

The presence of systematic reflection, by both teachers and students, emerges as a key indicator of pedagogical coherence. Reflection helps connect activities to learning objectives and competences, reinforcing a competence-oriented approach rather than a purely activity-based one.

3.6.6 Variability within a shared pedagogical framework

Taken together, these patterns show that while all these projects share a common pedagogical framework – international collaboration, digital mediation, and project-based learning – they differ significantly in how coherently and intentionally these elements are enacted. The Quality Label evaluations capture this variability, highlighting that pedagogical quality is not determined by thematic focus alone, but by the alignment between objectives, methods, collaboration, technology use, and documentation.

This variability is analytically valuable. It allows the present study to move beyond generic descriptions of eTwinning projects and to identify specific design features that shape learning environments and potentially influence competence development.

3.7 From project quality to pedagogical plausibility of competence development

The qualitative patterns identified across the fourteen eTwinning projects allow for a pedagogical interpretation of how different design features may create favourable conditions for the development of key competences. Rather than establishing causal relationships between specific project characteristics and learning outcomes, this section examines the plausibility of competence-oriented learning processes emerging from the observed pedagogical practices.

From a competence-based perspective, learning environments that promote active participation, collaboration, reflection, and meaningful use of knowledge are more likely to support the development of transversal competences such as communication, collaboration, digital competence, learning to learn, and civic engagement. The eTwinning projects analysed in this study vary in the extent to which these conditions are intentionally and coherently enacted.

Projects characterised by structured international collaboration create opportunities for students to engage in authentic communication, negotiate meaning with peers from different cultural backgrounds, and work towards shared goals. These experiences plausibly support the development of multilingual, intercultural, and social competences, as well as students' ability to participate constructively in collective tasks. When collaboration is embedded in joint problem-solving or co-creation activities, rather than limited to information exchange, students are more likely to experience learning as a socially mediated and dialogic process.

The pedagogical use of digital technologies also plays a central role in shaping competence-oriented learning environments. Projects in which digital tools are integrated into inquiry, production, and reflection processes provide students with opportunities to develop digital competence through purposeful and contextualised use. In these cases, technology supports not only technical skills, but also critical thinking, creativity, and communication. By contrast, when digital tools are mainly used for

presentation or dissemination, their contribution to competence development remains more limited.

Student agency emerges as another key dimension of pedagogical plausibility. Projects that assign meaningful roles to students and involve them in decision-making, planning, and evaluation processes create conditions for the development of autonomy, responsibility, and learning-to-learn competences. These experiences encourage students to reflect on their own learning processes, regulate their efforts, and collaborate effectively with others. When student agency is less clearly structured, active participation may still occur, but its contribution to competence development is less explicitly supported by pedagogical design.

The degree of curricular integration further influences the plausibility of competence development. Projects that are clearly embedded in subject curricula or interdisciplinary learning pathways allow students to connect transversal competences with disciplinary knowledge and formal learning objectives. This alignment helps ensure that competence development is not treated as an add-on, but as an integral part of educational practice. Interdisciplinary projects, in particular, offer opportunities for students to apply knowledge across domains, fostering problem-solving, critical thinking, and systems-oriented perspectives.

Finally, the presence of systematic documentation and reflection enhances pedagogical coherence. When teachers and students explicitly reflect on learning processes, objectives, and outcomes, competences become more visible and more consciously developed. Reflection supports the internalisation of learning experiences and helps students recognise how their skills evolve over time. In this sense, reflective practices contribute to a competence-oriented learning culture, rather than a purely activity-based one.

Taken together, these elements suggest that project quality matters not because it guarantees measurable learning outcomes, but because it shapes the learning conditions in which competences may plausibly develop. The variability observed across the eTwinning projects shows that international, project-based learning can support competence development in different ways and to different degrees, depending on how collaboration, technology, student agency, curricular integration, and reflection are pedagogically orchestrated.

This qualitative interpretation complements the quantitative findings of the study by providing a contextual understanding of the environments in which competence-related changes were observed. It highlights the

importance of pedagogical design and coherence in creating meaningful learning experiences, while avoiding simplistic assumptions about direct or uniform impacts of innovative educational programmes.

3.8 Summary and implications for the overall study

This chapter has examined the eTwinning projects implemented by the participating teachers as documented pedagogical cases validated by an external quality framework. Through the analysis of Quality Label applications and NSO evaluations, the chapter has provided a qualitative interpretation of the learning environments in which competence development was observed during the study.

The overview of project themes and pedagogical orientations highlighted the diversity of educational contexts in which eTwinning was integrated, ranging from sustainability and citizenship to well-being, digital innovation, and cultural exchange. Despite this thematic variety, the projects shared a common commitment to international collaboration, student-centred learning, and the development of transversal competences within formal school curricula.

The analysis of Quality Label scores and evaluators' feedback revealed meaningful variability in project quality, even among experienced eTwinning teachers, whose profiles have also been detailed in this chapter. This variability was not primarily linked to the thematic focus of the projects, but to the coherence and depth of their pedagogical design, including the structuring of collaboration, the purposeful use of digital technologies, the clarity of learning objectives, and the quality of documentation and reflection.

The cross-cutting pedagogical patterns identified in the chapter showed that international, project-based learning environments can support competence-oriented learning in different ways and to different degrees. Projects characterised by structured collaboration, meaningful student agency, curricular integration, and reflective practices were more likely to create conditions that plausibly foster the development of key competences. At the same time, the analysis confirmed that such outcomes depend on pedagogical intentionality rather than on participation in innovative projects per se. This is consistent with recent research indicating that the impact of virtual exchanges on intercultural development is significantly

enhanced when interactions are supported by specific intercultural communication training (Arias-Cifuentes et. al, 2025).

Importantly, this qualitative component does not claim to demonstrate causal effects of eTwinning participation on students' competences. Instead, it provides a contextual and pedagogical interpretation of how learning environments are designed and enacted in real school settings, complementing the quantitative findings of the study. By linking project quality to plausible learning conditions, the chapter highlights the central role of pedagogical coherence in competence-oriented education.

Overall, the qualitative analysis reinforces the idea that the educational value of international collaborative projects lies not only in their innovative format, but in the ways in which they are pedagogically structured. This insight informs the integrative discussion presented in the following chapters, where the quantitative and qualitative findings are brought together to reflect on the implications for competence-based teaching, teacher professional development, and future research on international educational programmes.

Chapter 4
Results of the Impact Analysis of eTwinning on Students' Competence Development

Jacopo Condò

4.1 Data preparation and analytical strategy

This section describes how raw data from the instruments were prepared, transformed into analytic variables, and analysed to estimate competence development over time and compare competence development between eTwinning and control group. The analytical workflow was standardised across competences and implemented through dedicated Python scripts developed for the study (one for student questionnaires and one for teacher assessments), ensuring consistent, reliable, and replicable preprocessing, scoring, and output generation across schools and measurement waves.

4.1.1. Quantitative data preparation and analysis

Quantitative analyses were conducted on two sources: student self-assessment questionnaires (closed-ended Likert items) and teacher assessment grids (rubric-based proficiency levels). Both instruments were designed to reflect the same competence architecture (Vuorikari et al., 2022), in which specific competences represent the most granular units of measurement; groups of specific competences define competence areas (three areas for each key competence, except Digital Competence, which follows the five-area structure of DigComp 2.2); and competence areas aggregate into the overall key-competence score.

In preprocessing, questionnaire responses were first converted into

numeric values according to the Likert scale, verifying item direction and reversing polarity where needed. Teacher grid ratings were encoded by converting the A1-D2 proficiency levels into an eight-point ordinal scale, preserving the progression embedded in the rubrics. Furthermore, to enable direct comparability across sources and to keep all quantitative outputs coherent with the proficiency logic of the competence model, questionnaire-based scores were harmonised to the same 1-8 metric (A1-D2 logic) through a linear transformation from the original 1-5 response scale. This step did not change the relative ordering of student responses, but placed questionnaire and rubric outputs on a common scale aligned with the study's competence structure.

Analytically, change was operationalised as pre–post deltas (Δ = post – pre) computed at the most detailed level available: for questionnaires, deltas were derived at item level and then aggregated to the corresponding specific competences; for teacher grids, deltas were derived directly at the level of specific competences. These specific-competence deltas were then aggregated to produce competence-area deltas and overall key-competence deltas, ensuring that higher-level indicators remained traceable to the underlying competence components. Missing data were handled using a complete-case approach at the level of the specific analysis: delta-based comparisons were performed only for students with both baseline and endline data available for the given competence and instrument. Missingness was primarily due to absences or incomplete participation at one of the two measurement points; no imputation procedures were applied.

The inferential strategy was articulated in two steps. First, descriptive statistics – mean and standard deviation – were computed for pre, post, and delta scores separately for the eTwinning and control groups, and separately for student questionnaires and teacher grids, to provide a direct overview of baseline levels and changes over time. The mean represents the average score in a group, while the standard deviation indicates how dispersed scores are around that average (for example, whether most students are near the mean or whether scores vary widely across individuals). Reporting both is important because two groups can have the same average but very different degrees of heterogeneity.

Second, group differences in competence development were tested by comparing delta scores between eTwinning students and control-group students using independent-samples t-tests, again keeping questionnaires and teacher grids as distinct outcome sources. The t-test is a widely used

method for evaluating whether the difference between two group means (the average delta in the eTwinning group versus the average delta in the control group) is larger than what would be reasonably expected due to random variation. In other words, it provides an indicator on whether differences in improvement are likely to reflect a systematic association with participation in eTwinning rather than accidental changes. Results are reported with a p-value, which indicates how compatible the observed difference is with the hypothesis of no difference between groups: smaller p-values (below 0.05) suggest that the observed difference is unlikely to be explained by random variations alone.

In comparing delta between the eTwinning and control group, the study primarily relied on independent-samples t-tests. When the assumptions of the standard t-test were not well met – most importantly when the two groups showed unequal variances – the Welch t-test was used instead. Welch's test answers the same question as the standard t-test, but is more robust when variability differs across groups and/or when group sizes are unbalanced (Welch, 1947). In addition, because delta scores derived from ordinal scales and classroom-based assessments may not always approximate a normal distribution, non-parametric Mann–Whitney U tests were also computed as a robustness check in selected comparisons. The Mann–Whitney test does not compare means directly; rather, it assesses whether values in one group tend to be systematically higher (or lower) than in the other, without requiring normality (Mann & Whitney, 1947). Taken together, this strategy helps ensure that conclusions about between-group differences are not driven by violations of parametric assumptions, while keeping the interpretation focused on the same substantive question: whether competence development differs between eTwinning and control group students.

Since statistical significance depends on the sample size, it is not sufficient on its own to describe the practical relevance of an effect. For this reason, all t-test results are accompanied by an effect size estimate, which quantifies the size of the difference in mean change between the eTwinning and control groups in standardised units (Cohen, 1988). In practice, this step helps distinguish between effects that are statistically detectable but negligible in size, and effects that represent more meaningful differences in competence development. From a study-design perspective, reporting effect sizes is also important because the present evaluation was conceived to detect small-to-moderate educational effects, which are typical in real-world school interventions. With an overall sample of 479 students (257

eTwinning; 222 control), the study offers a suitable basis to identify these kinds of effect, ensuring that the findings are interpreted not only in terms of statistical significance, but also in terms of the size and plausibility of the observed differences.

To account for baseline differences and contextual factors, ANCOVA models were additionally estimated on delta outcomes (Dimitrov & Rumrill, 2003). In these models, the key predictor was group membership (eTwinning vs control group), while covariates included the starting level of the corresponding competence, school, and grade/year. ANCOVA can be considered as a further way to compare the two groups by taking into accounts other variables that may influence outcomes (Vickers & Altman, 2001; Van Breukelen, 2006). This is particularly relevant in quasi-experimental school settings, where groups may have a different starting level or where school and age can have an impact on competence development independently of the intervention. By incorporating these covariates, the model estimates whether stronger development of key competences can be associated with eTwinning participation considering such contextual differences.

4.1.2 Qualitative analysis and integration logic

The qualitative component draws on two types of textual data: open-ended prompts included in the student questionnaires (pre and post), where students describe experiences, perceived changes, difficulties, and salient aspects of learning activities; and structured teacher logbook compiled monthly, documenting project implementation, classroom dynamics, and competence-relevant episodes observed over time. Texts were imported, anonymised, and organised into analysable units by dedicated Python tools developed for the project, which produce structured tables indexed by source, time point, and class condition (eTwinning vs control group). These tables were used as the basis for qualitative coding and for generating text indicators.

Qualitative analysis followed a hybrid deductive–inductive thematic coding approach (Dooly & Vinagre, 2022; Creswell & Plano Clark, 2018; Ivankova, Creswell, & Stick, 2006). Deductive coding started from an initial category scheme aligned with the competence taxonomy, ensuring that themes could be connected back to the constructs measured quantitatively. Inductive coding was used to capture recurrent content not

fully covered by the initial scheme. The workflow included an initial familiarisation and exploratory coding phase on a subset of texts to refine code definitions and reduce ambiguity in coding criteria, followed by systematic application of the codebook to the full corpus.

In parallel to thematic coding, the qualitative scripts compute a set of computational text indicators intended to complement – and not to replace – interpretive analysis (Pennebaker, Booth, Boyd, & Francis, 2015). In particular, they estimate affective and sentiment-related dimensions using Italian lexical resources, including: an Italian-adapted ANEW-like resource provided as separate dictionaries for valence, arousal, and dominance, and an Italian sentiment lexicon (Sentix Italian Sentiment Lexicon) providing polarity and intensity information. These lexicon-based measures are aggregated at the level of response or text unit, with combination rules controlled by a dedicated configuration file specifying parameter weights. In addition, for students' open-ended responses, the pipeline computes indicators related to linguistic complexity and maturity, used descriptively to characterise written productions and support comparisons across groups and time points, without treating them as school-type performance evaluations.

Integration between quantitative and qualitative strands followed a sequential explanatory logic (Hauck et al., 2020; O'Dowd, 2016). Quantitative analyses provided the primary evidence base for estimating competence development and testing group differences, while qualitative materials were used as an interpretive layer to contextualise and clarify the observed patterns. Rather than treating qualitative findings as a parallel second outcome or as a formal confirmation of statistical results, qualitative outputs were used to illuminate how projects unfolded across classes, which conditions facilitated or constrained participation, and what kinds of competence-relevant behaviours teachers and students described during the project period (O'Dowd, 2021; Dooly & Vinagre, 2022; Greene, Caracelli, & Graham, 1989).

In practical terms, integration consisted of reading diary themes and selected excerpts alongside the competence domains analysed quantitatively, in order to support a more grounded interpretation of changes (or lack of change) in scores (Dovrat, 2022). Where available, basic text indicators were considered as descriptive complements to thematic evidence, without assigning them the same inferential status as the quantitative estimates. Overall, the role of the qualitative strand in this study is therefore explanatory and contextual: it helps interpret the quantitative findings and

highlights classroom processes and situational factors that may account for variability in outcomes, while the main conclusions about effects rely on the quantitative results.

4.2 Sample overview and dataset

The quantitative dataset includes 479 students, of whom 257 belong to the eTwinning group and 222 to the control group. The design is based on 28 classes organised in paired within-school comparisons (one eTwinning class and one control class), with both classes taught by the same teacher in the same subject. Students are distributed across grade years as follows: 6 first-year classes, 20 second-year classes, and 2 third-year classes.

Schools	14
Classes (total)	28
Classes (eTwinning / control)	14/ 14
Students (total)	479
Students (eTwinning / control)	257 / 222
Grade distribution (classes)	1st year: 6 / 2nd year: 20 / 3rd year: 2

The following tables report baseline and endline descriptive statistics for the five key competences measured via student self-assessment questionnaires. For each competence, scores are shown both at the level of the overall key competence and at the level of the three competence areas (five areas for Digital Competence, following the DigComp structure).

Measure	**Group**	**N**	**Pre_M**	**Post_M**	**Delta_M**
Key competence (overall)	eTwinning	221	4,794	4,942	0,148
Key competence (overall)	Control	139	4,905	4,845	-0,06
Area: Personal	eTwinning	221	4,892	5,014	0,122
Area: Personal	Control	139	5,048	4,914	-0,134
Area: Social	eTwinning	221	4,704	4,821	0,116
Area: Social	Control	139	4,784	4,698	-0,086
Area: Learning-to-learn	eTwinning	221	4,787	4,993	0,205
Area: Learning-to-learn	Control	139	4,883	4,925	0,042

Measure	Group	N	Pre_M	Post_M	Delta_M
Specific competence: Self-awareness and self-efficacy	eTwinning	221	4,992	5,092	0,1
Specific competence: Self-awareness and self-efficacy	Control	139	5,067	5,046	-0,021
Specific competence: Self-regulation, resilience and wellbeing	eTwinning	221	4,682	4,759	0,077
Specific competence: Self-regulation, resilience and wellbeing	Control	139	4,806	4,621	-0,185
Specific competence: Flexibility and adaptability	eTwinning	221	4,979	5,098	0,119
Specific competence: Flexibility and adaptability	Control	139	5,155	4,96	-0,195
Specific competence: Motivation and perseverance	eTwinning	221	5,243	5,419	0,176
Specific competence: Motivation and perseverance	Control	139	5,545	5,31	-0,235
Specific competence: Initiative and uncertainty management	eTwinning	221	4,564	4,704	0,14
Specific competence: Initiative and uncertainty management	Control	139	4,668	4,632	-0,036
Specific competence: Communication skills	eTwinning	221	3,852	3,998	0,146
Specific competence: Communication skills	Control	139	3,906	3,866	-0,04
Specific competence: Critical thinking and problem solving	eTwinning	221	5,352	5,438	0,086
Specific competence: Critical thinking and problem solving	Control	139	5,464	5,441	-0,022
Specific competence: Learning from experience and opportunities	eTwinning	221	4,909	5,025	0,116
Specific competence: Learning from experience and opportunities	Control	139	4,983	4,785	-0,197
Specific competence: Managing learning and learning gaps	eTwinning	221	4,221	4,443	0,222
Specific competence: Managing learning and learning gaps	Control	139	4,294	4,31	0,015
Specific competence: Creative and systems thinking	eTwinning	221	4,888	5,13	0,242
Specific competence: Creative and systems thinking	Control	139	4,947	5,129	0,183

Measure	Group	N	Pre_M	Post_M	Delta_M
Specific competence: Reflective thinking and evaluation	eTwinning	221	5,252	5,405	0,153
Specific competence: Reflective thinking and evaluation	Control	139	5,406	5,335	-0,071

Tab. 4.1 – Competence 1 Personal, social, and learning to learn

Measure	Group	N	Pre_M	Post_M	Delta_M
Key competence (overall)	eTwinning	160	5,495	5,539	0,044
Key competence (overall)	Control	97	5,633	5,425	-0,209
Area: Digital citizenship	eTwinning	160	5,409	5,52	0,11
Area: Digital citizenship	Control	97	5,574	5,423	-0,15
Area: Social values and attitudes	eTwinning	160	5,556	5,556	0
Area: Social values and attitudes	Control	97	5,719	5,452	-0,267
Area: Civic skills and engagement	eTwinning	160	5,519	5,541	0,023
Area: Civic skills and engagement	Control	97	5,607	5,398	-0,209
Specific competence: Digital participation	eTwinning	160	5,301	5,408	0,107
Specific competence: Digital participation	Control	97	5,61	5,411	-0,198
Specific competence: Managing online identity	eTwinning	160	6,13	6,059	-0,071
Specific competence: Managing online identity	Control	97	6,232	6,052	-0,18
Specific competence: Privacy and data protection	eTwinning	160	4,858	4,969	0,111
Specific competence: Privacy and data protection	Control	97	5,181	5,034	-0,147
Specific competence: Environmental impact of digital technologies	eTwinning	160	5,349	5,644	0,295
Specific competence: Environmental impact of digital technologies	Control	97	5,272	5,196	-0,076
Specific competence: Core values	eTwinning	160	5,78	5,73	-0,05
Specific competence: Core values	Control	97	5,905	5,567	-0,338
Specific competence: Attitudes and responsibility	eTwinning	160	5,67	5,714	0,044
Specific competence: Attitudes and responsibility	Control	97	5,799	5,528	-0,271
Specific competence: Empathy and tolerance	eTwinning	160	5,381	5,427	0,045

Measure	Group	N	Pre_M	Post_M	Delta_M
Specific competence: Empathy and tolerance	Control	97	5,598	5,415	-0,183
Specific competence: Ethics and sustainability	eTwinning	160	5,174	5,196	0,022
Specific competence: Ethics and sustainability	Control	97	5,184	4,985	-0,2
Specific competence: Collaboration and cooperation	eTwinning	160	5,774	5,714	-0,06
Specific competence: Collaboration and cooperation	Control	97	6,11	5,767	-0,343
Specific competence: Critical thinking and understanding	eTwinning	160	5,836	5,862	0,026
Specific competence: Critical thinking and understanding	Control	97	5,803	5,702	-0,101
Specific competence: Vision and creativity for the future	eTwinning	160	5,266	5,266	0
Specific competence: Vision and creativity for the future	Control	97	5,438	5,204	-0,235
Specific competence: Individual civic initiative	eTwinning	160	5,455	5,497	0,042
Specific competence: Individual civic initiative	Control	97	5,58	5,289	-0,291

Tab. 4.2 – Competence 2 Citizenship

Measure	Group	N	Pre_M	Post_M	Delta_M
Key competence (overall)	eTwinning	145	4,972	5,134	0,163
Key competence (overall)	Control	99	5,187	5,12	-0,068
Area: Ideas and opportunities	eTwinning	145	4,767	4,919	0,152
Area: Ideas and opportunities	Control	99	4,933	4,868	-0,065
Area: Resource management	eTwinning	145	5,088	5,214	0,126
Area: Resource management	Control	99	5,328	5,268	-0,06
Area: Turning ideas into action	eTwinning	145	5,06	5,271	0,211
Area: Turning ideas into action	Control	99	5,301	5,223	-0,078
Specific competence: Spot opportunities	eTwinning	145	4,709	4,987	0,278
Specific competence: Spot opportunities	Control	99	4,865	4,742	-0,124
Specific competence: Creativity and exploratory thinking	eTwinning	145	4,75	4,823	0,072
Specific competence: Creativity and exploratory thinking	Control	99	4,845	4,823	-0,022

Measure	Group	N	Pre_M	Post_M	Delta_M
Specific competence: Vision and creativity for the future	eTwinning	145	4,778	4,971	0,193
Specific competence: Vision and creativity for the future	Control	99	4,933	4,818	-0,115
Specific competence: Valuing ideas and ethical thinking	eTwinning	145	4,597	4,63	0,034
Specific competence: Valuing ideas and ethical thinking	Control	99	4,726	4,663	-0,064
Specific competence: Individual initiative	eTwinning	145	5,001	5,182	0,181
Specific competence: Individual initiative	Control	99	5,295	5,295	0
Specific competence: Self-awareness and self-efficacy	eTwinning	145	4,959	5,134	0,175
Specific competence: Self-awareness and self-efficacy	Control	99	5,125	5,16	0,035
Specific competence: Motivation, perseverance and adaptability	eTwinning	145	5,027	5,122	0,095
Specific competence: Motivation, perseverance and adaptability	Control	99	5,292	5,164	-0,128
Specific competence: Mobilising resources and financial literacy	eTwinning	145	5,22	5,289	0,068
Specific competence: Mobilising resources and financial literacy	Control	99	5,455	5,301	-0,153
Specific competence: Motivating others and working with others	eTwinning	145	5,394	5,488	0,094
Specific competence: Motivating others and working with others	Control	99	5,526	5,45	-0,077
Specific competence: Managing learning and growth mindset	eTwinning	145	4,838	5,037	0,199
Specific competence: Managing learning and growth mindset	Control	99	5,242	5,263	0,021
Specific competence: Planning and management	eTwinning	145	5,339	5,425	0,086
Specific competence: Planning and management	Control	99	5,477	5,419	-0,057
Specific competence: Learning from experience	eTwinning	145	5,402	5,478	0,075
Specific competence: Learning from experience	Control	99	5,768	5,503	-0,265
Specific competence: Copyright and licences	eTwinning	145	4,44	4,91	0,471
Specific competence: Copyright and licences	Control	99	4,659	4,747	0,088

Tab. 4.3 – Competence 3 Entrepreneurship

Measure	Group	N	Pre_M	Post_M	Delta_M
Key competence (overall)	eTwinning	134	5,197	5,333	0,136
Key competence (overall)	Control	101	5,323	5,141	-0,182
Area: Creative expression and digital skills	eTwinning	134	5,284	5,405	0,121
Area: Creative expression and digital skills	Control	101	5,397	5,086	-0,311
Area: Cultural values and ethical considerations	eTwinning	134	4,684	4,983	0,299
Area: Cultural values and ethical considerations	Control	101	4,909	4,901	-0,009
Area: Cultural awareness and intercultural understanding	eTwinning	134	5,621	5,611	-0,01
Area: Cultural awareness and intercultural understanding	Control	101	5,663	5,436	-0,227
Specific competence: 1.1 Creating digital content	eTwinning	134	5,453	5,466	0,013
Specific competence: 1.1 Creating digital content	Control	101	5,297	4,847	-0,45
Specific competence: 1.2 Integrating and re-elaborating digital content	eTwinning	134	5,506	5,656	0,15
Specific competence: 1.2 Integrating and re-elaborating digital content	Control	101	5,67	5,453	-0,217
Specific competence: 1.3 Creativity	eTwinning	134	4,894	5,093	0,199
Specific competence: 1.3 Creativity	Control	101	5,224	4,957	-0,267
Specific competence: 2.1 Ethical and sustainable thinking	eTwinning	134	5,91	5,884	-0,026
Specific competence: 2.1 Ethical and sustainable thinking	Control	101	5,99	6,007	0,017
Specific competence: 2.2 Promoting ecology	eTwinning	134	3,84	4,369	0,529
Specific competence: 2.2 Promoting ecology	Control	101	4,075	4,058	-0,017
Specific competence: 2.3 Valuing human dignity and human rights	eTwinning	134	5,284	5,414	0,131
Specific competence: 2.3 Valuing human dignity and human rights	Control	101	5,401	5,141	-0,26
Specific competence: 2.4 Valuing democracy, justice, equity, equality and the rule of law	eTwinning	134	3,703	4,265	0,562
Specific competence: 2.4 Valuing democracy, justice, equity, equality and the rule of law	Control	101	4,171	4,396	0,225

Measure	Group	N	Pre_M	Post_M	Delta_M
Specific competence: 3.1 Valuing cultural diversity	eTwinning	134	4,787	4,996	0,209
Specific competence: 3.1 Valuing cultural diversity	Control	101	4,812	4,725	-0,087
Specific competence: 3.2 Openness to other cultures	eTwinning	134	5,642	5,494	-0,147
Specific competence: 3.2 Openness to other cultures	Control	101	5,545	5,488	-0,057
Specific competence: 3.3 Knowledge and critical understanding of the world	eTwinning	134	6,433	6,341	-0,091
Specific competence: 3.3 Knowledge and critical understanding of the world	Control	101	6,631	6,094	-0,537

Tab. 4.4 – Competence 4 Cultural awareness and expression

Measure	Group	N	Pre_M	Post_M	Delta_M
Key competence (overall)	eTwinning	120	4,735	4,946	0,211
Key competence (overall)	Control	96	4,914	4,848	-0,066
Area: Information and data literacy	eTwinning	120	4,805	4,868	0,063
Area: Information and data literacy	Control	96	5,004	4,826	-0,178
Area: Communication and collaboration	eTwinning	120	5,222	5,354	0,132
Area: Communication and collaboration	Control	96	5,309	5,164	-0,145
Area: Digital content creation	eTwinning	120	4,52	4,807	0,287
Area: Digital content creation	Control	96	4,573	4,801	0,228
Area: Safety	eTwinning	120	4,315	4,722	0,408
Area: Safety	Control	96	4,758	4,547	-0,211
Area: Problem solving	eTwinning	120	4,812	4,977	0,165
Area: Problem solving	Control	96	4,928	4,904	-0,024
Specific competence: Browse, search and filter data, information and digital content.	eTwinning	120	4,578	4,474	-0,104
Specific competence: Browse, search and filter data, information and digital content.	Control	96	4,593	4,448	-0,146
Specific competence: Evaluate data, information and digital content.	eTwinning	120	4,819	4,973	0,154
Specific competence: Evaluate data, information and digital content.	Control	96	5,126	4,901	-0,225

Measure	Group	N	Pre_M	Post_M	Delta_M
Specific competence: Manage data, information and digital content.	eTwinning	120	5,018	5,156	0,139
Specific competence: Manage data, information and digital content.	Control	96	5,293	5,129	-0,164
Specific competence: Interact with others through technologies.	eTwinning	120	5,237	5,364	0,126
Specific competence: Interact with others through technologies.	Control	96	5,255	5,13	-0,126
Specific competence: Share information through digital technologies.	eTwinning	120	5,969	5,922	-0,047
Specific competence: Share information through digital technologies.	Control	96	6,018	5,776	-0,242
Specific competence: Engage in citizenship through digital technologies.	eTwinning	120	5,142	5,346	0,204
Specific competence: Engage in citizenship through digital technologies.	Control	96	5,74	5,43	-0,31
Specific competence: Collaborate through digital technologies.	eTwinning	120	5,098	5,462	0,365
Specific competence: Collaborate through digital technologies.	Control	96	4,956	5,047	0,091
Specific competence: Netiquette.	eTwinning	120	4,378	4,845	0,467
Specific competence: Netiquette.	Control	96	4,494	4,464	-0,03
Specific competence: Manage digital identity.	eTwinning	120	5,506	5,185	-0,321
Specific competence: Manage digital identity.	Control	96	5,393	5,138	-0,255
Specific competence: Develop digital content.	eTwinning	120	3,924	4,303	0,379
Specific competence: Develop digital content.	Control	96	3,99	4,135	0,146
Specific competence: Integrate and re-elaborate digital content.	eTwinning	120	5,317	4,952	-0,365
Specific competence: Integrate and re-elaborate digital content.	Control	96	4,919	4,81	-0,109
Specific competence: Copyright and licences.	eTwinning	120	3,96	4,262	0,301
Specific competence: Copyright and licences.	Control	96	4,318	4,409	0,091
Specific competence: Programming.	eTwinning	120	4,879	5,71	0,831
Specific competence: Programming.	Control	96	5,065	5,849	0,784
Specific competence: Protect devices.	eTwinning	120	4,412	4,923	0,51
Specific competence: Protect devices.	Control	96	5,339	4,591	-0,747

Measure	Group	N	Pre_M	Post_M	Delta_M
Specific competence: Protect personal data and privacy.	eTwinning	120	4,981	5,36	0,379
Specific competence: Protect personal data and privacy.	Control	96	5,205	5,296	0,091
Specific competence: Protect health and wellbeing.	eTwinning	120	4,59	4,69	0,1
Specific competence: Protect health and wellbeing.	Control	96	4,646	4,804	0,158
Specific competence: Protect the environment.	eTwinning	120	3,275	3,917	0,642
Specific competence: Protect the environment.	Control	96	3,844	3,497	-0,346
Specific competence: Solve technical problems.	eTwinning	120	4,522	4,775	0,253
Specific competence: Solve technical problems.	Control	96	4,588	4,64	0,052
Specific competence: Identify needs and technological responses.	eTwinning	120	5,156	5,156	0
Specific competence: Identify needs and technological responses.	Control	96	5,339	4,901	-0,438
Specific competence: Use digital technologies creatively.	eTwinning	120	5,025	5,2	0,175
Specific competence: Use digital technologies creatively.	Control	96	5,211	5,029	-0,182
Specific competence: Identify digital competence gaps.	eTwinning	120	4,544	4,777	0,233
Specific competence: Identify digital competence gaps.	Control	96	4,573	5,047	0,474

Tab. 4.5 – Competence 5 Digital

In parallel to student self-assessments, teachers completed analytic rubric-based assessments at baseline and endline. Descriptive statistics for teacher-derived scores are reported in Tables 4.3 using the same matched pre–post logic.

Measure	Group	N	Pre_M	Post_M	Delta_M
Key competence (overall)	eTwinning	246	1,91647	2,09607	0,1796
Key competence (overall)	Control	210	1,77631	1,85643	0,08012
Area: Personal	eTwinning	246	1,87276	2,06545	0,19268
Area: Personal	Control	210	1,75143	1,8419	0,09048
Area: Social	eTwinning	246	1,96748	2,13347	0,16599

Measure	Group	N	Pre_M	Post_M	Delta_M
Area: Social	Control	210	1,84048	1,89365	0,05317
Area: Learning to learn	eTwinning	238	1,97059	2,15126	0,18067
Area: Learning to learn	Control	208	1,7476	1,84495	0,09736
Specific competence: Self-awareness and self-efficacy	eTwinning	243	2	2,17078	0,17078
Specific competence: Self-awareness and self-efficacy	Control	210	1,85714	1,9619	0,10476
Specific competence: Self-regulation, resilience and wellbeing	eTwinning	243	1,76749	2	0,23251
Specific competence: Self-regulation, resilience and wellbeing	Control	210	1,68571	1,78571	0,1
Specific competence: Flexibility and adaptability	eTwinning	242	1,90909	2,10744	0,19835
Specific competence: Flexibility and adaptability	Control	209	1,7799	1,88038	0,10048
Specific competence: Motivation and perseverance	eTwinning	241	1,92116	2,11826	0,1971
Specific competence: Motivation and perseverance	Control	207	1,77295	1,85024	0,07729
Specific competence: Initiative and managing uncertainty	eTwinning	245	1,82449	1,99796	0,17347
Specific competence: Initiative and managing uncertainty	Control	208	1,68269	1,75481	0,07212
Specific competence: Communication skills	eTwinning	246	1,9939	2,14228	0,14837
Specific competence: Communication skills	Control	210	1,93333	2,00952	0,07619
Specific competence: Critical thinking and problem solving	eTwinning	244	1,90779	2,11066	0,20287
Specific competence: Critical thinking and problem solving	Control	209	1,84689	1,89474	0,04785
Specific competence: Learning from experience and opportunities	eTwinning	246	2,00407	2,1565	0,15244
Specific competence: Learning from experience and opportunities	Control	208	1,74038	1,78846	0,04808
Specific competence: Managing learning and gaps	eTwinning	238	1,93067	2,12605	0,19538
Specific competence: Managing learning and gaps	Control	208	1,73077	1,84615	0,11538
Specific competence: Reflective thinking and evaluation	eTwinning	237	2,01477	2,18143	0,16667
Specific competence: Reflective thinking and evaluation	Control	207	1,76812	1,84783	0,07971

Tab. 4.6 – Competence evaluation 1 Personal, social, and learning to learn

Measure	Group	N	Pre_M	Post_M	Delta_M
Key competence (overall)	eTwinning	160	5,495	5,539	0,044
Key competence (overall)	Control	97	5,633	5,425	-0,209
Area: Digital citizenship	eTwinning	160	5,409	5,52	0,11
Area: Digital citizenship	Control	97	5,574	5,423	-0,15
Area: Social values and attitudes	eTwinning	160	5,556	5,556	0
Area: Social values and attitudes	Control	97	5,719	5,452	-0,267
Area: Civic skills and engagement	eTwinning	160	5,519	5,541	0,023
Area: Civic skills and engagement	Control	97	5,607	5,398	-0,209
Specific competence: Digital participation	eTwinning	160	5,301	5,408	0,107
Specific competence: Digital participation	Control	97	5,61	5,411	-0,198
Specific competence: Managing online identity	eTwinning	160	6,13	6,059	-0,071
Specific competence: Managing online identity	Control	97	6,232	6,052	-0,18
Specific competence: Privacy and data protection	eTwinning	160	4,858	4,969	0,111
Specific competence: Privacy and data protection	Control	97	5,181	5,034	-0,147
Specific competence: Environmental impact of digital technologies	eTwinning	160	5,349	5,644	0,295
Specific competence: Environmental impact of digital technologies	Control	97	5,272	5,196	-0,076
Specific competence: Core values	eTwinning	160	5,78	5,73	-0,05
Specific competence: Core values	Control	97	5,905	5,567	-0,338
Specific competence: Attitudes and responsibility	eTwinning	160	5,67	5,714	0,044
Specific competence: Attitudes and responsibility	Control	97	5,799	5,528	-0,271
Specific competence: Empathy and tolerance	eTwinning	160	5,381	5,427	0,045
Specific competence: Empathy and tolerance	Control	97	5,598	5,415	-0,183
Specific competence: Ethics and sustainability	eTwinning	160	5,174	5,196	0,022
Specific competence: Ethics and sustainability	Control	97	5,184	4,985	-0,2
Specific competence: Collaboration and cooperation	eTwinning	160	5,774	5,714	-0,06
Specific competence: Collaboration and cooperation	Control	97	6,11	5,767	-0,343

Measure	Group	N	Pre_M	Post_M	Delta_M
Specific competence: Critical thinking and understanding	eTwinning	160	5,836	5,862	0,026
Specific competence: Critical thinking and understanding	Control	97	5,803	5,702	-0,101
Specific competence: Vision and creativity for the future	eTwinning	160	5,266	5,266	0
Specific competence: Vision and creativity for the future	Control	97	5,438	5,204	-0,235
Specific competence: Individual civic initiative	eTwinning	160	5,455	5,497	0,042
Specific competence: Individual civic initiative	Control	97	5,58	5,289	-0,291

Tab. 4.7 – Competence evaluation 2 Citizenship

Measure	Group	N	Pre_M	Post_M	Delta_M
Key competence (overall)	eTwinning	145	4,972	5,134	0,163
Key competence (overall)	Control	99	5,187	5,12	-0,068
Area: Ideas and opportunities	eTwinning	145	4,767	4,919	0,152
Area: Ideas and opportunities	Control	99	4,933	4,868	-0,065
Area: Resource management	eTwinning	145	5,088	5,214	0,126
Area: Resource management	Control	99	5,328	5,268	-0,06
Area: Turning ideas into action	eTwinning	145	5,06	5,271	0,211
Area: Turning ideas into action	Control	99	5,301	5,223	-0,078
Specific competence: Spot opportunities	eTwinning	145	4,709	4,987	0,278
Specific competence: Spot opportunities	Control	99	4,865	4,742	-0,124
Specific competence: Creativity and exploratory thinking	eTwinning	145	4,75	4,823	0,072
Specific competence: Creativity and exploratory thinking	Control	99	4,845	4,823	-0,022
Specific competence: Vision and creativity for the future	eTwinning	145	4,778	4,971	0,193
Specific competence: Vision and creativity for the future	Control	99	4,933	4,818	-0,115
Specific competence: Valuing ideas and ethical thinking	eTwinning	145	4,597	4,63	0,034
Specific competence: Valuing ideas and ethical thinking	Control	99	4,726	4,663	-0,064
Specific competence: Individual initiative	eTwinning	145	5,001	5,182	0,181

Measure	Group	N	Pre_M	Post_M	Delta_M
Specific competence: Individual initiative	Control	99	5,295	5,295	0
Specific competence: Self-awareness and self-efficacy	eTwinning	145	4,959	5,134	0,175
Specific competence: Self-awareness and self-efficacy	Control	99	5,125	5,16	0,035
Specific competence: Motivation, perseverance and adaptability	eTwinning	145	5,027	5,122	0,095
Specific competence: Motivation, perseverance and adaptability	Control	99	5,292	5,164	-0,128
Specific competence: Mobilising resources and financial literacy	eTwinning	145	5,22	5,289	0,068
Specific competence: Mobilising resources and financial literacy	Control	99	5,455	5,301	-0,153
Specific competence: Motivating others and working with others	eTwinning	145	5,394	5,488	0,094
Specific competence: Motivating others and working with others	Control	99	5,526	5,45	-0,077
Specific competence: Managing learning and growth mindset	eTwinning	145	4,838	5,037	0,199
Specific competence: Managing learning and growth mindset	Control	99	5,242	5,263	0,021
Specific competence: Planning and management	eTwinning	145	5,339	5,425	0,086
Specific competence: Planning and management	Control	99	5,477	5,419	-0,057
Specific competence: Learning from experience	eTwinning	145	5,402	5,478	0,075
Specific competence: Learning from experience	Control	99	5,768	5,503	-0,265
Specific competence: Copyright and licences	eTwinning	145	4,44	4,91	0,471
Specific competence: Copyright and licences	Control	99	4,659	4,747	0,088

Tab. 4.8 – Competence evaluation 3 Entrepreneurship

Measure	Group	N	Pre_M	Post_M	Delta_M
Key competence (overall)	eTwinning	134	5,197	5,333	0,136
Key competence (overall)	Control	101	5,323	5,141	-0,182
Area: Creative expression and digital skills	eTwinning	134	5,284	5,405	0,121

Measure	Group	N	Pre_M	Post_M	Delta_M
Area: Creative expression and digital skills	Control	101	5,397	5,086	-0,311
Area: Cultural values and ethical considerations	eTwinning	134	4,684	4,983	0,299
Area: Cultural values and ethical considerations	Control	101	4,909	4,901	-0,009
Area: Cultural awareness and intercultural understanding	eTwinning	134	5,621	5,611	-0,01
Area: Cultural awareness and intercultural understanding	Control	101	5,663	5,436	-0,227
Specific competence: 1.1 Creating digital content	eTwinning	134	5,453	5,466	0,013
Specific competence: 1.1 Creating digital content	Control	101	5,297	4,847	-0,45
Specific competence: 1.2 Integrating and re-elaborating digital content	eTwinning	134	5,506	5,656	0,15
Specific competence: 1.2 Integrating and re-elaborating digital content	Control	101	5,67	5,453	-0,217
Specific competence: 1.3 Creativity	eTwinning	134	4,894	5,093	0,199
Specific competence: 1.3 Creativity	Control	101	5,224	4,957	-0,267
Specific competence: 2.1 Ethical and sustainable thinking	eTwinning	134	5,91	5,884	-0,026
Specific competence: 2.1 Ethical and sustainable thinking	Control	101	5,99	6,007	0,017
Specific competence: 2.2 Promoting ecology	eTwinning	134	3,84	4,369	0,529
Specific competence: 2.2 Promoting ecology	Control	101	4,075	4,058	-0,017
Specific competence: 2.3 Valuing human dignity and human rights	eTwinning	134	5,284	5,414	0,131
Specific competence: 2.3 Valuing human dignity and human rights	Control	101	5,401	5,141	-0,26
Specific competence: 2.4 Valuing democracy, justice, equity, equality and the rule of law	eTwinning	134	3,703	4,265	0,562
Specific competence: 2.4 Valuing democracy, justice, equity, equality and the rule of law	Control	101	4,171	4,396	0,225
Specific competence: 3.1 Valuing cultural diversity	eTwinning	134	4,787	4,996	0,209
Specific competence: 3.1 Valuing cultural diversity	Control	101	4,812	4,725	-0,087
Specific competence: 3.2 Openness to other cultures	eTwinning	134	5,642	5,494	-0,147

Measure	Group	N	Pre_M	Post_M	Delta_M
Specific competence: 3.2 Openness to other cultures	Control	101	5,545	5,488	-0,057
Specific competence: 3.3 Knowledge and critical understanding of the world	eTwinning	134	6,433	6,341	-0,091
Specific competence: 3.3 Knowledge and critical understanding of the world	Control	101	6,631	6,094	-0,537

Tab. 4.9 – Competence evaluation 4 Cultural awareness and expression

Measure	Group	N	Pre_M	Post_M	Delta_M
Key competence (overall)	eTwinning	120	4,735	4,946	0,211
Key competence (overall)	Control	96	4,914	4,848	-0,066
Area: Information and data literacy	eTwinning	120	4,805	4,868	0,063
Area: Information and data literacy	Control	96	5,004	4,826	-0,178
Area: Communication and collaboration	eTwinning	120	5,222	5,354	0,132
Area: Communication and collaboration	Control	96	5,309	5,164	-0,145
Area: Digital content creation	eTwinning	120	4,52	4,807	0,287
Area: Digital content creation	Control	96	4,573	4,801	0,228
Area: Safety	eTwinning	120	4,315	4,722	0,408
Area: Safety	Control	96	4,758	4,547	-0,211
Area: Problem solving	eTwinning	120	4,812	4,977	0,165
Area: Problem solving	Control	96	4,928	4,904	-0,024
Specific competence: Browse, search and filter data, information and digital content.	eTwinning	120	4,578	4,474	-0,104
Specific competence: Browse, search and filter data, information and digital content.	Control	96	4,593	4,448	-0,146
Specific competence: Evaluate data, information and digital content.	eTwinning	120	4,819	4,973	0,154
Specific competence: Evaluate data, information and digital content.	Control	96	5,126	4,901	-0,225
Specific competence: Manage data, information and digital content.	eTwinning	120	5,018	5,156	0,139
Specific competence: Manage data, information and digital content.	Control	96	5,293	5,129	-0,164
Specific competence: Interact with others through technologies.	eTwinning	120	5,237	5,364	0,126

Measure	Group	N	Pre_M	Post_M	Delta_M
Specific competence: Interact with others through technologies.	Control	96	5,255	5,13	-0,126
Specific competence: Share information through digital technologies.	eTwinning	120	5,969	5,922	-0,047
Specific competence: Share information through digital technologies.	Control	96	6,018	5,776	-0,242
Specific competence: Engage in citizenship through digital technologies.	eTwinning	120	5,142	5,346	0,204
Specific competence: Engage in citizenship through digital technologies.	Control	96	5,74	5,43	-0,31
Specific competence: Collaborate through digital technologies.	eTwinning	120	5,098	5,462	0,365
Specific competence: Collaborate through digital technologies.	Control	96	4,956	5,047	0,091
Specific competence: Netiquette.	eTwinning	120	4,378	4,845	0,467
Specific competence: Netiquette.	Control	96	4,494	4,464	-0,03
Specific competence: Manage digital identity.	eTwinning	120	5,506	5,185	-0,321
Specific competence: Manage digital identity.	Control	96	5,393	5,138	-0,255
Specific competence: Develop digital content.	eTwinning	120	3,924	4,303	0,379
Specific competence: Develop digital content.	Control	96	3,99	4,135	0,146
Specific competence: Integrate and re-elaborate digital content.	eTwinning	120	5,317	4,952	-0,365
Specific competence: Integrate and re-elaborate digital content.	Control	96	4,919	4,81	-0,109
Specific competence: Copyright and licences.	eTwinning	120	3,96	4,262	0,301
Specific competence: Copyright and licences.	Control	96	4,318	4,409	0,091
Specific competence: Programming.	eTwinning	120	4,879	5,71	0,831
Specific competence: Programming.	Control	96	5,065	5,849	0,784
Specific competence: Protect devices.	eTwinning	120	4,412	4,923	0,51
Specific competence: Protect devices.	Control	96	5,339	4,591	-0,747
Specific competence: Protect personal data and privacy.	eTwinning	120	4,981	5,36	0,379
Specific competence: Protect personal data and privacy.	Control	96	5,205	5,296	0,091
Specific competence: Protect health and wellbeing.	eTwinning	120	4,59	4,69	0,1

Measure	Group	N	Pre_M	Post_M	Delta_M
Specific competence: Protect health and wellbeing.	Control	96	4,646	4,804	0,158
Specific competence: Protect the environment.	eTwinning	120	3,275	3,917	0,642
Specific competence: Protect the environment.	Control	96	3,844	3,497	-0,346
Specific competence: Solve technical problems.	eTwinning	120	4,522	4,775	0,253
Specific competence: Solve technical problems.	Control	96	4,588	4,64	0,052
Specific competence: Identify needs and technological responses.	eTwinning	120	5,156	5,156	0
Specific competence: Identify needs and technological responses.	Control	96	5,339	4,901	-0,438
Specific competence: Use digital technologies creatively.	eTwinning	120	5,025	5,2	0,175
Specific competence: Use digital technologies creatively.	Control	96	5,211	5,029	-0,182
Specific competence: Identify digital competence gaps.	eTwinning	120	4,544	4,777	0,233
Specific competence: Identify digital competence gaps.	Control	96	4,573	5,047	0,474

Tab. 4.10 – Competence evaluation 5 Digital

Together, these descriptive summaries provide the baseline for the inferential analyses reported in the next section, and show the scale and variability of competence scores in the two groups.

4.3 Quantitative effects of the intervention

The effects of eTwinning were estimated by comparing pre–post change (Δ = post − pre) between the eTwinning group and the control group. For each key competence (and, where relevant, for each competence area), two complementary inferential perspectives were considered: a direct comparison of Δ between groups (Welch t-test on change scores) and an ANCOVA model, estimating the group effect while adjusting for baseline (starting level) and contextual covariates (school and grade/year). In substantive terms, the ANCOVA models compare eTwinning and control students' change while adjusting for their starting level and contextual

covariates, thereby estimating the group difference in development net of baseline and school/grade effects.

Overall, across all five key competences, students' self-assessments show a larger average improvement in the eTwinning group than in the control group, with a statistically significant group effect in the ANCOVA models. This pattern is consistent with the central hypothesis of the study: that participation in structured, collaborative eTwinning projects provides learning conditions that are particularly conducive to the development of transversal competences.

This conclusion does not rely on a simple comparison of raw post-test levels. The ANCOVA models estimate the association between eTwinning participation and competence growth conditional on students' starting level and the school/grade context. By adjusting for baseline scores, the models explicitly reduce the risk that apparent gains are driven by initial group imbalances (e.g., one class beginning the year with higher competence levels). By controlling for school and grade/year, they further limit the possibility that results reflect structural differences across schools or age-related trends rather than the participation to eTwinning project itself.

Taken together, the consistency of the overall ANCOVA effect across all five competence domains suggests a broad, cross-cutting impact profile. Rather than being confined to a single competence area, the eTwinning advantage appears to generalise across personal-social dimensions, citizenship-related competences, entrepreneurship-related orientations, cultural awareness/expression, and digital competence. This holistic pattern is coherent with the fact that eTwinning projects combine recurring features – collaboration, communication with authentic external partners, joint production of artefacts, and sustained digital mediation – that can simultaneously activate multiple competence components. At the same time, the subsequent area-level analyses indicate that this overall effect is not necessarily uniform across all subdimensions: in several cases the overall pattern is supported by more selective area-level effects, suggesting that eTwinning may strengthen particular competence components more strongly than others, depending on how projects are designed and enacted in classrooms.

In this regard, it is important to underline that, from a statistical perspective, it is entirely expected that some (or even many) single specific competences do not reach statistical significance in ANCOVA or in the delta-based t-tests, while broader outcomes – such as a whole key–competence score or a competence-area score – do reach significance.

Specific competences are much narrower measures, so they tend to be noisier and their true changes are often smaller in size. By contrast, area-level and overall key-competence scores are obtained by combining multiple specific competences. This aggregation has two advantages. First, it produces a more stable indicator, because random ups-and-downs in individual components tend to average out. Second, it captures a common pattern where the intervention effect is distributed: eTwinning may generate small improvements across several dimensions rather than a large jump in a single one. In that situation, each specific competence may show only a modest difference, and not always large enough to be significant on its own, but the combined score can show a clearer and more consistent separation between groups. For this reason, non-significant results at the most granular level should not be read as "negative"; they often mean that the change is spread across components and therefore becomes visible once placed in a broader perspective .

In reporting statistical results, this study follows the most common convention in empirical research: results are described as "statistically significant" when the probability value (p-value) is below 0.05. This threshold is a widely used scientific standard that indicates the observed difference in change between groups would be unlikely to occur by chance alone (less than a 5% probability) if, in reality, there were no true group effect. Importantly, the p-value does not measure "how big" or "how important" an effect is; it only expresses how compatible the data are with the hypothesis of no difference. Given the large number of comparisons at the level of specific competences, these granular significance results are treated as exploratory and are interpreted cautiously, while the primary interpretation relies on the more stable area- and key-competence summaries.

4.3.1 ANCOVA – Student self-assessment

The paragraphs below summarise the ANCOVA results for student self-assessments, reported in the following tables. For each competence, the ANCOVA tests whether membership in the eTwinning group vs. the control group predicts a different pre–post change (Δ), while adjusting for baseline and contextual covariates. Results are shown at multiple levels: the overall key-competence score, the competence-area scores, and specific competences.

Outcome	F	p	Significant
Key competence (overall)	4,842049	0,02844	✓
Self-awareness and self-efficacy	0,9714156	0,3250221	
Critical thinking and problem solving	0,1650999	0,6847573	
Self-regulation, resilience and wellbeing	5,1062207	0,0244671	✓
Communication skills	0,6996422	0,4034863	
Motivation and perseverance	3,0780729	0,0802474	
Flexibility and adaptability	2,4848347	0,1158703	
Initiative and managing uncertainty	2,4919248	0,1153534	
Managing learning and gaps	1,810358	0,1793541	
Reflective thinking and evaluation	0,2755449	0,5999753	
Learning from experience and opportunities	3,586241	0,0591011	
Creative and systems thinking	2,309E-05	0,9961686	
Personal	8,1929345	0,0044637	✓
Social	3,1286006	0,0778184	
Learning to learn	0,9823766	0,3223115	

Tab. 4.11 – ANCOVA competence 1 – Personal, Social, and Learning-to-learn

Outcome	F	p	Significant
Key competence (overall)	5,8074881	0,0167084	✓
Digital participation	0,3390326	0,5609325	
Digital Identity Management	2,9406094	0,0876636	
Privacy e protezione dei dati	0,564356	0,4532434	
Impatto ambientale delle tecnologie digitali	3,8868702	0,049809	✓
Core values	1,6466732	0,2006449	
Attitudes and responsibility	2,5167037	0,113957	
Empathy and tolerance	0,3304627	0,565923	
Ethics and sustainability	2,6950506	0,1019646	
Collaboration and cooperation	0,5868554	0,4443873	
Critical thinking and understanding	0,408848	0,5231621	
Vision and creativity for the future	0,3923186	0,531676	
Individual civic initiative	3,264957	0,072022	
Digital citizenship	4,578139	0,0333872	✓
Social values and attitudes	3,8762459	0,0501199	
Civic skills and engagement	1,7018474	0,193291	

Tab. 4.12 – ANCOVA competence 2 – Citizenship

Outcome	F	p	Significant
Key competence (overall)	3,3111682	0,0701163	
Spot opportunities	4,4330142	0,0363397	✓
Creativity and exploratory thinking	0,1810032	0,670912	
Vision and creativity for the future	2,6426103	0,1054079	
Valuing ideas and ethical thinking	0,5796033	0,4472511	
Individual initiative	0,0061225	0,9377006	
Self-awareness and self-efficacy	0,0043637	0,9473891	
Motivation, perseverance and adaptability	1,3891988	0,2397637	
Mobilising resources and financial literacy	1,4057433	0,2369931	
Motivating others and working with others	1,1877395	0,2769315	
Managing learning and growth mindset	0,0012444	0,9718906	
Planning and management	0,0004581	0,9829432	
Learning from experience	1,8383801	0,1764765	
Copyright and licences	1,7076255	0,1926045	
Ideas and opportunities	2,1406819	0,1448093	
Resource management	1,6360118	0,2021681	
Turning ideas into action	1,6583803	0,199122	

Tab. 4.13 – ANCOVA competence 3 – Entrepreneurship

Outcome	F	p	Significant
Key competence (overall)	4,3610019	0,0379265	✓
1.1 Digital content creation	2,2150469	0,1381094	
1.2 Digital Content Integration & Repurposing	3,464982	0,0640211	
1.3 Creativity	0,575105	0,4490528	
2.1 Ethical and sustainable thinking	0,1461585	0,7026045	
2.2 Promoting ecology	3,8110847	0,052189	
2.3 Valuing human dignity and human rights	1,8849149	0,1711808	
2.4 Valuing democracy, justice, equity, equality and the rule of law	0,0312682	0,8598068	
3.1 Valuing cultural diversity	1,197005	0,275123	
3.2 Openness to other cultures	1,2077368	0,2729875	
3.3 Knowledge and critical understanding of the world	1,1944204	0,2756404	
Creative expression and digital skills	4,2876564	0,0395623	✓
Cultural values and ethical considerations	1,617155	0,2048378	
Cultural awareness and intercultural understanding	0,8324465	0,3625693	

Tab. 4.14 – ANCOVA competence 4 – Cultural awareness and expression

Outcome	F	p	Significant
Key competence (overall)	5,9673057	0,0154416	✓
Browse, search and filter data, information and digital content.	0,1316763	0,7170835	
Evaluate data, information and digital content.	0,7375258	0,3914827	
Manage data, information and digital content.	0,4981593	0,4811313	
Interact with others through technologies.	4,9972506	0,0264932	✓
Share information through digital technologies.	0,6900455	0,4071394	
Engage in citizenship through digital technologies.	0,7454403	0,3889579	
Collaborate through digital technologies.	1,7406944	0,1885593	
Netiquette.	6,0694231	0,0145987	✓
Manage digital identity.	0,0012881	0,9714057	
Develop digital content.	0,0425242	0,8368336	
Integrate and re-elaborate digital content.	0,3534053	0,5528637	
Copyright and licences.	2,1915961	0,140339	
Programming.	0,0060687	0,9379841	
Protect devices.	8,3270636	0,0043345	✓
Protect personal data and privacy.	0,4700299	0,4937673	
Protect health and wellbeing.	1,2384406	0,2671076	
Protect the environment.	1,1870825	0,2772299	
Solve technical problems.	2,935889	0,0881804	
Identify needs and technological responses.	3,4651681	0,0641414	
Utilizzare in modo creativo le tecnologie digitali.	1,7989579	0,1813596	
Individuare i divari di competenza digitale.	0,2357395	0,6278318	
Information and data literacy	0,8705302	0,3519336	
Communication and collaboration	4,6226162	0,0327536	✓
Digital content creation	0,0111695	0,9159376	
Safety	6,0318552	0,0149031	✓
Problem solving	2,7193055	0,100711	

Tab. 4.15 – ANCOVA competence 5 – Digital

Personal, social and learning to learn (Tab. 4.11).

At the overall level, the ANCOVA indicates a statistically significant group effect (p = 0.028), meaning that – after adjustment for baseline and context – the two groups show a different average change. At the area level,

the effect is most clearly concentrated in the Personal area ($p = 0.004$). At the most granular level, one component stands out as significant (Self-regulation, resilience, and wellbeing, $p = 0.024$), while the remaining components do not reach the conventional threshold.

Citizenship (Tab. 4.12).

The ANCOVA shows a significant group effect for the overall citizenship score ($p = 0.017$). At the area level, the clearest signal appears in Digital citizenship ($p = 0.033$). The other two areas are close to the threshold (Active citizenship and democratic participation, $p = 0.050$; Cultural/intercultural awareness, $p = 0.050$). At the specific-competence level, one component reaches significance (Environmental impact of digital technologies, $p = 0.050$).

Entrepreneurship (Tab. 4.13).

For entrepreneurship, the overall key-competence score does not reach statistical significance in the ANCOVA ($p = 0.070$). Similarly, the three entrepreneurship areas do not reach significance in the ANCOVA (all $p > 0.14$). At the more granular level, however, one component is significant: Identifying opportunities ($p = 0.036$).

Cultural awareness and expression (Tab. 4.14).

The ANCOVA indicates a significant group effect at the overall level ($p = 0.038$). At the area level, the result is primarily driven by Creative expression and digital skills ($p = 0.040$). At the specific-competence level, no single component reaches significance, although Empathy and intercultural openness approaches the threshold ($p = 0.052$), consistent with a pattern where change is distributed across multiple elements rather than concentrated in one indicator.

Digital competence (Tab. 4.15).

For digital competence, the ANCOVA shows a significant overall group effect ($p = 0.015$). At the area level, results are clearly concentrated in Communication and collaboration ($p < 0.001$) and Safety ($p < 0.001$). At the specific-competence level, none of the single components reaches significance, which is – again – consistent with the idea that digital gains are broadly distributed within areas, and therefore more detectable once aggregated to the area/competence level.

Overall, the questionnaire-based ANCOVA results suggest that the eTwinning advantage is most clearly detectable at broader levels of measurement (key competence and, in several cases, competence areas), while it is less consistently detectable at the level of individual specific competences. This is expected not only because single specific competences are noisier and tend to yield smaller effect sizes, but also because the intervention effect appears to be distributed across multiple components rather than concentrated in one isolated dimension. In other words, eTwinning seems to produce many small, coherent gains across the competence profile; taken one-by-one, these gains may be too modest to reach statistical significance consistently, but their cumulative pattern becomes visible and statistically reliable when competences are summarised at area or overall level.

4.3.2 ANCOVA – Teacher assessments

Teacher assessments provide a fundamental complementary perspective. The next section applies the same ANCOVA logic to the teachers' evaluations, which assess competence development through externally observed proficiency levels aligned to the same competence taxonomy. This allows us to examine whether the questionnaire-based patterns are also detectable in systematic teacher judgements, and whether effects appear more clearly at competence-area and overall levels when using an observation-based instrument.

Outcome	F	p	Significant
Key competence (overall)	113,38254	3,577E-26	✓
Self-awareness and self-efficacy	5,972129	0,0149085	✓
Self-regulation, resilience and wellbeing	16,941949	4,568E-05	✓
Flexibility and adaptability	10,949883	0,0010099	✓
Motivation and perseverance	14,743967	0,0001406	✓
Initiative and managing uncertainty	10,615489	0,0012045	✓
Communication skills	6,5909	0,0105631	✓
Critical thinking and problem solving	19,793695	1,083E-05	✓
Learning from experience and opportunities	15,936634	7,62E-05	✓
Managing learning and gaps	7,2025962	0,0075465	✓
Reflective thinking and evaluation	8,9490334	0,0029283	✓

Area: Personal	58,026687	3,749E-14	✓
Area: Social	40,926073	2,155E-10	✓
Area: Learning to learn	15,959695	6,995E-05	✓

Tab. 4.16 – ANCOVA competence 1 Evaluation – Personal, social, and learning to learn

Outcome	**F**	**p**	**Significant**
Key competence (overall)	137,56873	2,05E-31	✓
Digital participation	8,0727378	0,004686	✓
Digital Identity Management	22,589319	2,651E-06	✓
Privacy e protezione dei dati	14,556389	0,0001537	✓
Impatto ambientale delle tecnologie digitali	11,048306	0,0009551	✓
Core values	7,6954109	0,0057523	✓
Attitudes and responsibility	8,5578779	0,003605	✓
Empathy and tolerance	20,507311	7,517E-06	✓
Ethics and sustainability	3,6939727	0,055201	✗
Collaboration and cooperation	8,3931633	0,0039403	✓
Critical thinking and understanding	18,063429	2,568E-05	✓
Vision and creativity for the future	8,9395891	0,0029348	✓
Individual civic initiative	12,686709	0,0004049	✓
Area: Digital citizenship	53,741839	3,343E-13	✓
Area: Social values and attitudes	47,390339	7,401E-12	✓
Area: Civic skills and engagement	38,713214	6,418E-10	✓

Tab. 4.17 – ANCOVA competence 2 Evaluation – Citizenship

Outcome	**F**	**p**	**Significant**
Key competence (overall)	125,68465	6,947E-29	✓
Spot opportunities	22,082284	3,45E-06	✓
Creativity and exploratory thinking	8,8935598	0,0030128	✓
Vision and creativity for the future	13,168732	0,0003162	✓
Valuing ideas and ethical thinking	7,269609	0,0072659	✓
Individual initiative	20,431834	7,861E-06	✓
Self-awareness and self-efficacy	4,3320127	0,0379416	✓
Motivation, perseverance and adaptability	21,108119	5,613E-06	✓
Mobilising resources and financial literacy	7,5564703	0,0062078	✓
Motivating others and working with others	8,3737479	0,0039837	✓
Managing learning and growth mindset	6,4422559	0,0114697	✓
Planning and management	10,898558	0,0010399	✓

Learning from experience	4,1142929	0,0431201	✓
Copyright and licences	7,3697324	0,0068898	✓
Area: Ideas and opportunities	63,126056	2,989E-15	✓
Area: Resource management	43,103444	6,368E-11	✓
Area: Turning ideas into action	20,825738	5,491E-06	✓

Tab. 4.18 – ANCOVA competence 3 Evaluation – Entrepreneurship

Outcome	**F**	**p**	**Significant**
Key competence (overall)	194,98149	2,06E-43	✓
Digital content creation	20,777981	6,644E-06	✓
Digital Content Integration & Repurposing	40,406063	5,039E-10	✓
Creativity	33,543204	1,315E-08	✓
Ethical and sustainable thinking	21,850969	3,893E-06	✓
Promoting ecology	13,133405	0,0003232	✓
Valuing human dignity and human rights	13,246201	0,000305	✓
Valuing democracy, justice, equity, equality and the rule of law	19,722412	1,13E-05	✓
Valuing cultural diversity	8,2220252	0,0043346	✓
Openness to other cultures	14,645955	0,0001482	✓
Knowledge and critical understanding of the world	17,578855	3,331E-05	✓
Area: Creative expression and digital skills	93,687326	1,789E-21	✓
Area: Cultural values and ethical considerations	66,800204	5,592E-16	✓
Area: Cultural awareness and intercultural understanding	40,621275	2,536E-10	✓

Tab. 4.19 – ANCOVA competence 4 Evaluation – Cultural awareness and expression

Outcome	**F**	**p**	**Significant**
Key competence (overall)	275,02568	1,214E-60	✓
Browsing, searching, and filtering data, information, and digital content	2,4245682	0,1201445	✗
Evaluating data, information, and digital content	22,842148	2,381E-06	✓
Managing data, information, and digital content	28,265406	1,664E-07	✓
Interacting through digital technologies	10,708304	0,0011483	✓
Sharing through digital technologies	27,377368	2,564E-07	✓
Developing digital content	14,56162	0,0001545	✓
Integrating and re-elaborating digital content	27,324203	2,636E-07	✓

Copyright and licenses	28,268425	1,662E-07	✓
Programming	12,574517	0,0004319	✓
Protecting devices	32,881938	1,827E-08	✓
Protecting personal data and privacy	21,878419	3,876E-06	✓
Protecting health and well-being	21,622053	4,402E-06	✓
Protecting the environment	10,001662	0,0016753	✓
Solving technical problems	16,73751	5,11E-05	✓
Identifying needs and technological responses	10,310327	0,0014203	✓
Creatively using digital technologies	11,480917	0,0007669	✓
Area: Information and data literacy	46,418309	1,428E-11	✓
Area: Communication and collaboration	35,94945	2,92E-09	✓
Area: Digital content creation	72,105367	4,176E-17	✓
Area: Safety	83,627069	1,61E-19	✓
Area: Problem solving	37,903592	9,846E-10	✓

Tab. 4.20 – ANCOVA competence 5 Evaluation – Digital

The teacher assessment grids provide an external, observation-based perspective on students' competence development. Using the same inferential strategy adopted for the questionnaires, ANCOVA models were estimated on change scores (Δ = post – pre), with group (eTwinning vs control) as the focal predictor and baseline score, school, and grade/year as covariates. Across all five key competences, the teacher-based ANCOVA models indicate a statistically significant positive group effect (all $p < .001$) in favour of eTwinning. In practical terms, this means that teachers attributed larger average competence growth to students in eTwinning classes than to students in the matched control classes.

At a more detailed level, the teachers' evaluations show a high degree of internal coherence: the significant overall effects are mirrored by consistent area-level effects, and – almost always – by significant effects also at the level of specific competences.

For Personal, social and learning to learn, the teacher grids show a strong overall effect ($p < 0.001$) and significant effects for all three areas: Personal ($p < 0.001$), Social ($p < 0.001$), and Learning-to-learn ($p < 0.001$). Notably, in this competence domain, all specific competences in the rubric also reach significance, suggesting a broader and more-fine grained improvement as observed by teachers.

For Citizenship, the overall group effect is again clear ($p < 0.001$) and

is supported by significant effects across all three competence areas: Digital Citizenship ($p < 0.001$), Values and social attitudes ($p < 0.001$), and Skills and civic angagement ($p < 0.001$). At the level of specific competences, the pattern remains highly consistent: 11 out of 12 specific competences are significant, with only one descriptor not reaching the $p < 0.05$ threshold.

For Entrepreneurship, the teacher grids again show a robust overall effect ($p < 0.001$) and significant effects across all three areas: Ideas and opportunity ($p < 0.001$), Resource managment ($p < 0.001$), and Transforming ideas in action ($p < 0.001$). In this case, all 16 specific competences are significant.

For Cultural awareness and expression, the overall effect is among the strongest in the teacher grids ($p < 0.001$), with significant effects for all three areas: Creative expression and digital competences ($p < 0.001$), Cultural values and ethical considerations ($p < 0.001$), and Cultural awareness and intercultural understanding ($p < 0.001$). Also here, all 16 specific competences are significant.

Finally, for Digital competence, the teacher grids show a strong overall effect ($p < 0.001$) supported by significant effects across all five areas: Information and data literacy ($p < 0.001$), Communication and collaboration ($p < 0.001$), Creation of digital contents ($p < 0.001$), Security ($p < 0.001$), and Problem solving ($p < 0.001$). At the specific competence level, 15 out of 16 descriptors are significant.

Because the number of specific competences is very large, the present chapter focuses on key-competence and competence-area results, which provide the most readable synthesis at book level. Full outputs at the level of specific competences (including research materials, analysis results, and research instruments) are made available in the companion online repository, accessible via the QR code reported.

In summary, the teacher assessment grids provide strong convergent evidence for an eTwinning advantage across all five competence domains. Importantly, this advantage is visible not only in overall scores, but also in competence-area scores and, in almost all cases, in the specific competences that make up the rubrics. This strengthens the overall inference that the quantitative improvements associated with eTwinning are not confined to students' self-perceptions, but are also reflected in structured teacher judgements.

4.3.3 Average Delta for the Key Competences

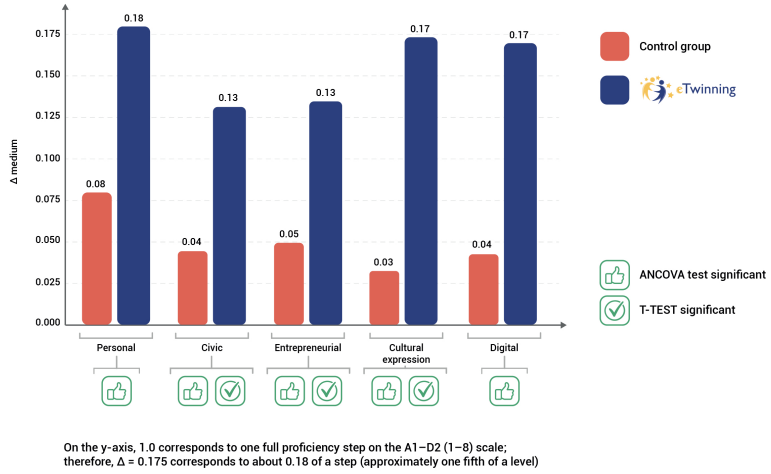


Fig. 4.1 – Competences Comparison: ANCOVA and T-Test

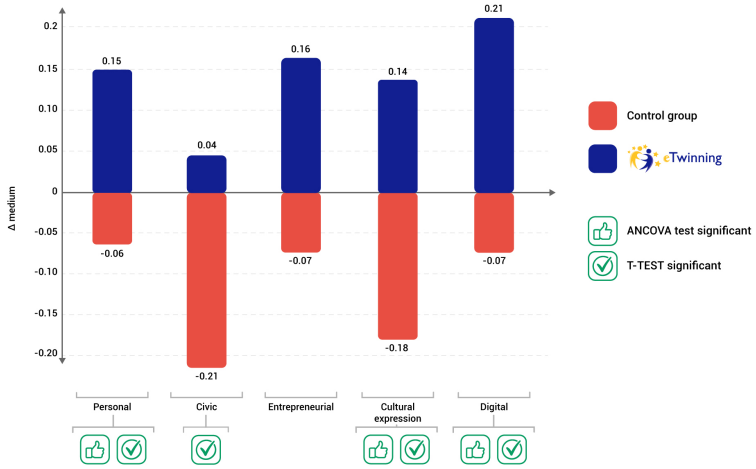


Fig. 4.2 – Overall Students' Questionnaire Delta Comparison with ANCOVA and t-test results

These histograms provide a compact overview of the intervention's quantitative pattern across the five key competences. The first figure is a synthesis "significance map": for each competence, it reports whether the between-group difference in pre–post change is supported by the

independent-samples t-test on and/or by the ANCOVA model (which adjusts for baseline competence level and contextual covariates such as school and grade/year). Concordant indications across both tests provide stronger convergent evidence, while significance emerging in only one approach should be interpreted more cautiously. The second and third figures provide a synthesis of the average pre–post change (Δ) for the five key competences, shown separately for the eTwinning group and the control group, and separately by data source (student questionnaires and teachers' evaluations). The key message is highly consistent across the two sources: for every competence, the eTwinning group shows a larger average improvement than the control group. This visual pattern mirrors the results discussed above, and helps showing the direction and coherence of the "eTwinning effect".

A second important point is that the two sources differ in their baseline tendency over time. In the teacher evaluations, both groups show positive average growth across competences, but the eTwinning group grows more (e.g., roughly $\Delta \approx 0.17–0.18$ vs $\Delta \approx 0.03–0.08$, depending on the competence). This is compatible with a realistic school-year pattern, in which students typically progress over time due to maturation and ordinary instruction. In the questionnaires (Figure 4.6a), instead, the eTwinning group shows growth across all competences, while the control group shows small-to-moderate negative average changes.

Read together, the two figures strengthen the interpretation in a complementary way. The teacher assessment grids suggest that, in both groups, competence development is observable over the school year, but eTwinning accelerates that development across the full set of competences. The questionnaires indicate that eTwinning is associated not only with higher perceived growth, but also with a clearer separation from the control condition. Most importantly for the study's logic, the convergence in direction across sources (eTwinning over control group for all five competences) supports the idea that the observed advantage is not an artefact of one single measurement method, but a coherent pattern detectable from both an internal (student) and an external (teacher) perspective.

The negative shift observed in the control group's self-evaluation is an interesting and somewhat puzzling pattern that goes beyond the primary aim of the study, but it is still worth examining. Importantly, questionnaire scores reflect perceived competence and metacognitive calibration, not only skill accumulation (Sala et al., 2020). In this sense, a negative delta may

reflect changing standards, confidence, or how students interpret their own performance at different moments of the school year. This is precisely where the qualitative strand becomes useful – not to prove an explanation, but to provide plausible contextual information that helps interpret an unexpected quantitative trend.

Diary evidence suggests several factors that could plausibly contribute to give a clearer picture of these data. First, the endline period often coincides with an "assessment pressure" phase, which can shift students' attention from progress to perceived gaps and performance anxiety, leading to harsher self-evaluations even when learning is continuing. Second, compared with project-based contexts, ordinary instruction may offer fewer salient "competence moments" (collaboration, initiative, production of tangible artefacts, interaction with external partners) that make competence growth visible to students; competence may develop, but in absence of adequate contexts students may not recognise it as such. Third, logbook also contain signals compatible with motivation and engagement fluctuations (fatigue, uneven participation, variability in class climate), which can influence perceived self-efficacy and therefore questionnaire responses. Fourth, practical disruptions typical of the school year (absences, timetable constraints, competing school activities, compressed schedules) can reduce the sense of continuity and consolidation – again affecting perceived competence even when objective ability is stable.

In contrast, diary entries for eTwinning classes more often describe structured project milestones, collaborative tasks, and production-oriented activities. These elements can support both actual competence enactment and a stronger subjective sense of growth: students receive more frequent feedback from artefacts, peers, and authentic audiences, and the project structure can make progress more visible and easier to attribute to specific actions. Overall, the qualitative evidence therefore suggests a coherent interpretive hypothesis: the divergence between groups in questionnaire deltas may reflect not only differential learning opportunities, but also differences in salience, motivation, and self-calibration across the school year – an emerging pattern that warrants targeted investigation in future work.

4.3.4 Supplementary visual outputs and how to read the figures

In addition to the tables and inferential models reported in this chapter, the study has produced an extensive set of descriptive visualisations for every level of the competence hierarchy – specific competences, competence areas, and overall key competences – and for both data sources, student questionnaires and teacher assessment grids. These outputs include, for example, distributions of post-levels, change-score (Δ) comparisons between groups, violin-style plots showing the spread of individual change, radar summaries, and multivariate views such as PCA plots.

Within the book, figures are therefore used with an illustrative intent. For the Personal, social and learning to learn key competence, the visual set included in the text follows the same hierarchical logic as the instruments: one example at the specific competence level, then the corresponding competence-area summary, and finally the overall key competence summary – all regarding the students' self-evaluation questionnaires. This selection keeps the narrative manageable while still showing how the same underlying data can be examined at increasing levels of aggregation.

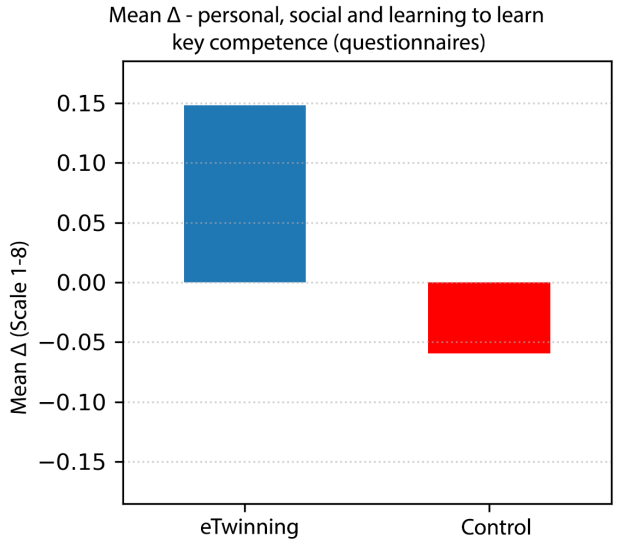


Fig. 4.3 – Overall key competence (students' questionnaires): Bar summary of the average pre-post change (Δ) in the overall key competence score for the two groups

Fig. 4.4 – Overall key competence (students' questionnaires): Distribution plot showing how individual students' pre-post changes (Δ) in the overall key competence score vary within each group

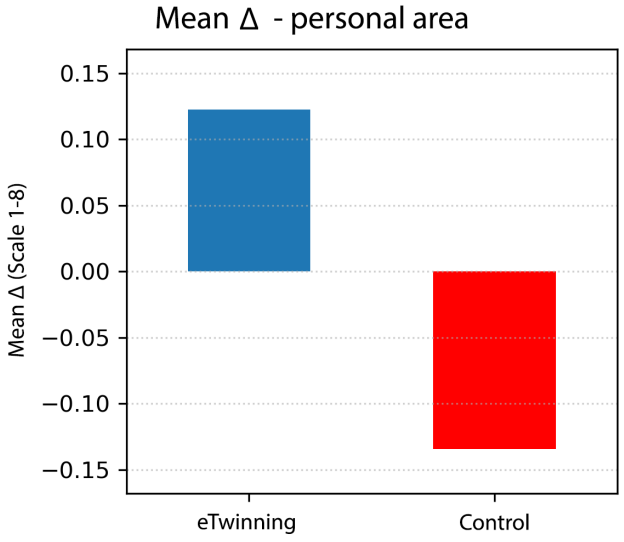


Fig. 4.5 – Personal competence area (students' questionnaires): Bar summary of the average pre-post change (Δ) in the Personal competence area score for the two groups

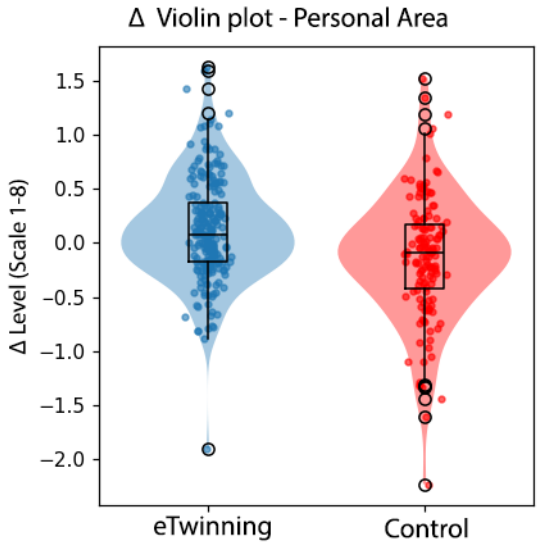


Fig. 4.6 – Personal competence area (students' questionnaires): Distribution plot showing within-group variability in pre-post change (Δ) for the Personal competence area

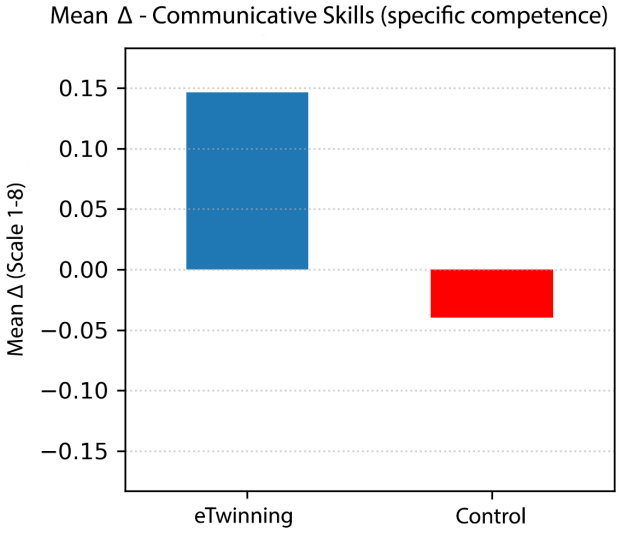


Fig. 4.7 – Specific competence - Communication skills (students' questionnaires): Bar summary of the average pre-post change (Δ) in the specific competence "Communication skills" for the two groups

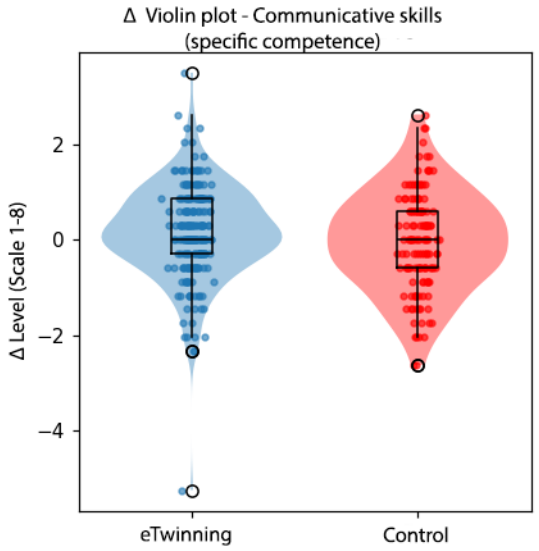


Fig. 4.8 – Specific competence - Communication skills (students' questionnaires): Distribution plot showing within-group variability in pre-post change (Δ) for the specific competence "Communication skills"

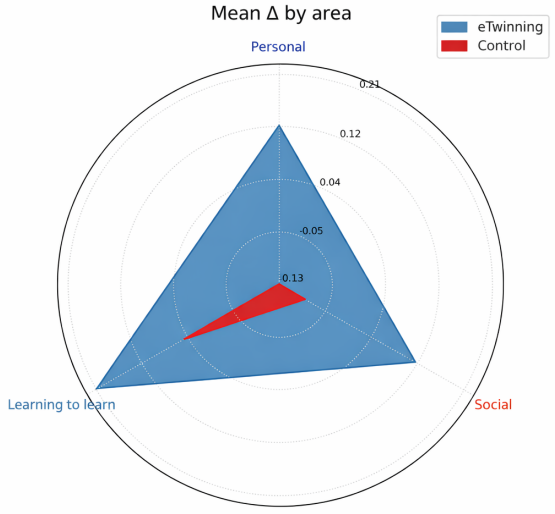


Fig. 4.9 – Competence areas (students' questionnaires): Radar profile comparing the pattern of mean pre-post change (Δ) across the three competence areas of the "personal, social and learning to learn" key competence between the two groups

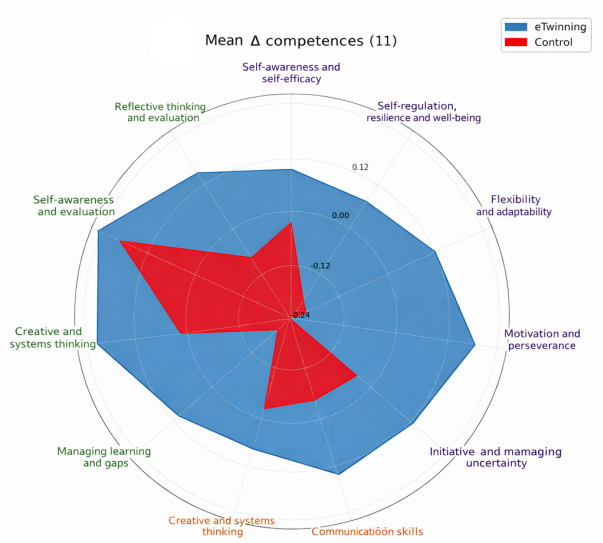


Fig. 4.10 – Specific competences (students' questionnaires): Radar profile comparing the pattern of mean pre-post change (Δ) across the set of specific competences of the "personal, social and learning to learn" key competence between groups

Scan the QR code for all research data

https://etwinning.indire.it/ricerca/etwinning-e-lo-sviluppo-delle-competenze-degli-alunni/

The example figure set can be read as follows. A first plot shows the average change (Δ) for eTwinning and control groups, providing an immediate indication of the direction and size of group-level change. A second plot uses a distribution-of-change (violin plot) view, which makes it visible that group averages are composed of many individual trajectories – some students improve more, some less, and a small number may decrease – thereby complementing mean-based summaries with information about

variability. Finally, the radar plots provide a compact view of the pattern across multiple dimensions at once (areas or sets of specific competences), supporting a quick comparison of the profile of change rather than a single score.

For completeness and comparability, the histograms for average change (Δ) for eTwinning and control groups are provided for each key competence, separately for the two outcome sources (student self-assessment questionnaires and teacher assessment grids). All the other figures are available on the website repository.

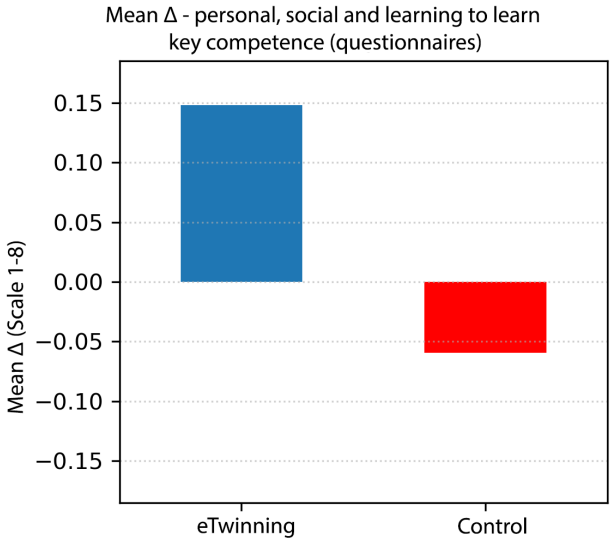


Fig. 4.11 – Overall key competence "Personal, Social and Learning-to-Learn" (students' questionnaires): Bar summary of the average pre-post change (Δ) in the overall key competence score for the two groups

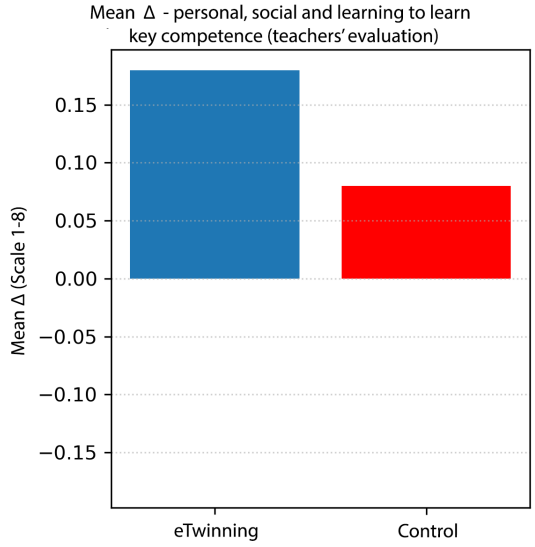


Fig. 4.12 – Overall key competence "Personal, Social and Learning-to-Learn" (teachers' evaluation): Bar summary of the average pre-post change (Δ) in the overall key competence score for the two groups

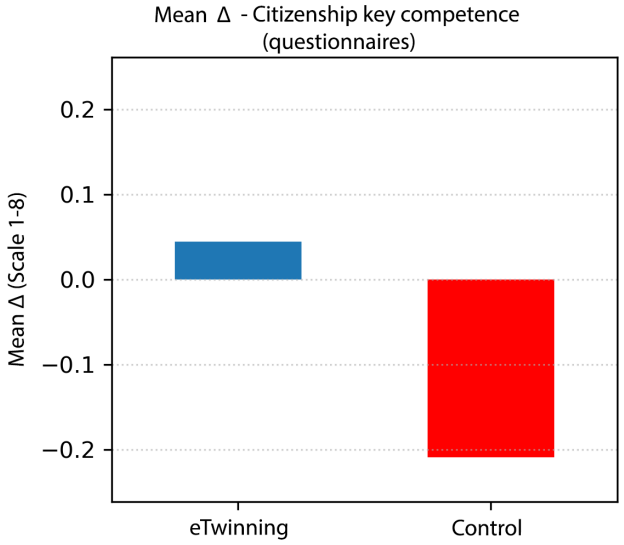


Fig. 4.13 – Overall key competence "Citizenship" (students' questionnaires): Bar summary of the average pre-post change (Δ) in the overall key competence score for the two groups

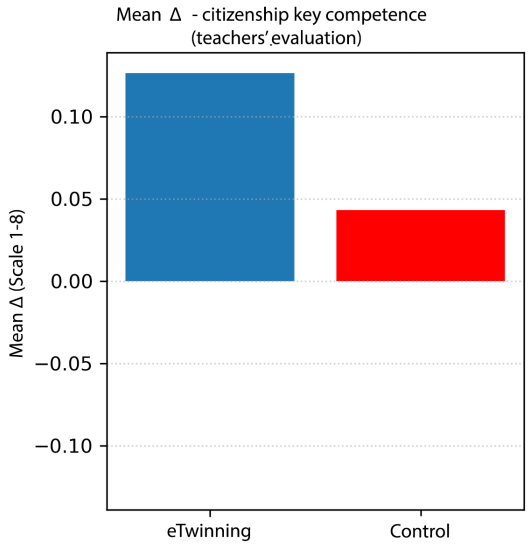


Fig. 4.14 – Overall key competence "Citizenship" (teachers' evaluation): Bar summary of the average pre-post change (Δ) in the overall key competence score for the two groups

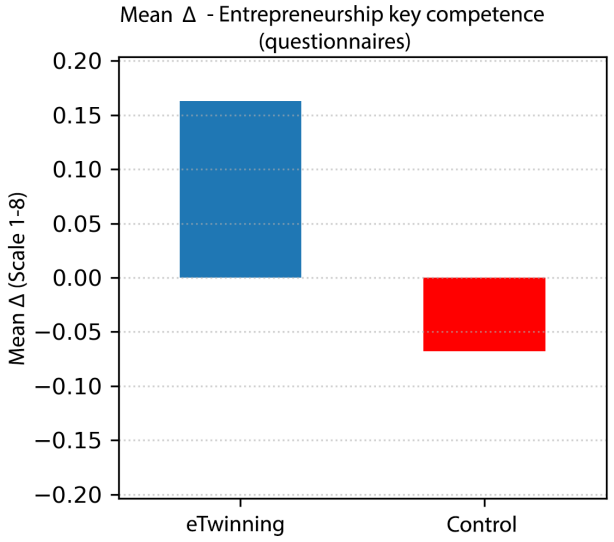


Fig. 4.15 – Overall key competence "Entrepreneurship" (students' questionnaires): Bar summary of the average pre-post change (Δ) in the overall key competence score for the two groups

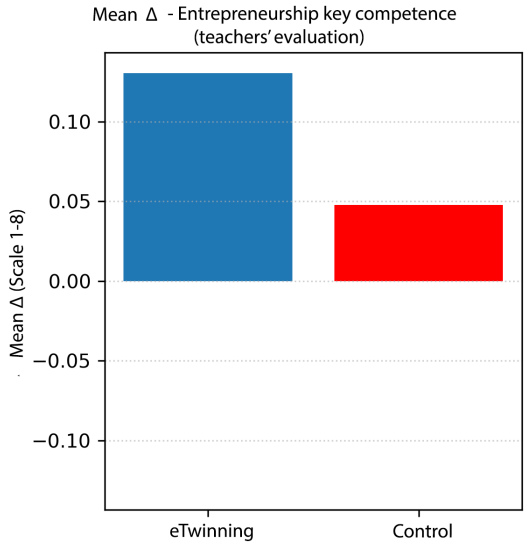


Fig. 4.16 – Overall key competence "Entrepreneurship" (teachers' evaluation): Bar summary of the average pre-post change (Δ) in the overall key competence score for the two groups

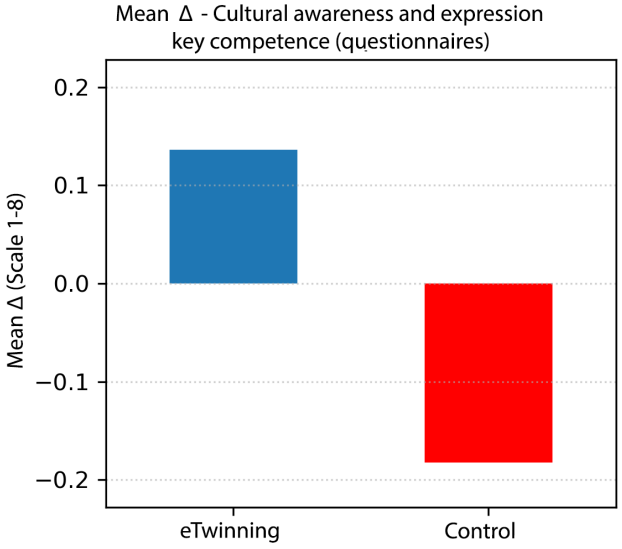


Fig. 4.17 – Overall key competence "Cultural awareness and expression" (students' questionnaires): Bar summary of the average pre-post change (Δ) in the overall key competence score for the two groups

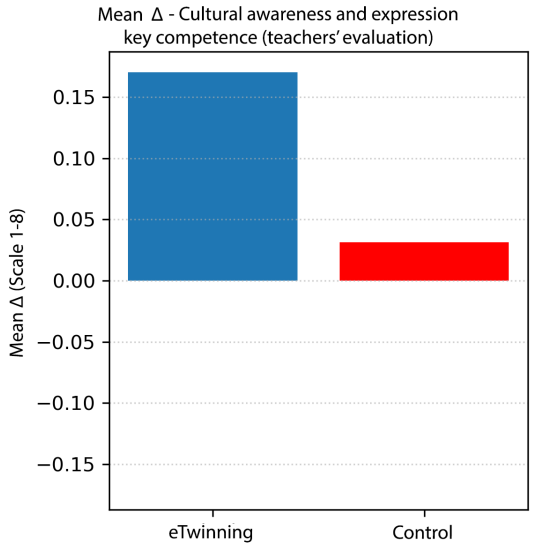


Fig. 4.18 – Overall key competence "Cultural awareness and expression" (teachers' evaluation): Bar summary of the average pre-post change (Δ) in the overall key competence score for the two groups

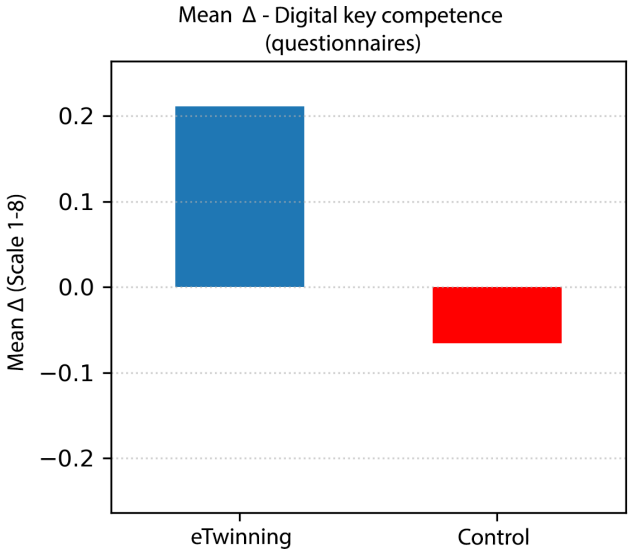


Fig. 4.19 – Overall key competence "Digital competence" (students' questionnaires): Bar summary of the average pre-post change (Δ) in the overall key competence score for the two groups

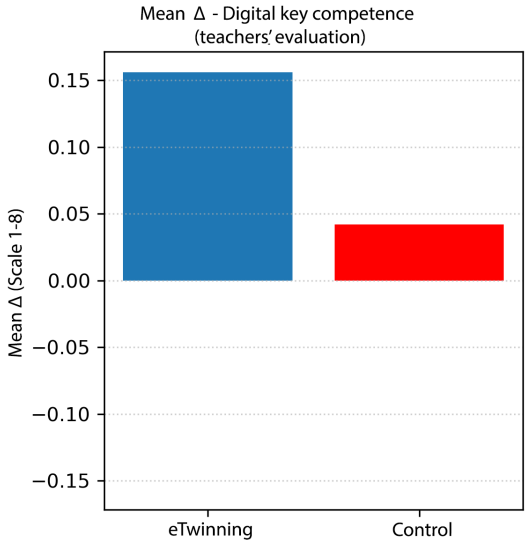


Fig. 4.20 – Overall key competence "Digital competence" (teachers' evaluation): Bar summary of the average pre-post change (Δ) in the overall key competence score for the two groups

4.4 Qualitative analysis

The qualitative component of the study was designed to add an interpretive layer to the quantitative evidence by documenting how competence-related processes unfolded in classroom contexts, and which kinds of experiences students and teachers associated with change over time. It draws on two text-based sources: the open-ended questions included in the student self-assessment questionnaires (pre and post), and the structured monthly teacher logbook, compiled for both the eTwinning class and the matched control class. Unlike the closed-ended items and rubric scores – whose main function is measurement – the qualitative materials primarily serve to contextualise results and highlight conditions that may help explain why, for example, effects are stronger for some competences or areas than others, or why the same competence shows different patterns across sources.

Both sources were processed through a standardised workflow aimed at ensuring comparability across schools, time points, groups, and competence domains. After collection, texts were cleaned and prepared for analysis (including basic normalisation, removal of artefacts, and anonymisation where needed). The corpus was then organised into clearly indexed units (by competence, area, group, time, school/class, and – where applicable –

question), so that qualitative evidence could be inspected consistently alongside the same competence structure used in the quantitative strand.

Analytically, the qualitative work combines two complementary layers. First, a thematic layer: texts are treated as units of meaning that can be coded and synthesised into recurring themes (perceived changes, obstacles, enabling factors, classroom dynamics, technology use, collaboration patterns). The coding approach is hybrid: it is guided by the competence taxonomy, but it remains open to recurring themes that emerge from the data and are not fully anticipated by the framework. Second, a computational text-characterisation layer: in addition to thematic reading, the pipeline produces descriptive indicators that help summarise large amounts of text systematically following lexical richness and sentiment-style indicators. These indicators are used as structured descriptors that can support interpretation and comparison, and to help prioritise interesting parts for close qualitative investigation.

In this book, the qualitative section will focus on synthesised themes (what teachers and students repeatedly emphasise) and on a limited number of anonymised exemplar extracts selected to illustrate those themes. The complete set of qualitative exports is too extensive to be printed, but it is preserved in full for transparency and reusability. The full qualitative exports are available in the companion online repository (see QR code). This disposition keeps the book readable while still meeting the goal of open, traceable reporting. Thematic coding was conducted by one primary coder, with the broader research group periodically reviewing the evolving codebook and discussing coded excerpts. Any uncertainties or disagreements were resolved through group discussion until consensus was reached, ensuring coherence of interpretation while maintaining a single-coder workflow.

4.4.1 Qualitative analysis: open-ended questionnaire answers

Before turning to the competence-by-competence findings, it is useful to clarify what the following qualitative synthesis is (and is not) intended to do. The open-ended questionnaire answers were analysed as students' narrated experiences and self-interpretations across two time points and two conditions (eTwinning vs control). The goal is not to score or rank students' competences through text, but to examine how students frame competence-related experiences, which topics become more salient over time, and which kinds of situations students connect to perceived change.

In this sense, the qualitative evidence complements the quantitative strand by highlighting meaning, mechanisms, and context: it provides interpretative lens that can help us understand why quantitative effects may concentrate in some competences or areas, why they may be more visible at aggregated levels than at single specific competences, and why perceived change can differ between self-assessments and teacher-based measures.

To keep the interpretation coherent and comparable across domains, the synthesis is organised according to the same competence architecture used throughout the study. For each key competence, the text is discussed by competence area, focusing on the main endline shifts in the eTwinning group, the main endline shifts in the control group, and the most informative contrasts between groups. Importantly, topics are labelled using their most frequent terms and are interpreted as recurring narrative frames, not as exclusive categories (O'Dowd, 2016; Hauck et al., 2020): the same answer may draw on multiple themes. Finally, the analysis remains cautious about causal claims: open-ended answers can indicate plausible mechanisms and perceived change, but they do not provide a direct measure of competence growth.

For each competence area, the figures report a heatmap of topic-prevalence change from pre to post. Each row corresponds to one topic (T0–T9), labelled with a short readable description derived from the most frequent terms in that topic. Importantly, topics are interpreted as recurring narrative frames, not as exclusive categories; as a consequence, the same answer may draw on multiple themes. Each column corresponds to one group (eTwinning vs control). Cells show the topic proportion expressed as percentage points: positive values indicate that, at post-test, that topic became more prevalent in students' open-ended answers; negative values indicate that it became less prevalent. The colour scale mirrors this directionality (warmer colours indicate an increase, cooler colours a decrease).

These plots should be read as changes in salience of narrative frames, not as direct competence scores. A topic increasing does not mean that a competence improved, but it indicates that students more often framed their answers through that theme. Conversely, a topic decreasing indicates that students less often used that frame at endline.

Interpretation follows two complementary steps:

1. Within-group reading (vertical): for each group, identify which topics show the largest positive and negative shifts. These indicate which

themes become more central – or fade – in that group's endline narratives for the given area.

2. Between-group reading (horizontal): focus on topics that move in opposite directions (for example, positive in eTwinning but negative in control) or that show substantially different levels. These contrasts are the most informative for discussing how the two conditions differ in the way students narrate competence-related experiences.

Finally, topics are not mutually exclusive categories. Individual answers can contain multiple themes, and a topic label is a shorthand for a recurrent lexical-semantic pattern, not a strict code applied to each response. The heatmaps are therefore used to summarise broad shifts in the discourse across groups and time points.

For readability, only one illustrative heatmap is reproduced in the printed chapter (Personal area, ersonal, social, and learning-to-learn key competence) to show how to interpret the visual output. Equivalent heatmaps were generated for every competence area discussed in this chapter; the full set can be accessed via the QR code.

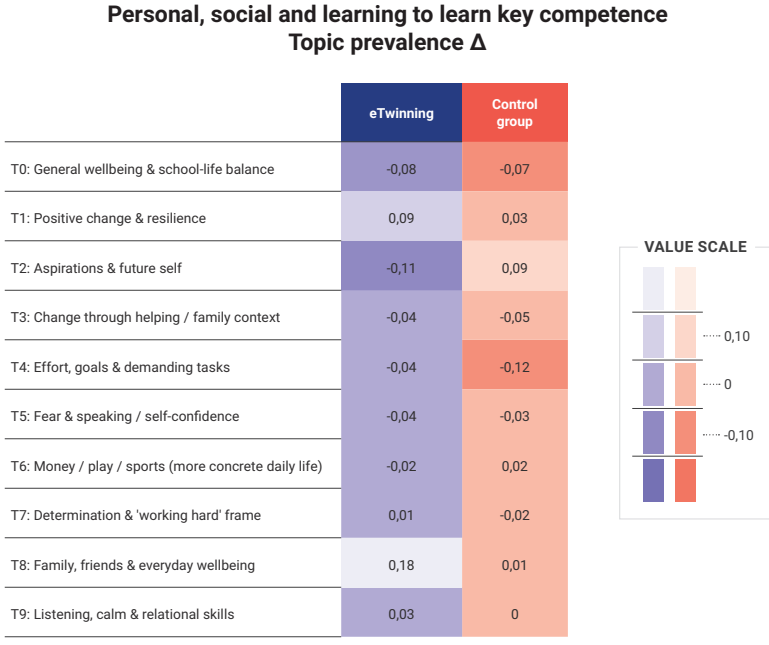


Fig. 4.21 – Personal competence area (open-ended answers students' questionnaires): Heatmap summarising the pre-post change (Δ) in topic prevalence for each topic (T0-T9) comparing eTwinning vs control group.

https://etwinning.indire.it/ricerca/etwinning-e-lo-sviluppo-delle-competenze-degli-alunni/

1) Personal, Social, and Learning-to-learn Key Competence

1.1 Personal

The Personal area shows a clear between-group divergence in what becomes salient at endline. In the eTwinning group, the strongest increase is concentrated in "Family, friends & everyday wellbeing" (T8), suggesting a shift toward a more situated, everyday-life framing of personal development (relationships, routines, wellbeing). In parallel, eTwinning also increases "Positive change & resilience" (T1), consistent with a more positive self-narration of change over the school year.

By contrast, the control group's largest endline increase is in "Aspirations & future self" (T2), a future-oriented frame that foregrounds "becoming" and long-term plans. At the same time, control shows a marked decrease in "Effort, goals & demanding tasks" (T4), indicating a reduced salience of effort/goal-pursuit narratives at endline. Overall, the contrast suggests that eTwinning students increasingly anchor personal change in relational and everyday contexts, while control students shift more toward future aspirations and away from effort-centred narratives.

1.2 Social

In the Social area, both groups show a strong endline increase in "Group initiative & shared goals" (T0), indicating that collaboration becomes more central in students' narratives overall. The more informative contrasts appear in what fades and what replaces those themes.

In eTwinning, topics linked to communicative discomfort decrease, especially "Public speaking anxiety" (T6), and the broader "Peer conflict /

peace-making / negotiating" frame (T4) also becomes less salient. In parallel, eTwinning shows increases in more action-oriented themes such as "Taking initiative in interaction" (T7). This combination is compatible with a narrative move away from fear- or tension-centred descriptions toward accounts emphasising initiative and practice in interaction.

In the control group, the reduction of fear-related frames is weaker overall and the endline profile remains more clustered around general statements rather than the same "initiative-through-practice" emphasis. Taken together, the pattern suggests that eTwinning narratives more often describe social competence through enacted interaction (initiative, trying, practice), rather than primarily through the absence/presence of fear.

1.3 Learning-to-learn

For Learning-to-learn, the endline profile differs in how students frame regulation and improvement. In the control group, the clearest positive movement is in "Study method + self-esteem / physical state" (T1), consistent with a school-performance and self-regulation frame that becomes more salient toward the end of the year.

In eTwinning, positive shifts are more dispersed across themes that connect learning regulation to broader routines and life organisation, including "School–sport–family balance / motivation" (T4) and "Self-improvement through sport/school routine" (T3). This suggests that learning-to-learn is often narrated less as an abstract "method" and more as balancing routines, motivation, and self-management across contexts.

Finally, some "novelty" frames decrease in both groups (e.g., "New habits / language learning / examples", T0), suggesting that endline narratives may move away from generic novelty statements toward more concrete regulation and execution narratives.

2) Citizenship Key Competence

2.1 Digital citizenship

The digital citizenship heatmap aligns well with a shift – especially in eTwinning – toward active civic participation online and more explicit civic-action frames. The most direct indicator is T3 "Civic discussion & participation (projects/initiatives)", which increases in both groups but

shows a stronger positive shift in eTwinning. This supports the interpretation that eTwinning students increasingly describe digital citizenship through participation in discussions, initiatives, and civic exchange.

In addition, several topics move from neutral/negative in control to clearly positive in eTwinning, especially those that connect online engagement to civic agency and reflection: T2 "Petitions, risk perception & civic beliefs" and T4 "Social media as an 'opportunity' (engagement)" are positive in eTwinning while near-neutral or negative in control. This configuration suggests that eTwinning narratives do not only mention participation, but also include a more explicit framing of what online civic action looks like (petitions, engagement opportunities) and the associated evaluative layer (risk perception / beliefs).

By contrast, the control group's strongest positive movements are concentrated in topics that sound more like experience/ability and participation frequency rather than civic action frames: T7 "Online experience and responding (confidence/ability)" and T9 "Commenting, videos & online participation frequency" increase in control but are near-neutral or slightly negative in eTwinning. This suggests that control students tend to narrate digital citizenship more through exposure, confidence, and frequency of interaction, rather than through civic-action schemas.

2.2 Values and social attitudes

The Values and social attitudes competence area heatmap shows a strong divergence in which civic frame becomes most salient at endline. In the eTwinning group, the most striking signal is a very large increase in T0 "Global issues & sustainability", indicating a shift toward a more problem-facing, world-referential vocabulary of citizenship. Students increasingly anchor civic meaning to broad collective challenges and responsibilities, rather than only to general declarations of values.

In the control group, the clearest positive shifts concentrate instead on normative/value-declarative frames, particularly T9 "Human dignity & respect" and T4 "Rights & dignity". This suggests that, while control students also talk about civic values at endline, they tend to express them more as general principles (rights, dignity, respect), rather than as narratives explicitly organised around societal challenges.

2.3 Skills and civic engagement

In the Skills and civic engagement area, the most robust shared pattern is a reduction in T2 "Working alone vs group preference," which decreases in both groups and is more pronounced in eTwinning. This suggests that an explicit "I prefer doing things alone" framing becomes less salient over time, particularly under eTwinning.

Where eTwinning differs more clearly is in topics that describe civic engagement as interdependence and group functioning rather than as a generic prosocial stance. In particular, eTwinning shows a modest positive shift in T7 "Group dynamics & interdependence," while this topic decreases in control. This supports a nuanced interpretation: endline narratives in eTwinning reduce the "working alone" frame (T2) and show some increased salience of how civic participation is shaped by coordination and mutual dependence (T7), whereas control narratives increase most clearly in the broader "helping and listening" frame (T0).

In short, this area points less to a single "participation topic" rising uniquely in eTwinning, and more to a reconfiguration of engagement language: a reduced solo-preference frame (T2) and, in eTwinning, a slightly stronger emphasis on interdependence (T7), while both groups increase helping/listening (T0).

3) Entrepreneurship Key Competence

3.1 Ideas and opportunities

The heatmap supports a clear eTwinning shift from generic "problem talk" toward solution-oriented and generative framing. The most diagnostic signal is the divergence on T9, "Creative solutions & finding ideas", which is negative in control but strongly positive in eTwinning. This pattern fits a narrative move from describing problems as givens to describing idea generation as a practiced response to concrete situations.

Alongside this, both groups increase T0, but the shift is stronger in eTwinning, suggesting that problem recognition becomes more salient overall while eTwinning students more often connect it to an "active stance" rather than to a static description. By contrast, several school-bound or structure-bound frames like T6, "Noticing problems in school structures" and T2 "School examples / typical cases" remain negative or only mildly positive, indicating that what differentiates groups is less whether problems

are mentioned and more how they are narrated (constraints vs solutions; examples vs solution-building).

3.2 Resource management

Regarding this area, eTwinning shows its strongest positive shift in T0 – "Money, buying, what's needed", which rises in both groups but substantially more in eTwinning, indicating increased salience of practical resource needs ("what is necessary," "what we need to get/do something").

Meanwhile, control shows relatively stronger emphasis on school-year regulation themes such as T6. Importantly, several topics tied to "time scarcity" and stress (like T9) decrease more in eTwinning, suggesting that eTwinning students are not primarily narrating resources through pressure-to-study, but rather through practical constraints and means.

3.3 Taking action

This is the strongest and cleanest signal across the entrepreneurship set. Both groups increase action-oriented framing, but the eTwinning group shows a very large rise in T0 "Group work under constraints & delivering presentations", dwarfing the control increase. In the same direction, eTwinning also increases T7 "Changing and adapting over the school year" and shows modest positive movement in T9 "Group situations and planning in class". In contrast, several "routine collaboration" frames, like T4, decrease in both groups, suggesting that endline narratives consolidate around execution/delivery under constraints rather than generic "group work" statements.

Taken together, the "Taking action" heatmap supports this interpretation: eTwinning students are more likely to narrate action as a process (adapting, coordinating, delivering), not merely as an intention or a generic willingness to participate.

4) Cultural Awareness and Expression Key Competence

4.1 Creative expression & digital skills

In this area the control group shows strong increases in personal/social-platform creation frames: T2: "Making & posting creative media", T1 "Digital drawing/design", and T3 "Commenting/sharing with friends" all

rise in control while decreasing in eTwinning. This indicates that endline control narratives become more saturated with social posting and individual creative production vocabulary.

By contrast, eTwinning increases the project and task-oriented side of expression T8 "Writing/expression for school/project" rises more clearly in eTwinning, and T0 "Tech as a way to express myself" also increases in eTwinning while decreasing in control. Notably, T4 "Using social media to post/respond" increases in both groups, which suggests that eTwinning students do not "avoid" social platforms; rather, their endline narratives more often frame expression as purposeful production and sharing in structured contexts (school/project outputs), whereas control narratives shift more strongly toward everyday posting and personal creative routines.

4.2 Cultural values & ethical considerations

In the ethical-considerations area, both groups show modest endline reinforcement of responsibility-oriented themes, particularly T8 "Future generations & the planet", which increases in both conditions. The most informative contrast, however, concerns how students formulate value-oriented discourse.

eTwinning shows a clearer increase in T0 "Prejudice, context, and critical stance", indicating more frequent framing of values through context-sensitive reflection. This aligns with your earlier narrative about eTwinning shifting toward relational competence and interpretation, but it should be stated precisely as a rise in critical-reflective vocabulary rather than as a broad reduction of conflict language. Several other topics decrease in both groups, like T6 "Respect/coexistence" and T2 "School/project context", suggesting a consolidation toward fewer dominant ethical frames at endline rather than a uniform directional shift across all value-related themes.

4.3 Cultural knowledge and intercultural understanding

The Cultural knowledge and intercultural understanding area shows a shared endline emphasis on the broad value of culture, but the meaning of that emphasis differs by condition. Both groups increase T0 "Culture matters", with a stronger rise in the control group, suggesting that endline responses often converge on a general "culture is important" discourse.

What differentiates eTwinning is a more explicit shift toward culture as perspective-taking and relational openness. The clearest condition-specific

movement is T4 "Openness & perspective-taking", which increases in eTwinning while decreasing in control. This pattern supports an interpretation in which eTwinning students more often describe cultural understanding as something that reshapes how they see other people and viewpoints, rather than only as an abstract endorsement of culture. Smaller eTwinning-positive movements in T8 "Language and culture as learning/helping others" and T3 "Learning through diversity" are consistent with the same relational frame.

5) Digital Competence

5.1 Information and data literacy

The "information and data literacy" area shows a clear divergence between a tool and editing-centred framing (more salient in control) and a responsibility/ethics-of-sharing framing (more salient in eTwinning). In the control group, the largest positive shifts are concentrated in topics such as T4 "Creating/editing content" and T2 "Apps & editing tools", as well as T3 "Social media use & responsible behaviour online". This indicates that endline narratives in control increasingly describe digital competence through practices of tool use and content editing, and through everyday social media use.

By contrast, in the eTwinning group the clearest positive movement is in T0 "Responsible sharing, privacy & digital content", alongside a positive shift in T5 "Netiquette and online rules". These patterns support an interpretation in which eTwinning narratives shift toward norms and responsibility in the management of information and content, rather than toward the repertoire of apps and editing practices. Importantly, while the area name includes "information and data," the dominant lexical signal is less about evaluating sources and more about responsible circulation and conduct in digital environments.

5.2 Communication and collaboration

This heatmap supports an eTwinning-specific consolidation around project-mediated communication, rather than focusing on "tools" per se. The topic that most directly captures this is T7 "eTwinning project narrative", which increases in both groups but more in eTwinning,

indicating that students in the project condition narrate communication through the lens of a shared project experience. eTwinning also shows a positive shift in T6 "Online participation in eTwinning/project media", and in T0 "Online communication success/contrast", suggesting that online communication is framed as something practiced, experienced, and evaluated in context.

Some tool-centric coordination themes do not rise in eTwinning, which is informative: the qualitative signature is not simply "using more platforms/tools," but communication enacted inside a structured collaborative setting (project routines, shared outputs, participation in project media). Both groups increase T5 "Classmates, group presentations, collaboration", but eTwinning differs in anchoring this salience to the project narrative and mediated participation.

5.3 Digital content creation

Regarding this area, both groups show a very strong increase in T0 "Public vs private on social media", suggesting that endline narratives mainly centre on decisions about visibility, audience, and the public/private boundary – arguably a core aspect of adolescent "content creation" in practice.

Beyond this shared shift, group differences are more nuanced. Control shows stronger increases in a profile/settings frame such as T2 "Privacy settings and profile control" and identity-management decision language. eTwinning, instead, shows clearer positive movement in T1 "Managing digital identity" and a smaller positive shift in T6 "Being careful online".

5.4 Safety

The Safety area shows one of the clearest between-group contrasts in the whole qualitative corpus. eTwinning exhibits a very large increase in T0 "Scams & fake messages", while the same topic decreases sharply in control. This supports a strong interpretation: eTwinning endline narratives become much more oriented toward fraud recognition, and, implicitly, vigilance around deceptive digital messages.

Consistently, eTwinning also increases action-oriented safety routines such as T2 "Reacting to scams: block/report immediately" and T1 "Suspicious messages". The control group, by contrast, shows its strongest positive shift in T9 "Spam and email hygiene" and in T5 "Email/message

scams", suggesting a more email/spam-centric safety framing. In sum, both groups talk about safety, but eTwinning shifts toward scam recognition and immediate response routines, whereas control shifts toward spam hygiene and generic email caution.

5.5 Problem solving

The Problem-solving area suggests a split between self-reliant technical troubleshooting (more salient in control) and help-seeking/support-based problem solving (more salient in eTwinning). Control increases strongly in topics such as T2 "Solving problems independently" and T7 "Hardware/technical issues", indicating that endline narratives in control emphasise competence as the ability to fix issues on one's own.

eTwinning, by contrast, shows its strongest positive movement in T0 "Asking for help", which is strongly positive in eTwinning and negative in control. eTwinning also increases T8 "Device troubleshooting at home", but the defining feature remains that help-seeking becomes a salient, legitimised strategy. The implication is not that eTwinning students "solve fewer problems," but that they narrate problem solving through a networked/supportive approach (knowing when and how to ask), whereas control narratives highlight individual technical efficacy.

Taken together, the open-ended responses converge on a coherent qualitative profile that is consistent with the educational logic of eTwinning, but also more nuanced than a simple "more competence" narrative. Across domains, the eTwinning condition is characterised less by a uniform increase in positive statements and more by a re-weighting of what students choose to foreground when they describe change: everyday relational contexts, action under constraints, and responsibility-oriented digital behaviours become more salient, while several generic or routine frames fade.

Two cross-cutting shifts stand out. First, eTwinning narratives more often articulate competences as situated practice. This is particularly visible in the Personal area, where endline salience concentrates on relational and everyday wellbeing and positive change/resilience, and in Social area, where the shared rise in collaboration is paired – especially in eTwinning – with greater emphasis on initiative in interaction and reduced salience of discomfort/conflict frames. The same "competence-as-enactment" signature becomes particularly strong in Entrepreneurship, where "Taking action" is dominated by the very large eTwinning increase in group work under

constraints and delivering presentations, indicating that competence is narrated through execution, adaptation, and delivery rather than through abstract intention.

Second, the qualitative material suggests that eTwinning tends to pull civic and digital competences toward agency and responsibility frames, but in domain-specific ways. In Citizenship, the clearest divergence is not whether values are present (they are in both groups), but which civic lens becomes central: eTwinning shifts sharply toward global issues and sustainability, while the control condition concentrates more on rights/dignity as principles. In Digital citizenship, eTwinning emphasises civic participation and action-oriented engagement online, whereas control leans more toward experience/frequency frames. In Digital competence, the pattern is highly informative: control narratives become more tool and editing-centred in information/data literacy, whereas eTwinning becomes more responsibility-centred, and it differentiates itself strongly in Safety through scam recognition and response routines. Even in Problem solving, the divergence is interpretable as a difference in strategy salience: control foregrounds self-reliant technical fixing, while eTwinning foregrounds help-seeking as a legitimate competence strategy, consistent with a collaborative project ecology.

At the same time, the heatmaps make clear where interpretations must remain cautious and specific. In Cultural awareness and expression, both groups increase broad "culture matters" statements, but eTwinning's more distinctive movement is toward openness/perspective-taking rather than a generic endorsement of culture. In Creative expression and digital competences, the control group shows strong increases in personal/social-platform production, whereas eTwinning increases more structured, school/project-linked expression and a more general "tech as expression" frame. This does not support a simple "eTwinning produces, control consumes" storyline; instead, it supports a purpose/context distinction: personal posting and individual creation rise more in control, while purposeful, task-linked expression rises more in eTwinning.

Overall, these qualitative patterns strengthen the interpretation of the quantitative results as reflecting a broad activation mechanism rather than a single narrow skill gain. eTwinning appears to provide contexts in which multiple components are co-activated – coordination, responsibility, adaptation, participation, and relational regulation – so that students more often narrate competences as things they do in concrete situations. The

control condition, by contrast, more often retains endline narratives organised around school-performance regulation, declarative values, and tool/app repertoires, while generally remaining more "abstract" and "generic" than the eTwinning group. Finally, the topic profiles also underline heterogeneity: effects differ by competence and by area, suggesting that future work should focus on implementation features and classroom conditions that determine whether students experience competence enactment as frequent, meaningful, and recognisable enough to become salient in their own narratives.

As a descriptive complement to thematic coding, we computed a sentiment index and lexical diversity (MTLD) on students' open-ended answers, by competence area, group, and time (McCarthy & Jarvis, 2010). These indicators are sensitive to response length and missingness and are therefore not treated as outcomes. Nonetheless, MTLD shows a consistent pre–post decrease in the eTwinning group across all areas in all five competences, suggesting that endline discourse may become more consolidated around recurrent project-related frames (shared routines, action steps, responsibility language) rather than remaining diffuse. The contrast is most evident in Digital competence, where MTLD decreases in eTwinning in all five areas while remaining stable or increasing in the control group. Sentiment shifts are small and non-systematic, and are best read as stylistic descriptors rather than evidence of "more positive" outcomes. Detailed tables and full-resolution outputs for these indicators (for all competences, areas, groups, and time points) are available in the online repository and accessible via the QR code.

4.4.2 Qualitative analysis: teachers' reflective diaries

The teacher logbook provide the most process-oriented qualitative evidence in the study: they document what actually happened in classrooms month by month, which constraints shaped implementation, and which competence-relevant behaviours teachers observed in ordinary practice. Because each participating teacher completed the diary for both the eTwinning class and the matched control class, the corpus is particularly useful for within-teacher contrasts.

Across the corpus, one clear structural difference is activity density and specificity. eTwinning entries tend to contain longer and more detailed

descriptions of monthly activities (coordination with partners, production steps, tools used, division of roles), whereas control-class activity logs are usually shorter and more anchored to routine curricular progression and assessment phases. This is coherent with the nature of eTwinning as project-based work that requires explicit planning, coordination, and documentation.

To support the process-oriented synthesis of teachers' logbooks, we report a small set of descriptive monthly aggregates. The positive valence plot shows, for each month, the average positive tone of diary entries in the two conditions (eTwinning vs control). The event trend plots report the mean monthly frequency of coded event tags within each condition; higher values indicate that those events were mentioned more often in that month's diary records. As for the other qualitative data, these plots do not provide causal evidence, but they help contextualise implementation. For example, they make visible month-specific pressures that can plausibly shape activity density, workload, and the observability of competence enactment.

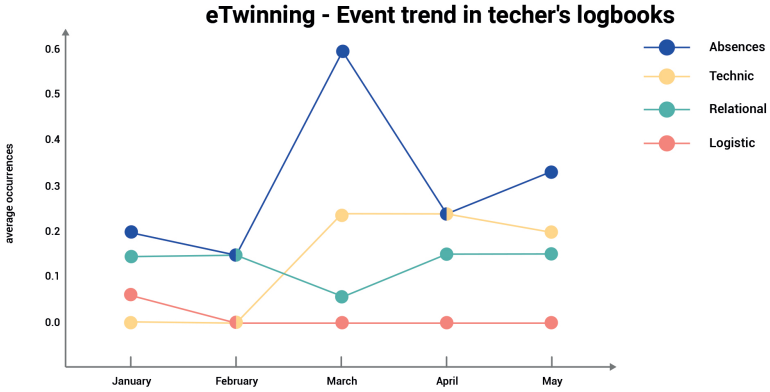


Fig. 4.22 – Teacher logbooks (eTwinning group): Monthly trend of the mean frequency of coded event tags (Absences, Technical, Relational, Logistic) reported in the logbooks

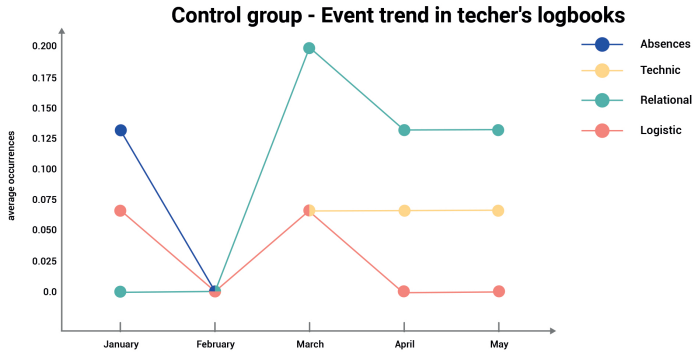


Fig. 4.23 – Teacher logbooks (control group): Monthly trend of the mean frequency of coded event tags (Absences, Technical, Relational, Logistic) reported in the logbooks

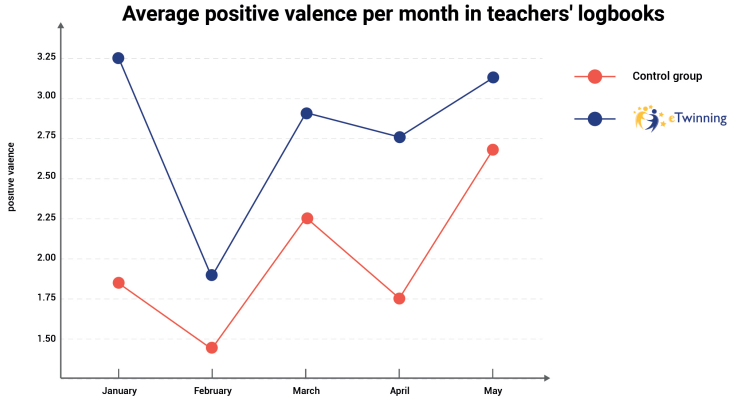


Fig. 4.24 – Teacher logbooks (both groups): Monthly trend of the average positive valence of diary entries, comparing the eTwinning and control group over the project period

From an interpretive standpoint, the logbooks can be synthesised into a set of recurring themes that help contextualise the quantitative patterns.

1) Calendar pressure, workload, and assessment mode

A strong cross-cutting theme, especially in the spring months, is the compression typical of the end of the school year: syllabus completion, oral examinations, written tests, remedial activities, timetable constraints, and competing school events. Teachers frequently describe periods where classroom time becomes time-pressured. This matters for interpretation because it plausibly affects students' perceived competence (self-ratings can

become more conservative under stress and comparison pressure) and the visibility of competence enactment, since many transversal competences are less salient when classroom activity is dominated by assessment routines. This background is present in both conditions, but it tends to be more dominant in control-class narratives.

2) Visibility of competence enactment

A second recurring contrast concerns how visible competence-related behaviours are in everyday classroom life. In control classes, teachers often describe competence-related progress indirectly (students are more mature, more responsible, better organised), but the episodes remain tied to standard lessons and assessments. In eTwinning classes, by contrast, logbooks more often report competence enactment as something observable in concrete moments: planning a shared task, negotiating roles, resolving coordination problems, creating and revising an artefact, interacting with external partners, or presenting outputs.

Regarding the specific key competences:

3) In the personal-social domain, eTwinning logbooks converge with the strongest quantitative signals by repeatedly describing: collaboration and communication as structured routines (division of tasks, peer coordination, group accountability, negotiation of roles); responsibility and autonomy (students taking initiative, managing deadlines, keeping commitments to peers, handling shared materials); self-regulation and persistence (planning work over time, revising outputs, coping with setbacks, re-organising after disruptions). In control classes, these dimensions appear too, but more often as general teacher impressions ("more mature", "more engaged") or as tied to study habits and performance. In eTwinning classes, they are more frequently narrated as competence episodes embedded in project workflows, which makes them easier to document, recall, and justify.

4) For citizenship-related competences, logbooks commonly report that eTwinning classes engage more often with collective decision-making and participation, discussion of social issues (sustainability, community problems, human rights, responsibilities), and civic communication practices (present, share, interacting with broader audiences, reflecting on how messages are received). Control logbooks more often frame citizenship within classroom climate and behavioural norms (respect, rules, inclusion),

which is still relevant but limited compared to the wider spectrum of citizenship competence.

5) When teachers describe entrepreneurial competence development, the clearest diary signals cluster around themes referring to the process that bring from the idea to its execution: proposing ideas, selecting feasible options, planning steps, and delivering outputs under constraints. Other topics discussed are resource management (time, materials, coordination, and practical problem-solving to complete tasks) and agency. These elements are present in some control narratives (often linked to individual effort and study organisation), but eTwinning logbooks more often make them visible as collective, task-driven processes.

6) In cultural competence, teachers' logbooks tend to differentiate the two conditions in how culture is experienced: In eTwinning, culture is more frequently described through exchange and comparison (encountering other perspectives, languages, practices) and through production and sharing (creating artefacts, presentations, or media outputs connected to cultural themes). In control contexts, cultural activity is more often described as curricular content (learning topics, discussing works, completing assignments). This aligns well with the idea that eTwinning makes cultural learning more concrete by anchoring it to authentic communication and shared outputs.

7) Finally, logbooks are particularly informative for digital competence because they document why and how tools are used, not only whether they are used. Across eTwinning logbooks, digital practices are more often framed as: communication and collaboration using tools as part of a workflow (sharing drafts, coordinating tasks, negotiating formats); content creation as iterative production (planning, building, revising, publishing, and presenting); problem-solving as task-bound troubleshooting (solving technical issues to deliver on time); safety and responsibility as concrete concerns when interacting online or managing accounts/materials. Control logbooks mention digital tools too, but mostly as support for routine schooling or individual use.

Taken together, the logbooks support a coherent interpretation of the quantitative findings: eTwinning appears to create learning conditions where competence-related behaviours are repeatedly enacted, relationally

contextualised, and tied to concrete outputs. This is exactly the type of holistic mechanism that tends to produce stronger signals at broader levels (areas and key competences) than at the narrowest level of single specific competences. At the same time, logbooks make it clear that the school-year context is not neutral: workload, assessment pressure, absences, and organisational constraints shape both groups and can influence how students perceive themselves at endline. These process traces do not prove causality on their own, but they provide plausible, context-grounded mechanisms that help explain why the patterns observed in the quantitative strand look the way they do.

Chapter 5
Cross-case Triangulation Across Schools: An Interpretive Reading of Patterns

Alexandra Tosi

5.1 Purpose and positioning within the report

This chapter provides a school-level cross-case reading that complements the aggregate results presented in Chapter 4. Its purpose is to examine whether the direction and magnitude of the "eTwinning–control difference" vary across schools and to interpret such variation through a triangulated view of outcome indicators, project quality evidence, and teachers' logbooks.

Results detailed in Chapter 4 indicated a clear overall advantage for eTwinning across the five competence areas. In contrast, the control group showed weaker gains in teachers' assessments and even a decline in students' self-perceived competences. Drawing on those results, the present subsection has an interpretive purpose: it uses cross-case triangulation across the 14 implementation contexts to illuminate recurring patterns that may help explain why some contexts align more strongly with the overall trend than others.

For this cross-case reading we focus on the student self-assessment questionnaires, while still acknowledging the study's planned outcome triangulation (student questionnaires and teacher assessments) discussed in Chapter 4. This choice is primarily pragmatic and editorial: the two outcome sources reflect different perspectives and cannot be meaningfully averaged into a single composite indicator, and replicating the entire cross-case comparison twice (for both sources) would exceed the scope of the present publication. In this first cross-case analysis, we therefore prioritise

the student perspective, which allows us to give voice to learners' perceived development and to explore contextual patterns using a single, coherent outcome metric. This aligns with the exploratory aim of the subsection: the focus is on identifying cross-case patterns and generating hypotheses for future work, rather than testing hypotheses.

These cross-case comparisons should be read as pattern-seeking rather than hypothesis-testing. When disaggregating results by school, sample sizes inevitably shrink and, in some cases, the number of matched students is very small, reducing statistical stability and making single-school estimates sensitive to missing data. Additional sources of incompleteness – such as missing logbook months for some schools and occasional gaps in test or questionnaire administration – further limit the strength of case-level inferences. For these reasons, the school-level indicators are used here primarily to support triangulation and to identify convergent configurations across quantitative signals and qualitative implementation evidence. Accordingly, the main inferential weight remains on the aggregated analyses in Chapter 4, which provide the most robust estimate of overall effects.

5.2 Cross-case indicators and robustness notes

As described in Chapter 4, questionnaire responses were converted into numeric Likert values; item directionality was verified and negatively worded items were reverse-coded to ensure that higher scores consistently indicated higher levels of the construct. Scores were then harmonised onto the common 1–8 metric used by the rubric-based competence model through a linear transformation. For each competence and each group (eTwinning vs control), change scores (Δ) were computed only on matched students, i.e., students who completed both the pre- and post-test; if a student was present in only one wave, the delta was treated as missing.

Before introducing the indicators, it is useful to clarify the terminology used throughout this chapter: the term "school-level cross-case analysis" refers to the systematic comparison of results across the 14 anonymised School IDs, and Table 5.1 is referred to as the "triangulation matrix", as it aligns outcome signals with project-quality evidence and logbook-derived contextual cues.

For cross-case comparisons, outcomes are summarised as an overall eTwinning advantage per school, defined as the difference between the

mean change in the eTwinning class and the mean change in the control class (ΔeTw – ΔCtrl), aggregated across the competence areas available for that school. Because the number of matched students can differ between eTwinning and control and across competences, the school-level indicator is computed as a weighted mean. The weight assigned to each competence is based on the number of students that can be fairly compared in both groups: specifically, it uses the *minimum* matched N between the two classes for that competence (e.g., if a competence has 18 matched students in eTwinning and 12 in control, the comparable matched N for that competence is 12). These minima are summed across competences and reported as Matched N (min-sum), i.e., the total "usable" matched evidence underpinning the school-level summary across domains.

A further interpretative choice concerns aggregation across competences. The school level advantage shown in figures 5.1 and 5.2 is an overall indicator that averages available competence deltas for that school. This is used strictly as a pragmatic cross-case "direction-of-travel" summary to facilitate comparison across schools; it does not replace competence-specific reading and should not be interpreted as a definitive estimate for any single domain.

Schools with Matched N (min-sum) below 10 (or missing) are flagged as low comparability and marked accordingly in figures. This flag is a stability cue, not a validity judgement: it indicates that the overall school-level summary is less stable and should be interpreted more cautiously. Accordingly, when a trend line is fitted to visualise the association between project quality and outcomes (Figure 5.1), it is estimated using only higher-comparability cases, while all schools remain visible in the plot.

5.3 Cross-case dataset for interpretive triangulation

Table 5.1 is designed as a triangulation matrix: its purpose is to place side by side, for each anonymised school, a set of context descriptors, process indicators, and outcome summaries, so that cross-case patterns can be read interpretively. Rather than "explaining" outcomes through a single variable, the table clarifies what is being put in relation: who the teacher is and what the school context looks like, how the eTwinning project was implemented and documented, and what the aggregated outcome signal looks like (overall advantage and its robustness).

Concretely, the table combines: teacher and school descriptors (included

primarily to characterise the sample and contextualise each case), eTwinning quality descriptors (including the macro-level category derived from the National Quality Label evaluation of the project implemented during the experiment - Satisfactory / Good / Excellent / Outstanding), concise indicators derived from logbooks (summarising baseline classroom differences, the perceived relative intensity of competence-oriented work in eTwinning vs control, and key contextual factors), and the school-level outcome indicators summarised in Section 5.2 (including Matched N). The outcome column reports a competence-averaged advantage (ΔeTw – ΔCtrl) as a compact cross-case signal. While this averaging is necessarily an approximation, it supports comparison across schools and is interpreted in conjunction with the competence-level checks reported above, which show that competence-specific trajectories are generally aligned with the aggregated direction.

Read together, the last three sections of the table make it possible to examine whether a positive (or weak) outcome signal tends to co-occur with particular configurations – for example, stronger project quality, richer implementation evidence in logbooks, or fewer disruptive contextual events – while also keeping in view the robustness of each case (matched sample size). School identities are anonymised; numbers correspond to the School IDs used consistently across figures and tables. Because participating teachers are generally highly experienced and show relatively homogeneous competence self-assessment profiles – and their eTwinning profiles are also broadly comparable, as all are experienced eTwinning ambassadors with multiple projects and recognised achievements – teacher variables in this chapter are treated mainly as background descriptors rather than strong predictors of outcome variation. The cross-case reading is therefore explicitly pattern-oriented and interpretive.

School profile			Teacher profile				eTwinning	Logbook			Outcomes (triangulation)						
School ID	Macro-area	School type	Years of teaching	Competence self assessment			Project quality level	Baseline	Intensity	Logbook notes	Δ Overall advantage (eTw - Ctrl)	Matched N (min-sum)	Δ Digital	Δ Personal	Δ Social & civic	Δ Cultural	Δ Entrep.
				Didactics	Institution & community	Professio-nalism											
1	Centre	IVET Upper Sec. Instit.	>25	3,42	3,55	4	Excellent	eTwinning ahead	eTwinning much higher	eTwinning class: positive climate; control class: more problematic and divided. Some disruption and fragile students reported.	0,463	59	0,494	0,486	0,337	0,508	0,527
2	North	General Upper Sec. Instit.	>25	3,63			Satisfactory	Not reported		Logbook not available.	0,024	89	-0,150	-0,021	0,374	-0,171	0,116
3	North	General Upper Sec. Instit.	>25	3,74	3,36	3,83	Excellent	Not reported	eTwinning higher	eTwinning: added collaborative elements (products, interaction, videoconference). Teacher reports stronger development than control.	0,378	49	0,307	0,169	0,496	0,756	0,393
4	North	General Upper Sec. Instit.	>25	3,79	3,64	4	Excellent	Not reported		Logbook not available.	NA	NA	NA	NA	NA	NA	NA
5	North	General Upper Sec. Instit.	>25	3,84	3,27	4	Outstanding	Not reported	eTwinning higher	eTwinning delivered via one weekly enhancement hour; partner collaboration discontinuous.	0,282	36	0,496	0,349	0,190	0,401	0,055
6	South & Islands	General Upper Sec. Instit.	>25	3,26	3,82	3,67	Satisfactory	Not reported		Sparse logbook; absences and test-related panic/anxiety noted. Both classes faced difficulties; April shortened by holidays/trips.	-0,420	1 [Low N<10]	NA	-0,420	NA	NA	NA
7	Centre	General Upper Sec. Instit.	21–25	3,21	3,09	3,67	Outstanding	Not reported	eTwinning higher	No major baseline differences; project involved sustainability and strong collaboration with partners and external associations.	0,403	70	0,522	0,479	0,208	0,356	0,434

School profile			Teacher profile				eTwinning	Logbook			Outcomes (triangulation)						
School ID	Macro-area	School type	Years of teaching	Competence self assessment			Project quality level	Baseline	Intensity	Logbook notes	Δ Overall advantage (eTw - Ctrl)	Matched N (min-sum)	Δ Digital	Δ Personal	Δ Social & civic	Δ Cultural	Δ Entrep.
				Didactics	Institution & community	Professio-nalism											
8	South & Islands	IVET Upper Sec. Instit.	18–20	3,42	3,91	4	Good	Control ahead	Control higher	eTwinning class described as fragile; continuity affected by major logistical constraints (school renovation/dispersed teaching).	0,204	62	0,226	0,399	-0,056	0,281	0,109
9	North	General Upper Sec. Instit.	>25	3,47	3,64	3,67	Good	Not reported		Logbook not available.	0,074	31	0,325	0,184	-0,315	0,001	0,245
10	South & Islands	IVET Upper Sec. Instit.	18–20	3,68	3,09	3,83	Excellent	Not reported	Comparable	eTwinning class described as very divided; engagement limited beyond a small motivated group.	0,324	59	0,458	0,108	0,421	0,511	0,216
11	North	General Upper Sec. Instit.	18–20	3	3	3,33	Good	Not reported	eTwinning higher	eTwinning activities plausibly supported digital/entrepreneurship; control class required substantial remediation (SEN/BES).	0,161	7 [Low N<10]	NA	0,161	NA	NA	NA
12	South & Islands	IVET Upper Sec. Instit.	>25	3,53	4	4	Good	Comparable	Comparable	Both classes used active methods; control appears to have received a comparable learning experience (possible attenuation of differences).	-0,173	6 [Low N<10]	NA	-0,173	NA	NA	NA
13	South & Islands	General Upper Sec. Instit.	21–25	3,53	3,64	4	Good	Not reported		Logbook not available.	NA	NA	NA	NA	NA	NA	NA
14	Centre	General Upper Sec. Instit.	18–20	2,79	2,55	4	Satisfactory	Not reported	eTwinning higher	Implementation issues: partner problems and limited TwinSpace use; teacher not satisfied; organisational constraints salient.	0,026	5 [Low N<10]	NA	0,026	NA	NA	NA

Tab. 5.1 – landscape page

To read Table 5.1 effectively, it is useful to distinguish five parts. The first two report school – and teacher – level descriptors, which are included to characterise the context of each case (rather than as direct predictors). Cross-case "matches" and interpretive comparisons should instead focus on the last three sections of the table, where project quality and implementation evidence (process indicators), salient contextual factors emerging from the logbooks, and the synthetic outcome signal (overall eTwinning advantage) are displayed together, always considering the robustness of the comparison via Matched N. Convergences across these elements guide the interpretations discussed in the following sections.

5.4 Project quality as an interpretive lens

To capture variation in implementation quality in a way that is externally grounded and comparable, we use the project quality evaluation associated with the National Quality Label framework, as extensively explained in Chapter 3. For the purposes of this subsection, quality is reported as descriptive macro-levels (Satisfactory, Good, Excellent, Outstanding) rather than as numeric scores. All projects in the present sample exceeded the Quality Label threshold and were awarded the label; nevertheless, the assessment differentiates projects in terms of clarity, coherence, depth of pedagogical design, and documentation of implementation and outcomes.

Figure 5.1 relates project quality to the overall eTwinning advantage per school. A clear positive gradient is visible: higher-quality projects tend to coincide with larger advantages for eTwinning over control. This association is interpreted descriptively rather than causally. It is theoretically coherent with the distinctive characteristics of eTwinning projects discussed in Chapter 3: when implemented with fidelity, eTwinning tends to combine project-based learning, authentic collaboration with partner schools, meaningful use of digital tools for communication and co-creation, opportunities for student agency and reflection, and structured documentation of processes and results. These elements create a learning context in which transversal competences can be exercised repeatedly and made visible, thereby plausibly supporting competence growth.

The distribution of cases also supports a nuance that is relevant for practice: projects classified as Satisfactory (i.e., meeting the quality threshold but not among the strongest cases) can still show a positive advantage. This suggests that participation in eTwinning may already

provide conditions favourable to competence development, while higher project quality is associated with stronger and more consistent outcomes.

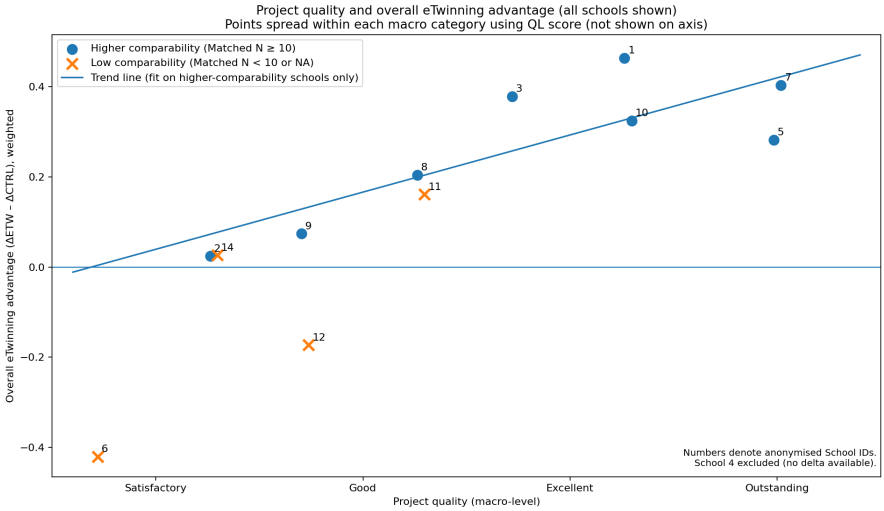


Fig. 5.1 – Project quality (macro-level) and overall eTwinning advantage by school. Note. Trend line fitted on higher-comparability schools only; low-comparability cases (Matched N min-sum < 10 or NA) are marked with ×

5.5 School-level comparison of eTwinning vs control deltas

Figure 5.2 compares mean pre–post deltas in eTwinning and control classes by school (weighted across competences, using matched-student minima as weights). This visualisation provides a concrete view of how outcomes distribute across contexts and supports interpretive triangulation by helping to identify contexts that merit qualitative deepening in future work (e.g., cases strongly aligned with the overall trend; cases closer to parity; and cases harder to interpret because comparability is limited by low matched N).

Because the school-level values are aggregated across competences, they should be read as an indicative summary signal. At the same time, the cross-case distribution is coherent with Chapter 4, with control-group deltas close to zero or negative in several contexts.

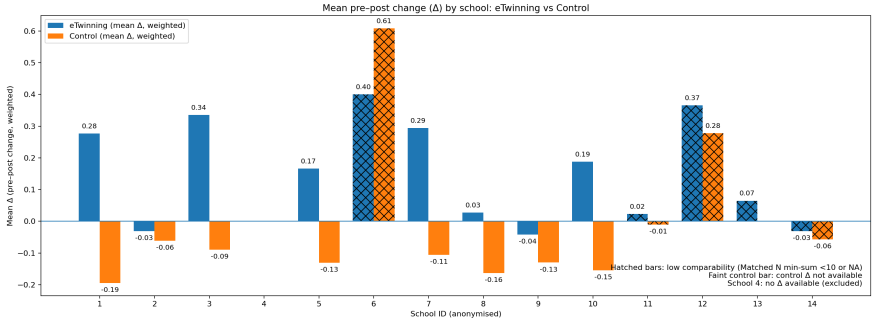


Fig. 5.2 – eTwinning and Control Delta per school

5.6 Logbooks and case vignettes

Teachers' logbooks were coded into concise interpretive cues: baseline differences (which class was initially advantaged, if stated), perceived relative intensity of competence-oriented work in eTwinning versus control, and brief contextual notes (e.g., classroom climate, disruptions, overlap of methods). Where logbooks describe eTwinning as higher or much higher in intensity, the quantitative pattern is often directionally consistent, showing larger advantages. Taken together, these logbook cues contextualise the quantitative signal by offering a plausible account of how implementation conditions may have shaped the observed differences between eTwinning and control classes across schools.

Logbooks also help identify special situations that can plausibly attenuate differences between groups. For example, where logbooks report that active/PBL-like methods were also implemented in control (School 12), differences between groups tend to narrow, and in fact the observed advantage is particularly low. However, such instances remain limited and – especially when Matched N is low – should be treated as suggestive rather than conclusive. A complementary example illustrates that baseline narratives are informative but not determinative: School 8 reports that the control class started from a more advantaged or mature position, yet the overall advantage remains positive, indicating that initial differences do not necessarily prevent later gains in eTwinning.

5.6.1 Case vignette School 1 – Excellent project quality and strong advantage

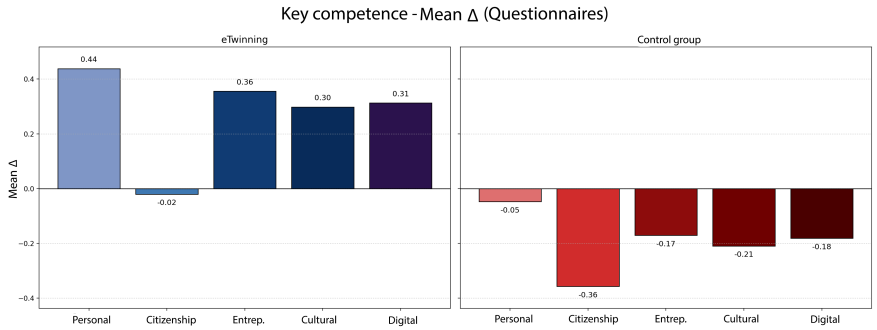


Fig. 5.3 – School 1 detail

School 1 illustrates a case where high project quality (Excellent) aligns with a strong and broadly consistent eTwinning advantage across competences (overall advantage = 0.463, Matched N (min-sum) = 59). The advantage is not driven by a single competence: questionnaire results show clear positive gains in eTwinning in four areas (personal, entrepreneurial, cultural expression, and digital), alongside a broadly stable civic trajectory. By contrast, the control class shows declines across all areas – particularly in civic competence – making the overall indicator representative of a diffuse and sizeable gap between conditions.

The logbooks help make this pattern tangible. Across the year, the eTwinning class engaged in a structured sequence of activities around AI in society and schooling (e-safety/netiquette, copyright and responsible use, chatbot-based tasks, digital escape rooms, misinformation/disinformation, and sustainability), often culminating in collaborative digital products towards the end of the project (e.g., infographic, quiz, podcast) created with support from AI tools. The teacher reports a "serene and participatory" classroom climate in eTwinning, with increased student motivation and engagement, including among less motivated students.

By contrast, the control class is described as significantly harder to manage, with disruptive dynamics, fragile students, and lower motivation, and the work is largely organised around textbook-based language instruction and assessments. In short, School 1 combines high-intensity competence-oriented work in eTwinning with a more constrained and

fragile learning environment in the control condition; an interpretable configuration that matches the cross-case gap observed in Figures 5.1-5.2.

5.6.2 Case vignette School 7 – Outstanding project quality and consistent advantage

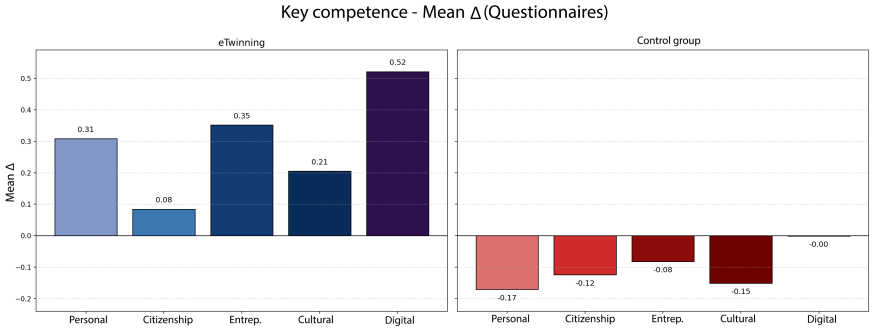


Fig. 5.4 – School 7 detail

School 7 represents a robust case in which high project quality (Outstanding) aligns with a clear and stable eTwinning advantage (overall advantage = 0.403, Matched N (min-sum) = 70). Competence-level questionnaire results reinforce this picture: eTwinning shows positive gains across all five competence areas, whereas the control class displays flat-to-negative trends overall. The largest gap emerges in the digital domain, where eTwinning increases sharply while the control group remains essentially unchanged. In Figure 5.1, School 7 sits among the strongest-quality projects; in Figure 5.2, it belongs to the cluster where eTwinning gains are visibly larger than those observed in the parallel control class.

The logbooks describe an eTwinning pathway characterised by sustained project-based work, international collaboration, and repeated production of shared artefacts. Students worked with international partners on Sustainable Development Goals focused "elevator pitches", publishing drafts and peer contributions on Padlet and monitoring progress through task cards. In subsequent months, activities expanded into eco-art and civic engagement, environmental regeneration initiatives, and collaborative tasks on wellbeing, intergenerational solidarity, and "deep time" themes-supported by regular interaction on TwinSpace and the creation of

multimodal outputs (games, ebooks, posters, storyboards). The teacher explicitly notes that, despite organisational constraints, the eTwinning group developed civic/environmental awareness and collaborative and organisational skills in a meaningful international context.

By contrast, the control class is consistently described through textbook-driven progression (units, grammar/vocabulary consolidation, and communicative functions), with the teacher reporting significant challenges linked to student absenteeism and limited time to "generate creative processes". Overall, the logbooks portray a strong "intensity gap" between conditions – coherent with the sizeable quantitative advantage observed for School 7.

5.6.3 Case vignette School 8 – Positive advantage despite a more mature control group

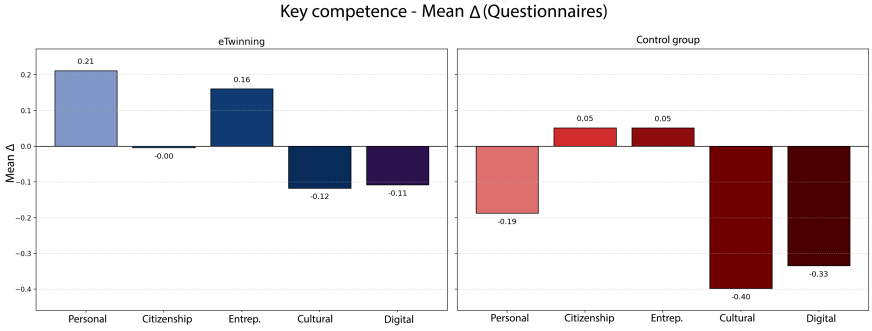


Fig. 5.5 – School 8 detail

School 8 offers a useful "non-trivial" case for triangulation: the overall pattern is still favourable to eTwinning, yet the logbooks suggest that the control group was initially more mature and that the teacher also implemented project-based, collaborative activities in the control condition. This makes the case analytically valuable because it helps clarify that eTwinning advantages are not simply a by-product of "easier" baseline conditions.

Results by competence help qualify this pattern: the advantage is not uniformly positive in absolute terms, but reflects both selective gains and a protective effect against decline. In eTwinning, students show clear

improvement in the personal and entrepreneurial areas, while civic competence remains broadly stable. In contrast, both groups decline in cultural expression and digital competence, but the losses are markedly smaller in eTwinning than in the control class, contributing substantially to the overall positive gap.

In the eTwinning class, the teacher reports a complex starting point: organisational constraints in the school (limited spaces, rotating/decentralised timetabling, shortened lessons) and a class described as behaviourally challenging and "not yet well-schooled", requiring continuous guidance to sustain engagement. Nonetheless, by February-March, the eTwinning pathway intensifies through structured TwinSpace participation (brainstorming for a wellbeing survey; collaborative tasks) and an authentic media-production experience (a class "talk show" for the 20th anniversary of eTwinning) that activated organisational and problem-solving skills and, notably, led to "serious" behaviour and punctuality in delivery.

In the control class, the logbooks describe a more stable profile and include an explicitly collaborative digital project, suggesting partial methodological overlap with eTwinning. Yet the teacher also notes that students struggle to see how digital tools support active citizenship and tend to rely on familiar tools.

Overall, School 8 illustrates a pattern where eTwinning retains a positive advantage even when the control context is relatively stronger and more active. Importantly, this advantage appears to arise not only from higher gains in some areas, but also from attenuating declines observed in the control group in others – supporting the interpretation that participation in eTwinning adds value beyond baseline differences alone.

5.7 Interim implications

Taken together, the cross-case reading reinforces two complementary messages. First, the overall impact results presented in Chapter 4 remain the primary evidence base: eTwinning classes show positive competence development across the competence areas, while control classes tend to show smaller gains, or even a regression in some cases. Second, cross-case triangulation suggests that implementation quality – as captured by the project quality macro-level and echoed in logbook intensity cues – is a plausible source of variability around the overall effect. These observations

support the practical implication that sustaining and scaling competence gains depends not only on participation in eTwinning, but also on supporting high-quality pedagogical design, curricular integration, and documentation.

Chapter 6
Summary of Key Findings and Triangulated Perspectives

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The purpose of this concluding chapter is to integrate the results of the previous chapters, interpret their educational meaning, and translate them into implications for practice, educational policy, and future research. The preceding chapters have presented a multi-layered investigation into the impact of eTwinning projects on the development of students' transversal competences. By combining quantitative impact estimates, qualitative narrative analysis, pedagogical project evaluation, and school-level cross-case triangulation, the research has captured the phenomenon from multiple observational standpoints. Before discussing the broader educational implications of these findings, it is necessary to summarise the core evidence that has emerged from the data.

The quantitative analysis (Chapter 4) demonstrated consistent and statistically significant gains for the eTwinning group over the matched control group across all five key competences investigated: Personal, Social and Learning-to-Learn; Citizenship; Entrepreneurship; Cultural Awareness and Expression; and Digital Competence. This advantage was corroborated by two distinct measurement sources. On the one hand, teacher-compiled assessment grids revealed strong, uniform growth in the eTwinning group, with statistically significant positive effects not only at the overall competence level but across almost all specific competences. On the other hand, student self-assessment questionnaires confirmed the eTwinning advantage, showing average positive growth for participating students, in stark contrast to the control group, which frequently registered stagnation or negative pre-post changes.

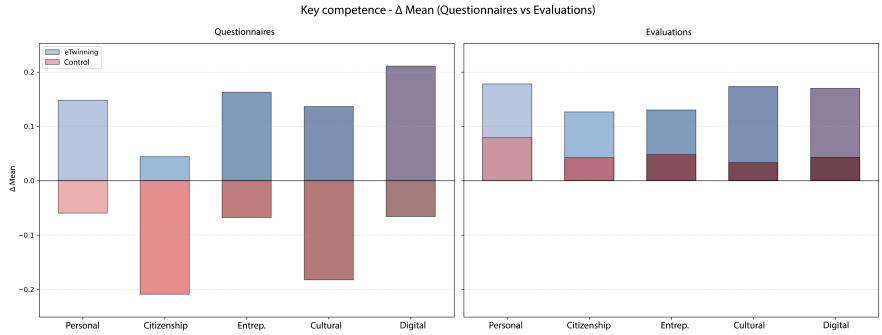

Fig. 6.1 – Results synthesis

The qualitative analysis of student questionnaires and teacher logbooks (Chapter 4) highlighted *how* this divergence in competence development was experienced and narrated. Students in the eTwinning group increasingly framed their competences around situated practice and collaborative execution under constraints. Conversely, control group narratives leaned more heavily toward future aspirations and routine school-performance regulation. Teacher logbooks confirmed this divergence by highlighting a clear difference in the "visibility" of competence enactment: eTwinning classrooms provided frequent, observable moments of collaboration, task negotiation, and interaction with external partners. In contrast, control classrooms were predominantly described through the lens of standard curricular progression and end-of-year assessment pressures.

Looking at the learning environments themselves, the qualitative analysis of Quality Label-awarded projects (Chapter 3) revealed that participation in eTwinning is not a uniform pedagogical treatment. Even among highly experienced teachers, as it is the case of all the teachers participating in this study, there was significant internal variability in project design and implementation. The findings showed that pedagogical quality operates on a continuum. The most robust projects – those that effectively supported competence development – were characterised by structured international collaboration centred on joint tasks, the use of digital technology as an active learning mediator rather than a mere container, the presence of genuine student agency and strong curricular integration.

Finally, the school-level cross-case triangulation (Chapter 5) synthesised these quantitative and qualitative strands by examining the 14 implementation contexts. The cross-case reading identified a positive

gradient associating the pedagogical quality of the eTwinning project with the magnitude of the observed quantitative advantage: higher-quality projects consistently aligned with stronger and broader competence gains for the students. Furthermore, this contextual analysis highlighted the "protective effect" of eTwinning, as it will be detailed in the next section: even in contexts where control classes were initially more mature, eTwinning maintained a comparative advantage, often by attenuating the typical end-of-year decline in self-perceived competences observed in standard classroom settings.

The results across these chapters converge to demonstrate that while eTwinning provides a clear structural advantage for competence development, the size and consistency of this advantage are deeply entwined with the pedagogical intentionality, the intensity of the collaborative design, and the tangible opportunities students are given to enact these competences in practice.

6.1 The paradox of self-evaluative decline and the "protective effect" of eTwinning

One of the most surprising and seemingly counterintuitive findings to emerge from the research is the widespread decline in self-perceived competences among students in the control group, as recorded in the post-test questionnaires. The interpretations proposed here should be read as plausible working hypotheses aimed at making sense of this observed pattern, while acknowledging that further investigation – ideally through a targeted qualitative focus – is needed before firmer conclusions can be drawn. Far from representing an actual regression in cognitive or operational skills, as it is witnessed by teachers' positive evaluation also in control groups, this negative delta requires an integrated reading that bridges the metacognitive dynamics of learning with the structural conditions of schooling. As highlighted by the qualitative analysis in Chapter 4, the questionnaires measure "perceived" competence: towards the end of the school year, control group students undergo a metacognitive recalibration (or "response shift") probably exacerbated by fatigue, stress, and intense assessment pressure – as documented in students' open answers. In a standard (non-eTwinning) curricular setting, which tends to focus on identifying gaps and performance anxiety rather than consolidating achievements, a student's self-efficacy tends to naturally erode.

This psychological element is intrinsically linked to a pedagogical explanation, supported by the analysis of project designs (Chapter 3) and teacher logbooks. Traditional teaching provides rare "tangible anchors" for students to recognise their competence growth. Conversely, eTwinning projects – especially those characterised by high pedagogical design quality – provide constant opportunities for the visibility of competence, or "competence enactment". The production of shared digital artefacts, authentic interaction with international partners, and the assumption of active roles (student agency) offer eTwinning students continuous, objective feedback on their abilities. This tangible evidence most likely sustains motivation and counteracts the decline in self-efficacy by making progress visible and easier to attribute to specific actions.

This dynamic finds its most robust validation in the school-level cross-case triangulation (Chapter 5). Contextual analysis demonstrates that the drop in self-assessments within the control group is not an isolated anomaly, but a recurring pattern across multiple settings. In cases such as Schools 1 and 7, the control group suffered a sharp, vertical decline across almost all competence areas, while the eTwinning group registered clear, broad gains. From this perspective, triangulating the data allows us to redefine the very concept of the "eTwinning advantage": the programme acts as a powerful protective factor and a source of resilience.

This protective effect emerges with particular clarity in complex and "non-trivial" school contexts, as illustrated by the emblematic case of School 8. In this specific configuration, the control group started from a more mature baseline and was even exposed to active, collaborative methodologies, including the use of digital tools for comparative literature. Despite this methodological overlap, control students still registered a decline, particularly in cultural and digital competences. The eTwinning group, although operating under more complex organisational constraints and behavioural challenges, significantly attenuated this loss, maintaining an overall positive differential.

The drop in self-assessments within the control group is consistent with extensive longitudinal evidence (e.g., Caprara et al., 2008) demonstrating a progressive decline in students' self-regulatory and academic efficacy in the face of the growing adaptational pressures of the educational system. Moreover, as highlighted by Health Behaviour in School-aged Children (HBSC) data, school pressure intensifies with age, reaching its peak at 15, which corresponds to the age of the students participating in this study. Precisely in light of this natural systemic 'wear and tear', the advantage

recorded in the eTwinning groups takes on an even more profound significance: eTwinning does not merely 'add' competences, but provides the tangible anchors necessary to break the downward trajectory of self-efficacy, acting as a powerful factor of resilience in an otherwise taxing and stressful school environment.

This demonstrates that eTwinning's impact is not merely the result of an easy comparison with passive traditional teaching; rather, it resides in the intrinsic added value of its architecture – authentic interaction, positive interdependence, and the epistemic use of technology – which shields the learner's identity and self-efficacy from the wear and tear of standard school routines.

6.2 The primacy of pedagogical design and structural scaffolding

A crucial insight emerging from the intersection of these findings is the primacy of specific pedagogical design over individual teacher characteristics. Successful educational innovations are often attributed to the charisma or exceptional skill of isolated "good teachers". However, the data from this research suggests a structural shift in perspective: the added value for students' competence development lies primarily in the intrinsic quality of the project framework rather than solely in the teacher's baseline profile.

This is vividly demonstrated by the qualitative analysis of the awarded projects (Chapter 3). Despite the sample being composed of highly experienced educators – frequently recognized as eTwinning Ambassadors with high self-perceived professional competences – there remained a significant internal variability in the pedagogical quality of the implemented projects. The evidence indicates that teacher expertise *per se* is insufficient to guarantee optimal outcomes; rather, it is the intentional architecture of the project – characterised by genuine international interdependence, student agency, and the epistemic use of technology – that actively drives competence development.

Furthermore, the cross-case triangulation (Chapter 5) confirms that the eTwinning methodology provides an advantage that transcends simple comparisons with "weak" traditional teaching. In non-trivial contexts control classrooms were led by highly capable teachers employing active, collaborative methodologies. Yet, the eTwinning framework still delivered a distinct structural advantage by providing authentic international constraints and tangible collaborative goals that standard curricula struggle to replicate.

This dynamic is particularly relevant when considering the systemic challenges of the teaching profession. As noted by Caprara et al. (2008), teachers themselves frequently report a progressive decline in their instructional efficacy to motivate students and promote learning as systemic adaptational pressures increase across grade levels. In this light, a well-structured eTwinning project acts as a vital "instructional scaffold". It provides an external, highly motivating architecture that supports not only the students' self-efficacy but also guides and elevates the teacher's instructional practice. Consequently, the eTwinning methodology emerges not merely as an optional tool for already excellent educators, but as a powerful, scalable lever capable of raising the overall quality of teaching and learning, providing structured support even for less experienced practitioners.

Specifically, the alignment with project quality criteria shared at a European level provides teachers with a robust methodological framework: on one hand, it enables constant and reflective monitoring of their own instructional practice; on the other, it fosters a systematic approach to the documentation and evaluation of these practices.

This structural necessity is vividly captured by qualitative reports from the Italian eTwinning NSO. When discussing their daily practice, highly experienced eTwinning educators frequently describe the project framework and its broader community not as optional enrichment, but as an indispensable environment for their professional survival and success. A memorable quote from a veteran teacher perfectly encapsulates this shift in professional identity: *"I cannot teach without a project".*

6.3 The architecture of the scaffold: five pedagogical mechanisms

To understand exactly how this "instructional scaffold" operates in practice, it is necessary to unpack the specific design elements that drive it. These dynamics concern both teachers and students, shaping in parallel teachers' instructional choices and students' learning experiences. Moving from the observed outcomes to the learning conditions, the empirical evidence presented in this volume points to five plausible pedagogical mechanisms through which "excellent" eTwinning projects consistently transform everyday classroom routines into competence-building environments. Importantly, these mechanisms do not necessarily co-occur in every project; rather, they tend to be partially present to varying degrees,

and are most consistently found in combination in the highest-quality implementations:

1. *Authentic tasks and meaningful products*: eTwinning projects typically require students to work on tangible outputs (e.g., digital artefacts, collaborative stories, campaigns) often addressed to an audience beyond the classroom. This authenticity shifts the learning logic from a purely performative mindset ("doing school" for grades) to a logic of contribution and responsibility, providing students with concrete reasons to plan, communicate clearly, and care about quality.
2. *Structured collaboration*: Cooperation in these projects is not an occasional method, but the structural operating system of the learning ecology. Students negotiate meaning, divide roles, and depend on one another to complete shared outputs. This sustained interdependence repeatedly activates relational competences – such as respect, participation, and conflict resolution – transforming them from abstract goals into stable learning conditions.
3. *Student agency and role-taking*: Projects require students to exercise autonomy by proposing ideas, taking ownership of specific tasks, or representing their group. This builds a profound sense of self-efficacy that is grounded in concrete, real-world scenarios rather than artificial test settings, allowing students to experience themselves as capable actors.
4. *Reflection and feedback loops*: The project workflow naturally generates iterative cycles of planning, producing, documenting, revising, and improving. Crucially, feedback in eTwinning is not limited to teacher assessment; it frequently includes peer responses from partner classes. This repeated exposure to external revision creates highly situated opportunities for metacognitive development, teaching students to monitor their progress and adjust their strategies.
5. *Internationalisation as a pedagogical driver*: Working with peers from other countries is not an accessory feature, but the engine of the experience. It introduces a mild but constant "displacement": language choices must be negotiated, communication becomes more explicit, and cultural assumptions are made visible. This transnational context inherently raises the stakes and the perceived value of the task, anchoring cultural expression and citizenship to a concrete relational space.

Taken together, these five mechanisms clarify what an "excellent" eTwinning project adds to ordinary teaching. It does not simply provide

digital tools; it provides a transnational ecosystem, a learning environment that structurally requires students to exercise authenticity, collaboration, agency, and reflection.

6.4 The differential sensitivity of competences: what grows most and why

While the overall results demonstrate a clear eTwinning advantage across the board, a closer look at the data reveals that competence development is not a uniform, undifferentiated phenomenon. The triangulation of quantitative measurements and qualitative narratives (Chapters 3 and 4) suggests a gradient of "sensitivity": certain competence areas respond more immediately and robustly to the eTwinning experience, while others present greater measurement challenges or require longer periods of consolidation. Understanding which competences are most impacted, and why, is crucial for moving beyond generic claims of effectiveness and grasping the actual pedagogical mechanics of international project-based learning.

The data indicate that the most pronounced and consistent gains – visible both in teacher assessments and student self-evaluations – are concentrated in the relational, communicative, and applied digital domains. Specifically, areas such as Digital Communication and Collaboration, Digital Safety, Digital Citizenship, and the Personal and Social dimensions show the strongest signals. Qualitatively, students' narratives in these areas undergo a radical shift: they move from abstract declarations or anxiety-driven descriptions (e.g., fear of public speaking, generic internet rules) to accounts of situated practice, such as taking initiative in interaction, recognizing online scams, and engaging in active civic discussions.

Why are these competences areas so deeply impacted? The answer lies in the structural architecture of an eTwinning project. Competences related to collaboration, digital communication, and safety are not merely "taught" as discrete topics within the project; rather, they are the very operating system of the learning ecology. Students cannot participate in eTwinning without negotiating tasks with peers, navigating shared digital workspaces, managing their online identity, and adhering to netiquette. These competences are highly responsive because they are subject to constant, structural enactment in almost all eTwinning projects. The project environment provides immediate, authentic constraints and continuous feedback loops (from peers and partners), forcing students to exercise these

dispositions repeatedly until they become consolidated practices.

Conversely, other domains present a more complex picture. Entrepreneurship serves as the most illustrative example. While teachers systematically recorded strong growth in this area across all specific indicators, the students' self-assessment questionnaires yielded statistically weaker overall signals. This discrepancy does not imply that entrepreneurial skills were not developed, but rather it's likely to highlight a challenge of semantic ambiguity and construct complexity. Entrepreneurship is a macro-competence that integrates initiative, planning, resource management and resilience, among other elements. As the qualitative analysis revealed, while eTwinning students significantly increased their descriptions of "taking action", "working under constraints", and "delivering presentations", they rarely self-identified these very actions under the formal label of "entrepreneurship". For adolescents (and also for many adults), the term often carries narrow economic connotations, making it difficult for them to recognize and self-evaluate their own transversal "project-management" skills.

Furthermore, dimensions related to deep cultural values or systemic civic awareness, while positively impacted, often showed a slower or more distributed rate of change. This is theoretically consistent: while a student can rapidly acquire and recognize a new digital safety routine or a collaborative strategy out of immediate project necessity, the profound internalisation of intercultural empathy or broad entrepreneurial mindsets requires longer gestation and broader contextual support.

Ultimately, this differential sensitivity reinforces a core lesson-learned from this study: competences do not react mechanically to educational interventions. They improve most visibly over time when the learning environment transforms them from abstract learning objectives into unavoidable, daily tools for authentic action.

6.5 Methodological reflections, limitations, and future directions

A major strength of this study lies in its methodological architecture. By combining a quasi-experimental design with mixed-methods triangulation, the research moves beyond purely perception-based evaluations to provide an empirically grounded estimation of competence development. The standardisation of competence definitions, assessment instruments, and analytical workflows not only ensured internal coherence and comparability

across diverse school contexts, but also produced an highly transferable methodological infrastructure. With appropriate adaptations, the tools developed for this study – which are freely and completely available in the website repository – can be reused by educators as practical supports for formative assessment, effectively bridging the gap between educational research and everyday competence-oriented practice.

Nevertheless, these findings must be interpreted within the constraints of the research design. Operationally, the rigorous evaluation procedures imposed a substantial workload on participating teachers, highlighting the persistent tension between comprehensive research demands and the pressing realities of everyday school routines. Furthermore, the study examines competence development over a relatively short time window, occasionally characterised by limited weekly intensity of eTwinning activities. Given these conditions, the results should not be read as deterministic causal claims – implying that eTwinning automatically produces competence growth in all scenarios – but rather as evidence of robust, structurally grounded associations under specific pedagogical conditions. It must also be acknowledged that both student self-assessments and teacher judgements have inherent measurement boundaries and cannot exhaust the full, multidimensional complexity of transversal competence development.

These reflections points to clear, actionable directions for future research. Primarily, there is a critical need for longitudinal studies to determine whether the observed competence gains persist, consolidate, or fade over extended periods. Future evaluations should also adopt mechanism-focused designs, moving beyond treating eTwinning as a single undifferentiated intervention to isolate which specific pedagogical features – such as authentic tasks, peer feedback loops, or international exchange – are most productive for particular competence areas. Additionally, a pressing research priority remains the deeper investigation of the progressive self-evaluative decline observed in standard control settings. Understanding the systemic or cultural dynamics behind this drop in self-efficacy is crucial for clarifying how innovative learning environments act as a shield against school fatigue. Finally, to ensure the long-term sustainability of competence evaluation, future tools should be developed through research-school co-design, guaranteeing that assessment remains a pedagogically meaningful and viable practice rather than an external bureaucratic burden.

6.6 Implications and recommendations for stakeholders

Fig. 6.2 – Key messages for stakeholders

This final section summarises recommendations that follow from the evidence and reflections developed across the volume. The following key messages are addressed to the main stakeholders who can shape, support, and sustain competence-oriented practice through and around eTwinning.

6.6.1 Teachers already active in eTwinning

A strong project design amplifies impact: make the competence work explicit, evidence-based, and shareable – so it can scale beyond individual teaching.

For teachers already active in eTwinning, the priority is to make the competence dimension of projects explicit, communicable, and shareable. This includes making learning intelligible to students by helping them see what they are doing, why it matters, and how it connects to the transversal competences they are building. Although many projects foster key competences, goals and evidence are not always named, documented, or discussed in ways that make progress clear. The tools developed for this study can support teachers in clarifying which competences are being addressed, collecting manageable evidence, and using shared criteria for observation and feedback, without turning documentation into paperwork.

A key message emerging from this work is that the added value of eTwinning is not reducible to the individual teacher alone: differences observed when the same teachers work with and without eTwinning point to the learning ecology it enables – network, community, and intentional project design. This strengthens the case for collegial work, because shared criteria and shared rubrics make competence-oriented observation more credible and help turn effective projects into transferable practice. Using the results and instruments of this work as a basis for collegial discussion can help involve colleagues in shared rubrics, co-planning, and the joint interpretation of evidence.

6.6.2 Teachers not yet involved in eTwinning

eTwinning is a pre-architected scaffold for change: turning the competence-based approach into everyday practice.

For teachers who are not yet involved in eTwinning but are willing to engage with competence-based approaches and to place students more deliberately at the centre of learning, eTwinning can function as a pre-architected pathway into innovation. It offers a structured context and a professional community that reduces the sense of starting from nothing, while making it easier to enact approaches associated with competence development, such as peer learning, authentic tasks, and opportunities for reflection and self-assessment. Adopting this approach through eTwinning does require an initial investment: beyond learning the basic project workflow and collaboration routines, teachers typically need to plan tasks, roles, and timelines more intentionally, and to introduce simple ways of capturing evidence and giving feedback on transversal competences. The advantage of eTwinning is that this effort can be made within a supportive ecosystem, with access to peer guidance, examples, and support services that accompany participation. Entry can also be gradual, starting from one class and one manageable project, while reducing professional isolation through connections with national and European colleagues. The practical recommendation is to begin with a focused, realistic project, learn by doing, and treat early attempts as legitimate learning experiences for teachers as well as for students.

6.6.3 School leaders and whole-school organisation

Embed eTwinning in school routines to move beyond single-teacher initiative and strengthen its benefits for engagement and competence development.

For school leaders, the recommendation is to treat eTwinning as a resource that can contribute to competence-oriented education and to create organisational conditions that allow this contribution to be sustained and scaled. In light of the study's findings – particularly the more positive student trajectories in self-perception associated with eTwinning – eTwinning can be seen not only as an enrichment activity, but as a supportive learning environment that helps sustain engagement and confidence over the school year. This potential is most likely to translate into lasting value when eTwinning is not left to isolated individual initiative, but is connected to school planning routines and shared priorities. Leadership can support this by making space for collegial work around eTwinning – scheduled co-planning, cross-disciplinary collaboration, and moments to share and interpret evidence – so that competence goals, feedback practices, and documentation do not remain attached to one teacher alone. In this way, leaders can help move eTwinning from a sporadic project to a stable, school-level lever for competence development and institutional quality.

6.6.4 National and regional school authorities (USR / MIM)

Consolidate eTwinning within the Italian school system to drive competence development, innovation and internationalisation, moving from episodic participation to sustainable implementation.

At national and regional level, the recommendations highlight the opportunity to treat eTwinning as a practical system instrument for competence-oriented innovation and international collaboration, helping translate policy orientations into everyday teaching. Competence-oriented reform is more likely to take hold when professional learning, implementation support, and usable tools are available without excessive procedural burden. In light of the evidence presented in this volume, particularly the stronger competence gains associated with eTwinning and its potential to buffer the typical decline in students' self-perceived competence over time, there is a case for treating eTwinning not as optional

enrichment, but as a strategically useful driver for competence development within ordinary schooling.

For Regional School Offices (USR), this can include integrating eTwinning more systematically into regional professional development offers for both newly appointed and in-service teachers, while supporting the circulation of instruments and lessons learned through this research so that local experiences become transferable across schools and territories.

For the Italian Ministry of Education (MIM), the recommendation is to avoid leaving eTwinning as an episodic phenomenon driven by individual enthusiasm, and instead to recognise it as a European resource and a community of practice that can support ongoing innovation aligned with national and European priorities. A further implication is to consider forms of recognition and organisational support so that international collaboration and competence-oriented documentation do not depend entirely on additional, often unrecognised effort, and so that schools can create protected space for collegial work linked to eTwinning. This would help move eTwinning from isolated success stories to a more intentional, evidence-informed component of competence-oriented innovation in the Italian system.

6.6.5 Initial teacher educators and teacher preparation institutions

Embed the eTwinning experience within initial training to prepare future teachers for innovative, competence-oriented education.

For initial teacher education, the recommendation is to bring competence-oriented pedagogy and its assessment tools into the formative core of teacher preparation, using eTwinning as a concrete training ground rather than treating the European dimension as an abstract add-on. Bridging competence-based policy and theory into everyday school practice – and building a culture of competence assessment that goes beyond single disciplines – is a long-term and demanding cultural shift, not a procedural adjustment. For this reason, it is crucial to work with new generations of teachers during initial preparation. Evidence from recent work on the eTwinning for Future Teachers initiative (Tosi, 2023) suggests that participation in international collaborative projects during university training can strengthen prospective teachers' pedagogical and didactic competences, by offering hands-on experience with project-based learning, international collaboration, and the effective, reflective use of digital

technologies. ITE institutions should therefore aim to integrate eTwinning more systematically within degree courses and practicum pathways. Exposing future educators to this "pre-architected" scaffolding early on ensures they enter the profession already equipped to design authentic, competence-centred learning environments. Within this integration, the rubrics and operational descriptors produced in this study can support training on how to set competence goals, design tasks that generate meaningful evidence, and provide formative feedback aligned with clear criteria.

6.6.6 European eTwinning governance and support structures (EC/EACEA/CSS)

Scale what works, keep it light, and keep the ecosystem reliable.

For European eTwinning governance and support structures, the priority is to strengthen competence-oriented support while safeguarding what makes eTwinning workable in practice. One implication concerns how the results and tools developed in this study can be taken forward at European level. Since these instruments were produced within a national research context, their wider use would benefit from further discussion and, where appropriate, validation through a European-level review process. In parallel, the CSS and interested NSOs could be involved – together with the Italian NSO – in a collaborative effort to review, refine, and, where needed, simplify the materials for broader use. Where feasible, NSOs could also replicate or pilot the study design in their national contexts, using the same (or jointly revised) instruments to strengthen comparability and the shared evidence base across countries. Within such a pathway, European channels could then play an enabling role in dissemination, whether by supporting the tools in their current form or by helping promote revised versions that emerge from collective work. A key consideration throughout is usability and pedagogical sustainability within eTwinning projects: refinement and dissemination should prioritise simplicity and classroom usability, so that competence-oriented support strengthens practice without creating procedural overload. Finally, the feasibility of scaling competence-oriented work through eTwinning also depends on the platform itself: a stable, user-friendly environment for collaboration is a precondition for participation, quality project design, and long-term educational impact.

6.6.7 Other National Support Organisations (NSOs) across Europe

Replicate, adapt, and compare: this study shared tools and cross-country learning can strengthen the evidence base for the whole network.

For other NSOns, a practical recommendation is to test and adapt the instruments developed in this study within their own national contexts, and – where possible – to replicate the research design on different samples, potentially in collaboration with national teacher education institutions. This would both strengthen the evidence base and support the progressive refinement of tools, so they remain light, sustainable, and comparable across countries. Over time, this kind of distributed effort could contribute to a shared European learning process on how competence development can be supported through structured transnational project work.

6.6.8 European policy stakeholders (strategic level)

From frameworks to usable tools: making the Union of Skills workable for schools.

At European level, the recommendations concern the competence infrastructure that enables implementation, in line with the ambition of the European Union of Skills. The experience of DigComp – supported by instruments such as SELFIE – shows how an operational, progressive and widely disseminated framework can help bridge policy alignment and everyday educational practice. Across other key competences, however, an equivalent level of structural support is still uneven. The current proliferation of frameworks and labels does not always map clearly onto the European Key Competences, creating ambiguity for schools in terms of language, priorities, and assessment expectations. In this context, a central recommendation is to strengthen coherence and "instrumentation" across the competence landscape: clearer and more aligned reference frameworks, accompanied by practical, user-friendly tools that help educators translate broad policy objectives into observable learning processes and assessable classroom practices.

6.6.9 INDIRE / Italian eTwinning NSO (self-message)

Translate evidence into everyday support: simplify the tools, disseminate smartly, and build partnerships that enable scale.

The conclusions point to a commitment for the Italian eTwinning NSO to translate evidence into support that schools can realistically use. This includes disseminating the findings in accessible formats, simplifying and modularising resources and tools so that they fit daily routines, and strengthening collaboration with other stakeholders, because competence-oriented innovation through eTwinning requires a shared ecosystem. As a possible future development, the dissemination strategy could also include a student-facing communication of the research results – short, clear, and designed for learners – to make explicit what participation in eTwinning projects can mean for them. Making this message visible to students can reinforce motivation and ownership, helping them approach eTwinning not as "extra work", but as an investment in skills that travel beyond a single project and beyond school. By focusing on usability, sustainability, and partnerships, the Italian NSO can help ensure that the legacy of this work is not only evidence of positive effects, but a set of practical conditions through which schools can move more confidently from policy aspiration to everyday practice.

6.6.10 Students

Claim your agency and shape the future – you are the true builders of a competent Europe.

School can sometimes feel like a rigid routine of tests, grades, and end-of-year pressures – a cycle that, as our data suggest, can naturally wear down students' motivation and their belief in their own abilities. Yet, the evidence from this study reveals a powerful alternative. When young people engage in international, collaborative environments like eTwinning, they step out of the traditional role of passive receivers of information. They become creators, problem-solvers, and active citizens. Competence is not just an abstract word on a teacher's assessment rubric; it is a passport to navigating an increasingly complex and unpredictable world. When they negotiate ideas with peers from another country, when they recognize and counter a digital scam, or when they take responsibility for a shared project on

sustainability, students are not merely "doing schoolwork" – they are rehearsing for life. The research shows that when learners are given authentic challenges and real roles, they discover a profound capacity to act, adapt, and grow. eTwinning provides the stage, but the agency is entirely theirs.

The final message for students is an invitation to dream bigger and demand this kind of learning. Students should seek out authentic collaboration, ask for tasks that matter beyond the classroom walls, and connect fearlessly across borders. The ambitious Union of Skills that policymakers envision for Europe's future does not live in official documents or institutional declarations; it lives in collaborative spaces, shared digital artefacts, and everyday intercultural interactions. By taking ownership of their learning journey today and understanding why what they do matters, young people are not just acquiring competences – they are already building the open, resilient, and connected society of tomorrow.

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What is the real impact of eTwinning collaboration on students' competences?
For years, teachers' experiences with eTwinning have highlighted dynamics of profound transformation in classrooms. This volume translates this experiential heritage into rigorous scientific evidence through a field-based impact study relying on a quasi-experimental design and the triangulation of quantitative and qualitative data.
The results show that eTwinning collaboration measurably strengthens students' competence development across five key areas (Personal/Social, Citizenship, Entrepreneurship, Cultural, and Digital), while also safeguarding motivation and turning competence from a theoretical construct into a situated practice.
Alongside these expected gains, the study also surfaced an unexpected and surprising dynamic: in ordinary teaching conditions, the combined wear and tear of routine and assessment pressure can gradually erode students' self-efficacy and perceived growth. This incidental finding helps explain why interventions like eTwinning matter: by offering an international, purposeful learning environment, eTwinning can act as a protective factor, strengthening resilience and sustaining engagement precisely where every day schooling may struggle.
Moving beyond the paradigm of the single talented teacher, the data demonstrate that the added value lies in the pedagogical architecture of the project. Authentic tasks, student agency, interdependence, and the strategic use of digital tools form an "instructional scaffold" that supports student learning and renews teachers' efficacy toward competence-based education.
In this sense, the volume also aims to make a European success story more visible and authoritative. Moving beyond distant or rhetorical agendas, eTwinning engages hundreds of thousands of teachers and students every year in collaborative projects, making its positive impact on classrooms and daily practice clearly visible and empowering them as the main actors of change.
Addressed to teachers, school leaders, and policymakers, the volume offers analytical results, validated tools, and key messages to contribute to innovating the European educational ecosystem.

Alexandra Tosi is a Researcher at INDIRE and has been engaged in the eTwinning Action since 2006. Her work focuses on teacher professional learning, internationalisation of education, competence development, and innovative online learning environments, with particular attention to peer learning and collaborative practices within the eTwinning community. She has co-edited key volumes on the impact of eTwinning on initial teacher education and continuing professional development (Carocci–INDIRE series, 2023). She serves as editor and scientific lead of this volume, contributing her expertise in linking research, professional development, and European cooperation.

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