Education for Sustainable Development in Teacher Education: What Could Universities Offer?.

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)

(Re)Imagining Teacher Education for a Future in Flux

Perspectives from the Erasmus+ Teacher Academy *teff*

WAXMANN

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)

(Re)Imagining Teacher Education for a Future in Flux

Perspectives from the Erasmus+ Teacher Academy *teff*

Waxmann 2026
Münster · New York

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

Bibliographic information published by the Deutsche Nationalbibliothek
The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available in the Internet at http://dnb.dnb.de

Print-ISBN 978-3-8188-0158-8
E-Book-ISBN 978-3-8188-5158-3
https://doi.org/10.31244/97818851583

Waxmann Verlag GmbH, 2026
Steinfurter Straße 555, 48159 Münster

www.waxmann.com
info@waxmann.com

Cover design: Anne Breitenbach, Münster
Typesetting: Roger Stoddart, Münster

Content

A. Teacher Education for a Future in Flux (*teff*)

B. Sustainable Futures: Fostering Sustainability (Green) Skills

C. Learning Without Borders: Connecting (Future) Teachers Across Europe

D. Well-Being at the Core: Teacher Well-Being as a Transversal Topic

E. A Sense of Belonging: Fostering Diversity & Inclusion Skills

F. Getting Future-Ready: Fostering Digital Skills in (Future) Teachers

G. Envisioning Education Tomorrow: Fostering Futures Thinking

H. Beyond *teff*: Strengthening Teacher Education Through Erasmus+ Teacher Academies

A.
Teacher Education for a Future in Flux (*teff*)

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Jan Springob, Daniela Frison, Beatrix Busse, Giovanna del Gobbo &
Dagmar M. Benincasa

From Collaboration to Transformation: A Shared European Journey in Teacher Education

Foreword to *teff* Volume

What do European teachers need today in order to teach in the world of tomorrow? This was the central question that brought our Teacher Academy consortium, *Teacher Education for a Future in Flux* (*teff*), together in 2022, as we joined forces to write and submit our – successful – Erasmus+ application. Over the next three years, global and societal developments consistently reminded us that the future remains in flux: unpredictable, challenging, and marked by profound uncertainty. At the same time, we witnessed how *teff* itself rose to meet these challenges, repeatedly exceeding our initial expectations – thanks, above all, to the dedication, creativity, and collaboration of our *teff* colleagues across Europe.

Thus, it is with a deep sense of pride and gratitude that we present this volume. What lies in the following pages is the result of an extraordinary collective endeavour: a rich constellation of voices, ideas, and practices contributed to by teacher educators, researchers, and practitioners from across Europe. Emerging from *teff* – and reaching well beyond it – this volume stands as a testament to what becomes possible when institutions, disciplines, and national contexts come together around a shared commitment to the future of teacher education. The breadth of contributions gathered here reflects not only the diversity of European educational landscapes, but also a shared willingness to experiment, to learn from one another, and to jointly shape responses to the complex challenges facing education today.

The volume begins by outlining the vision and framework of *teff*. It demonstrates how shared professional standards for teacher training and professional development, collaborative design, and transnational engagement can foster innovation in teacher education, while remaining sensitive to diverse national and institutional contexts and policies. *teff* proposals addressed the following key questions: what professional standards are expected to be met by teachers in order to respond to new educational challenges? How can initial education and professional development accompany future and in-service teachers, equipping them with the necessary knowledge and skills? The *teff* effort focused on the four pillars of the Teacher Academy proposal: digital skills, sustainability, diversity and inclusion, and well-being, exploring frameworks and

defining professional standards as point of reference for the learning and collaboration opportunities addressed to students and in service teachers.

Sustainability, diversity and inclusion, and well-being are transversal themes throughout the volume, explored both conceptually and practically. Contributions examine how universities can support education for sustainable development, how digital learning modules can enhance sustainability education, and how experiential, hands-on approaches cultivate inclusive and transformative learning.

Internationalisation and transnational collaboration form another key strand. This volume showcases innovative mobility models and digital collaboration spaces, highlighting how teacher educators and students can learn across borders and contexts. Closely linked to this are themes of (teacher) well-being and resilience, inclusion and belonging, community building, and adaptive professional growth as foundational dimensions of effective teacher education.

Digital competence development and futures thinking provide forward-looking perspectives, illustrating how collaborative design, innovation, and co-creation can equip future teachers to navigate change. The volume also situates *teff* within the broader landscape of European teacher education, offering insights into community building, transdisciplinary value creation, and professional development across disciplines, including STEM and the arts.

Taken together, the contributions in this volume illustrate the richness and diversity of approaches emerging from European collaboration in teacher education. They demonstrate how shared challenges can be addressed through joint design, mutual learning, and sustained communities of practice. As such, this volume not only documents the outcomes of the *teff* Teacher Academy but also offers inspiration and guidance for those seeking to strengthen teacher education for a future that remains, inevitably, in flux.

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Jan Springob & Beatrix Busse

A European Endeavour

The Erasmus+ Teacher Academy *Teacher Education for a Future in Flux (teff)*

Abstract
In a rapidly changing educational landscape, the Erasmus+ Teacher Academy *Teacher Education for a Future in Flux* (*teff*) responds to the growing need for agile, future-oriented, and cross-phased teacher education in Europe. Bringing together ten universities and partner institutions across nine countries, *teff* aims to strengthen collaboration between initial and continuous teacher education through a shared model-framework built on the concept of *futures literacy*. Within *teff*, this conceptual lens connects four central thematic areas of the European Education Area – digitalisation, sustainability, diversity, and well-being – by treating them as interrelated dimensions of future-ready professionalism. This article outlines the conceptual foundation, structure, and implementation of *teff*, which is organised around nine work packages and guided by agile project management principles. It analyses the processes and outcomes of cross-national cooperation, highlighting how *futures literacy*, collaborative quality assurance, and networked professional learning have fostered innovation across partner institutions. A first review of lessons learned demonstrates that agility benefits from structural coherence, that diversity across national systems serves as a catalyst for mutual learning, and that quality assurance can function as a collective learning process.

Keywords: Teacher Education, Erasmus+, Teacher Academy, future skills

Introduction

"The future will always surprise us" and we need to be prepared – somehow – for "shocks and surprises" (OECD, 2023, p. 8). This applies, in different forms and to varying degrees, to all people in all countries around the world. The teaching profession in Europe and worldwide is therefore of paramount importance in preparing young people, as effectively as possible, for the wide variety of opportunities and challenges of a constantly changing world – a future in flux, facing manifold challenges that could not have been imagined even a generation ago. Over the past decade, education systems worldwide have undergone profound and far-reaching transformations. The COVID-19 pandemic disrupted conventional models of schooling

and significantly hastened the adoption of digital technologies. Concurrently, demographic shifts and growing student diversity have heightened expectations around equity, inclusion, and teachers' ability to respond to diverse learner needs. Together, these global trends are redefining the nature of education and learning in the 21st century (OECD, 2025) and have immediate implications for universities and teacher education institutions.

Teacher educators must prepare teachers, who in turn prepare students for jobs not yet in existence, technologies not yet invented, and challenges not yet anticipated, related to diversity in the broadest sense (Schleicher, 2012). It seems evident that if initial teacher training remains too static or rigid, teachers cannot develop the necessary capacities to anticipate and respond to a fluctuating future in Europe and globally. "The old industrial approach to schooling also slows change in a fast-moving world" (Schleicher, 2021, p. 6). In 2020, the Council of the European Union recognised that, "(t)eachers and trainers, at all levels and in all types of education and training […] have a crucial role in preparing individuals of all backgrounds and ages to live, learn and work in the world of today, as well as in creating and leading future changes" (Council of the European Union, 2020). Thus, it is of utmost importance that teacher training and professional development are designed to respond to relevant classroom and global experiences.

In order to respond to a 'world and future in flux,' it is imperative that approaches to teaching and teacher education shift towards agile, efficacious, interdisciplinary, and future-oriented skills and mindsets, promoted and sustained from the outset, to better ensure teacher readiness and equip teachers and teacher educators with the tools needed to respond to a time of transition. At the same time, teacher education across Europe is currently fragmented by country-specific regulations and national educational structures.

The Erasmus+ Teacher Academies, initiated by the European Commission, therefore constitute a crucial initiative and a tangible contribution to agile and future-oriented teacher education in Europe. While the future cannot be predicted with certainty, strengthening teachers' capacity to imagine, anticipate, and engage with multiple plausible futures enhances their readiness to respond to change. This perspective positions teacher education as a lifelong, adaptive process that equips teachers with the professional judgement, flexibility, and critical foresight essential to both navigate complexity and support equitable learning in 21st-century education systems. The Erasmus+ Teacher Academy *Teacher Education for a Future in Flux* (*teff*) has provided a decisive impetus and shaped progress in teacher education initiatives through its offerings, which will be briefly presented here. The following articles in this volume expand upon the framework presented here by offering a detailed overview of the manifold activities and events within *teff*.

The Erasmus+ Teacher Academy "Teacher Education for a Future in Flux" (*teff*)

The Erasmus+ Teacher Academy Teacher Education for a Future in Flux (*teff*) is a consortium of ten leading European universities, their partner schools, further education, and government institutions dedicated to developing and strengthening cross-phased and inter-disciplinary teacher education. *teff* is a trans-institutional and trans-national collaborative network that adopts two existing university and school networks: the *European University for Well-being Alliance (EUniWell)* with universities from Cologne, Florence, Kalmar/Växjö, Murcia, and Nantes, and the *Teacher Education Network* (*TEN*) based at the University of KU Leuven, working with the universities of Cologne, Helsinki, Leuven, Oslo, Saxion, and Utrecht. Further educational institutions include the Teacher Training School of Nantes University (Inspé) and the Pacemaker Initiative from Germany.

teff examines present and future challenges from a European, co-creational perspective, to better equip pre-service and in-service teachers with the skills and tools required to navigate processes for shaping and implementing education at European level (Busse 2021). This European perspective is rendered possible by the European partnerships fostered between teacher education and training providers, universities, schools, and additional associated partners, who together form the *teff* consortium.

The Importance of *Futures Literacy*

All *teff* activities and products are based on an innovative, co-developed European model-framework which

- provides teachers across Europe with innovative learning and teaching opportunities and spaces for continuous professional development;
- improves existing lifelong learning opportunities for pre- and in-service teachers;
- enables network collaboration amongst teachers, student teachers, training providers, and the different public actors involved in teacher training;
- increases the attractiveness and relevance of the teaching profession as it deals with social and well-being developments in Europe;
- contributes to the goals of the European Education Area and the long-term development of the European Teacher Academies.

Most importantly, the model-framework aims to empower pre-service and in-service teachers with *futures literacy* skills for tackling challenges in an increasingly unpredictable present and future, drawing on skill- and research-oriented training from multiple disciplines. *Futures literacy* therefore permeates all *teff* skill activities, drawing on the power of human imagination to envision the future and the capability to "use" it (Riel, 2018). *teff* adopted the UNESCO definition of *futures literacy* as

> a capability. It is the skill that allows people to better understand the role that the future plays in what they see and do. People can become more skilled at 'using-the-future', become more 'futures literate', because of two facts. One is that the future does not yet exist, it can only be imagined. Two is that humans have the ability to imagine. As a result, humans are able to learn to imagine the future for different reasons and in different ways. These discoveries empower them to become more 'futures literate' (UNESCO, n.a.).

Educators of the *teff* Academy have the opportunity to develop transversal skills embedded within the areas of inclusion and diversity, digitalisation, sustainability, and well-being. *teff* recognises and embraces the interconnections between these topics. At the same time, each area receives dedicated attention, through individual work packages, which strengthen the Academy's focus on discipline-specific tasks and deliverables.

The *teff* Approach

At the heart of *teff*, nine work packages enable the creation of agile, cross-phased, mobile, and interdisciplinary learning opportunities. The *teff* Academy comprises the following work packages:

These work packages highlight the various expertise of the Academy by focusing on the following key priorities of the European Education area. They are:

Work Package 1 – Project Management
Work Package 2 – Design the Model Framework for Futures Literacy
Work Package 3 – Digital Skills
Work Package 4 – Sustainability Skills
Work Package 5 – Diversity and Inclusion Skills
Work Package 6 – Well-being Skills
Work Package 7 – Embedding Future Literacy
Work Package 8 – Developing Mobility Opportunities
Work Package 9 – Ensuring *teff* Impact on Quality and Policy Advice

The variety of (joint) activities and formats found in the work packages allow the *teff* Academy to achieve its objectives of (1) enabling sustainable multi-partner collaboration between schools, universities, and other providers to create a network of practice on teacher education, (2) researching, developing, and implementing agile cross-phased, mobile, and interdisciplinary learning opportunities for (future) teachers throughout their professional career, and (3) expanding knowledge sharing in the field of teacher education at a European level to impact quality and inform policy.

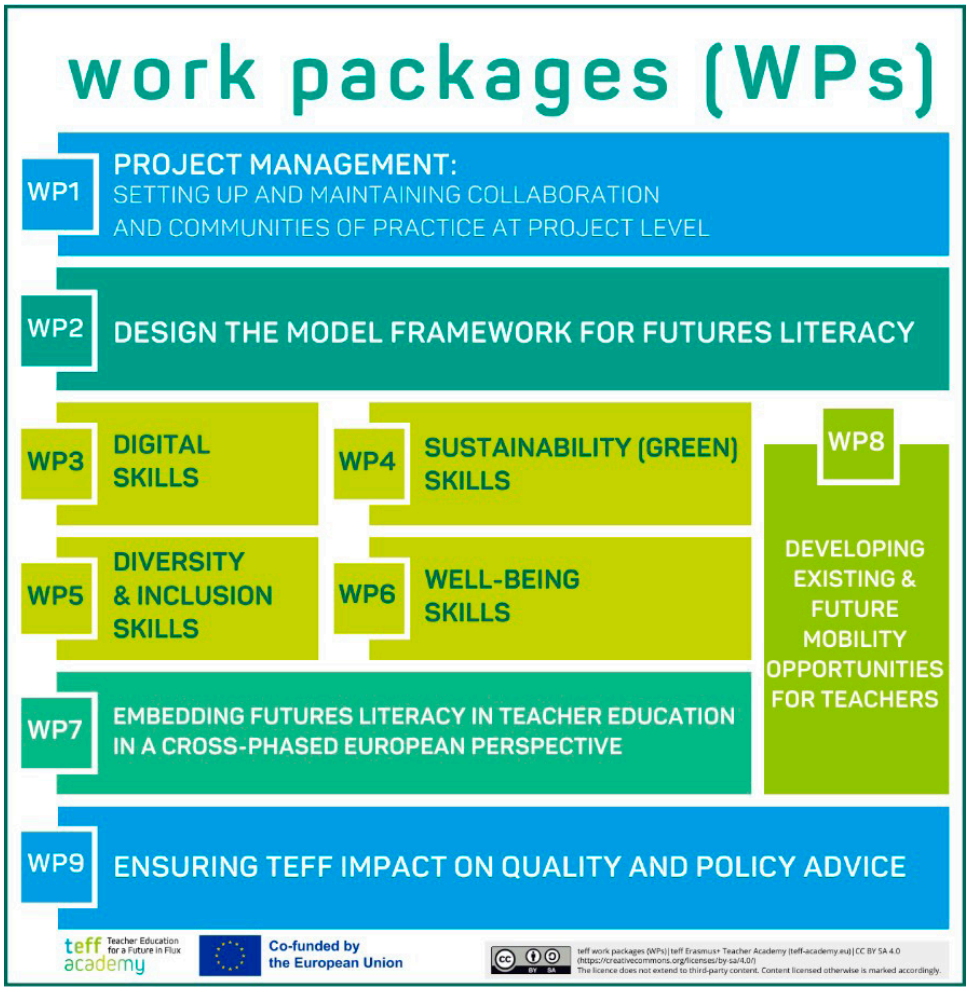


Figure 1: *teff* work packages

All activities act as focal points – or blueprints – for further development of partner activities, thereby enabling high quality and attainable deliverables by all partners. They further enable both experts and novices across Europe to engage with skills areas, and to (further) develop their professional identity and practise in addressing those challenges. The work packages are thus also a space for innovative formats, as well as an important aspect of quality assurance, continual development and evaluation. The design and implementation of these learning opportunities are guided by the "Comprehensive Guideline Booklet Designing Learning Activities" which itself is one of the main *teff* deliverables. The interweaving and complementary relationships between activities, work packages, and objectives are managed using the agile project management approach methodology, which is explained in the following section.

Quality assurance plays a key role in the collaborative work of *teff*. At the macro-level, monitoring and evaluation of all *teff* activities serve to analyse the processes

of agile, cross-phased, mobile, and interdisciplinary learning opportunities, as well as to identify innovative avenues for teacher professional development at the European level. At the micro-level, quality assurance is carried out through the design and implementation of a *Quality Assurance Plan* that assesses and evaluates joint project outputs and finances. The development and implementation of the *Quality Assurance Plan* was conceived and is monitored by all responsible persons in the respective work packages. These individuals work together to develop individual processes and indicators of progress that best fit each type of activity for research outputs, training outputs, and finances. The quality assurance plan includes:

- a *multi-perspective approach* for activity assessment that includes internal and external experts as well as the finance & research management department of the University of Cologne as the coordinating institution;
- a *handbook of control measurements* (continuous quality evaluation, peer reviews, benchmarking activities, etc.) to evaluate the quality of standards and processes;
- *focus groups* consisting of (associated) partners involved in the quality assurance of their partners' content (details on the focus group working process can be found in the Guideline Booklet);
- accompanying *research and surveys* amongst students, teachers, and other participants in pilot activities that encourage or include agile methods such as retrospective sessions and sprints; and
- communication with the *financial advisors* (of Research Management at the University of Cologne) and point-persons responsible for finances among partners.

Lessons Learned: A First Review & Outlook

The implementation of the Erasmus+ Teacher *teff* has provided valuable insights into the opportunities and challenges of establishing cross-national and cross-phased cooperation in teacher education across Europe. The following reflections summarise key lessons learned, emerging from the initial project phase.

Agility Benefits From Structural Coherence

The adoption of agile project management approaches facilitated flexibility, innovation, and responsiveness across partner institutions. At the same time, the process underscored the necessity of maintaining clearly defined communication channels, transparent governance structures, and harmonised documentation procedures to ensure coherence and sustainability within a complex transnational consortium. The role of a strong leadership institution – always approachable, quick in replying to questions raised by partners or the EC, and equipped with resources beyond third-party funding – should not be underestimated in this regard.

Futures Literacy as a Conceptual Anchor

The *teff* consortium confirmed the value of *futures literacy* as an integrative framework connecting diverse thematic priorities and disciplinary traditions. It enabled

participating institutions to conceptualise teacher education for digitalisation, sustainability, inclusion, and well-being, not as separate entities, but as interrelated dimensions of future-oriented professionalism.

Deep Collaboration as the Key to the Renewal of Teacher Education

This project profits from collaboration, whether on an international scale or between initial and continuous teacher education institutions across national contexts. Both proved highly productive, fostered the development of future-related competencies, and facilitated transformative mutual learning. However, maintaining these partnerships requires interminable institutional support, dedicated resources, and ongoing opportunities for professional exchange beyond the project's formal duration. In one country alone, implementing cross-phase teacher training is challenging; in a multilingual- and cultural setting, interdisciplinary co-creation requires time and steadfast commitment from all partners. And yet, as *teff* regards collaboration as the key to Europe's competitiveness and social cohesion, this Erasmus+ Teacher Academy serves as both a model and an example of how Europe's path towards well-being can be shaped. Ultimately, this way forward is then also a revalorisation of teacher education as a scientific field in research, education, and transfer of uttermost social relevance.

Diversity as Both a Challenge and an Enrichment

Variations in national teacher education systems, accreditation requirements, and organisational cultures initially posed coordination challenges in *teff*. Nevertheless, these differences ultimately fostered comparative learning and innovation – becoming tangible and visible in new piloted formats such as the Educathon, Hybrid Seminars, or virtual Seminar Series. These differences ultimately enhanced the consortium's capacity to develop a European model-framework that accommodates contextual differences while promoting shared principles and quality standards.

Quality Assurance as Collaborative Reflection

The project's participatory *Quality Assurance Plan*, combining peer review, focus groups, and accompanying research, evolved from a control mechanism into a process of joint reflection and knowledge generation. This approach reinforced mutual trust, improved accountability, and enhanced the collective learning capacity of the consortium.

In sum, the *teff* journey demonstrates that building a sustainable European Teacher Academy requires both structural and cultural transformation. Looking ahead, the consortium aims to consolidate effective formats that combine digital mobility, futures literacy training, and interdisciplinary professional learning communities. Future work will focus on deepening the evidence base on impact, reinforcing dialogue with policy stakeholders, and embedding futures-oriented perspectives into national and European teacher education frameworks. We will continue to translate the momentum gained from European-level cooperation into tangible benefits for local institutions and communities. Expanding upon the experience gained and the

insights acquired – presented in detail in the upcoming articles in this volume – we are committed to cross-phase teacher training that does not merely end after graduation from university. One essential step in this direction, to name just one example, is placing greater emphasis on continuing professional development for teachers at the University of Cologne – an initiative not undertaken prior to *teff*.

References

Busse, B. (2021). *Let's co-create and re-value teacher education: Lehrerinnen und Lehrer als change agents und „avant-garde"-Profession. Vision einer ganzheitlichen und zukunftsgerichteten Lehrer*innenbildung*. https://doi.org/10.13140/RG.2.2.26212.91526

Council of the European Union (2020). Council conclusions on European teachers and trainers for the future. *Official Journal of the European Union*. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=uriserv:OJ.C_.2020.193.01.0011.01.ENG

Miller, R. (2018). *Sensing and making-sense of Futures Literacy in Transforming the Future: Anticipation in the 21st Century.* UNESCO.

OECD (2023). *Teaching for the Future. Global Engagement, Sustainability and Digital Skills.* International Summit on the Teaching Profession. OECD Publishing. https://doi.org/10.1787/d6b3d234-en

OECD (2025). *TALIS Teacher Knowledge Survey 2024 Conceptual and Assessment Framework.* https://doi.org/10.1787/65903902-en

Schleicher, Andreas (2012). *The case for 21st-century learning*. OECD. https://web-archive.oecd.org/2012-06-14/61660-thecasefor21st-centurylearning.htm

Schleicher, Andreas (2021). *Learning from the Past, Looking to the Future. Excellence and Equity for All*. International Summit on the Teaching Profession. OECD Publishing. https://doi.org/10.1787/f43c1728-en

UNESCO (o. J.), *Futures Literacy*. https://en.unesco.org/futuresliteracy

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Daniela Frison, Giovanna Del Gobbo, Chiara Funari & Francesco De Maria[1]

The *teff* Model for Future Teachers' Professional Standards

Abstract
This chapter presents the model designed by the Erasmus+ *Teacher Education for a Future in Flux* (*teff*) Academy to provide teachers with training and professional development opportunities oriented towards professional standards, focusing on digitalisation, sustainability, diversity and inclusion, and well-being. After an overview on the topic of professional standards and their role in teachers' education and professional development worldwide, the chapter describes how the *teff* working groups have defined professional standards as a guide for the design of all learning opportunities offered by *teff*. Concrete examples of coherent Learning Outcomes and aligned Teaching Activities and tools will be provided to inspire teacher education and teachers' professional development pathways in Europe.

1. Introduction. Why Design Teacher Education Based on Professional Standards?

Education systems have undergone substantial expansion over recent decades, marked by unprecedented increases in participation and attainment. This growth has contributed to the development of the knowledge, skills, attitudes, and values upon which contemporary societies rely, fostering social cohesion and mobility and preparing individuals to become – and remain – competent workers and active citizens (Bernardi & Plavgo, 2019). Yet, as highlighted in the recent OECD publication *Building the Future of Education* (2021), education now stands at a critical juncture. While historically committed to transmitting humanity's accumulated knowledge to new generations, education systems now risk reinforcing mechanisms of reproduction and preservation, rather than cultivating the capacity to anticipate, prepare for, and shape the future. Similarly, the UNESCO report *Reimagining Our Futures Together* (2021) underscores how education systems often reproduce and perpetuate conditions that

1 For reasons of scientific attribution it is specified that paragraph 1 was written by Giovanna Del Gobbo, paragraph 2 by Chiara Funari, paragraph 3 by Francesco De Maria, paragraphs 4 by Daniela Frison, paragraph 5 jointly by the authors. Table 2, 3, 4, 5 are the results of the extensive work of all colleagues in the work packages of the Erasmus+ *teff* Teacher Academy.

threaten the future – such as discrimination, exclusion, and unsustainable lifestyles – and thereby limit education's transformative potential. These shortcomings highlight the need for a renewed shared vision and for updated principles and commitments that emphasise the crucial role of educational institutions in societal renewal and transformation, mobilising knowledge to confront an increasingly uncertain world. Today, more than ever, education is called upon to reimagine its purposes to address an unpredictable future and to cultivate the intelligence, imagination, and collective vision needed to build a better one.

To thrive in an interconnected world, younger generations require the ability to understand and appreciate different perspectives and worldviews, to interact respectfully with others, and to act responsibly in support of sustainability and collective well-being. Fundamental questions arise from this necessity: What kind of education do they need? What environment can support these skills? The world of education may need to change, as suggested by UNESCO's global approach to education for sustainability, relaunched by the European Commission (2023), but teachers occupy a central and indispensable role. The 2030 Agenda explicitly emphasises teacher qualification as a key element for achieving *Sustainable Development Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all*, thus transforming high-quality teacher education into a global priority. Of course, understanding past and current developments in education and training requires an examination of the professions, their processes of professionalisation, and the evolving identities of present and future practitioners. Initial and continuing teacher training is unequivocally integral to the broader professionalisation process, and can influence the professionalisation that is built up in educational practice, reinforcing skills and behaviours that are no longer appropriate.

Teacher education has thus become one of the most pressing social challenges at the international level. It is recognised as a strategic global issue for promoting sustainability, well-being, inclusion, and social cohesion. As stated by UNESCO (2021, p. 80): "In a new social contract for education, teachers must be at the centre, and their profession revalued and reimagined as a collaborative endeavour that generates new knowledge to bring about educational and social transformation."

This context calls for a redefinition of the areas of knowledge and competence that must underpin professional practice, supported by shared and internationally recognised benchmarks. Consequently, international policy debates increasingly emphasize the need for robust professional standards to guide teacher education and ensure coherent preparation, readiness, and performance, including through accreditation mechanisms. Professional standards are regarded as essential reference points for professional learning, as tools for the design of initial teacher education, for enhancing ongoing professional development, and for guiding the certification and evaluation processes aimed at ensuring and improving the quality of teaching in schools. Standards articulate the professional characteristics that teachers are expected to uphold and further develop throughout their careers, and they support the harmonisation of theoretical and practical-operational components that define the professional core of teaching.

2. Professional Standards in Teacher Education: An Overview of the Literature

Professional standards for teachers are widely recognised as pivotal for strengthening initial teacher education, supporting professional development, and enhancing overall instructional quality (AITSL, 2015; European Commission/EACEA/Eurydice, 2006, 2021; OECD, 2013, 2018). Their conceptualisation has evolved across multiple national and international frameworks. One of the earliest formal definitions emerged from the InTASC framework (1992), which articulated ten core competencies describing what teachers should know, be able to do, and value. This represented an important step in defining standards as measurable indicators guiding both instructional practice and professional growth. Building on this foundation, Ingvarson (2002) framed standards as expressions of teachers' competencies, essential for clarifying expectations of effective teaching and sustained learning. The Training and Development Agency for Schools (TDA) later refined this approach, offering concise descriptions of teachers' attributes, knowledge, understanding, and skills to support coherent professional progression (2007).

The literature highlights that professional standards serve multiple, interrelated functions that extend beyond simple competency frameworks. They may embody the profession's shared values and commitments (Ingvarson & Kleinhenz, 2007), operate as instruments for evaluating teaching quality – including content expectations, assessment methods, and performance thresholds – and act as quality assurance mechanisms within teacher evaluation systems (Toledo et al., 2017). Standards also function as policy tools shaping professional learning programmes and education quality processes at national and international levels (OECD, 2018; CEPPE, 2013). Crucially, they represent dynamic performances enacted in practice rather than static declarations of knowledge (Mulcahy, 2011). Research by CEPPE (2013) underscores the importance of involving teachers in developing standards, as broad consultation enhances their legitimacy, while the OECD (2018) recommends regular updates to integrate emerging research and new educational needs.

Several conditions influence the effectiveness of standards. Forde et al. (2016) emphasise the need for clarity, accessibility, flexibility, and professional dialogue during their development. Despite the intended role of standards in improving teaching, their implementation is often filtered through bureaucratic and political dynamics (Lewis et al., 2019), and their impact depends on how teachers interpret and appropriate them (Ceulemans et al., 2012). Implementation varies substantially across educational systems. The OECD report *Learning Standards, Teaching Standards and Standards for School Principals* (2013) outlines how countries regulate different stages of teacher education and career progression. In the United States, the InTASC standards inform certification, evaluation, and professional development (2011, 2013), while Australia, the United Kingdom, and Scotland employ regulatory frameworks defining competencies across career stages (Australian Professional Standards for Teachers, 2018; Professional Standards for Teachers and Trainers, 2022; Professional

Standards for Teachers in Scotland, 2022). Internationally, the ISCED-T framework (UNESCO, 2021) has supported a greater alignment of teacher education systems.

Across these perspectives, the literature shows that the effectiveness of professional standards depends on their design, implementation, and interpretation. Approaches that recognise teachers as active agents can transform standards into meaningful tools for improving teaching quality. Achieving an appropriate balance between regulation and autonomy, together with context-sensitive application, helps prevent standards from becoming bureaucratic checklists. Ultimately, embedding authentic, evidence-informed professional learning and fostering sustained dialogue within the educational community are crucial for turning standards into levers for continuous improvement.

3. Outcome-Based Design in Teacher Education: An Overview of the Literature

Outcome-based design has become a central paradigm in higher education and teacher education because it provides a coherent structure for aligning what learners are expected to achieve to how teaching, learning and assessment are organised. A foundational framework in outcome-based design is Biggs and Tang's theory of constructive alignment (2007; 2011), which conceptualises curriculum design as the alignment of Intended Learning Outcomes (ILOs), Teaching and Learning Activities (TLAs), and Assessment Tasks (ATs). The 5th edition (Biggs, Tang, & Kennedy, 2022) expands the original framework by explicitly addressing educational technology, staff development and institutional quality assurance. According to this model, learning outcomes define the target level of understanding; teaching activities are planned to actively elicit that understanding; and assessment tasks are designed to produce valid evidence of achievement. Constructive alignment thereby reinforces the idea that effective learning design depends on internal coherence, transparency, and active engagement.

A complementary perspective is offered by Fink's Integrated Course Design (ICD) (2003), which expands the traditional outcome-based approach by incorporating situational factors, the articulation of significant learning goals, and the integration of assessment and feedback with active learning strategies. ICD emphasises the multidimensional nature of learning, including foundational knowledge, application, integration, the human dimension, caring, and learning how to learn. This broader view is particularly relevant in teacher education, where learning outcomes often include the development of professional dispositions, reflective capacities, and agency.

The logic of outcome-based and backward design has also been widely developed in the educational design literature through Wiggins and McTighe's Understanding by Design (UbD) (2005). Their model structures curriculum planning around the identification of desired results, the definition of acceptable evidence, and the design of learning experiences. UbD reinforces the centrality of alignment and the importance of evidence-based assessment, offering a framework that is fully compatible with con-

structive alignment and highly relevant for defining professional standards and practice-oriented learning outcomes.

In the field of higher education and professional education, Harden's contributions to Outcome-Based Education (OBE) (1999; 2007) further clarify how outcomes and competencies can structure curricula, instructional strategies and assessment systems. Although developed primarily in medical education, Harden's work offers a robust conceptualisation of outcomes as drivers of curriculum coherence, professional competence and progression – an approach that aligns well with projects seeking to define and operationalise teacher professional standards.

Finally, contemporary reflections on future-oriented competencies emphasise the transformative role of learning outcomes in preparing learners for uncertain and evolving societal challenges. The OECD Learning Framework 2030 highlights student agency, global competencies, metacognition, and well-being as key elements guiding the design of curricula and learning environments. While not an outcome-based model in a strict sense, the OECD framework aligns with outcome-based design by emphasising competency-oriented learning goals and the need to support coherent, future-facing educational pathways.

Taken together, these contributions provide a rich theoretical foundation for the *teff* model. Constructive alignment, Integrated Course Design, backward design and competency-based approaches inform the way *teff* Work Packages have defined professional standards, formulated ILOs and designed aligned TLAs and ATs. This framework ensures that *teff* learning opportunities across digital skills, sustainability, diversity and inclusion, and well-being are coherent, comparable and transferable across institutions, while supporting the development of future-oriented teacher professionalism.

4. Professional Standards and Outcome-Based Design in the *teff* Academy Approach to Teacher Education and Professional Development

The first goal of *teff* Academy is to empower pre-service and in-service teachers with futures literacy for an increasingly unpredictable and challenging world, by drawing on skilling and research-oriented training from different disciplines. The second goal is to provide teachers across Europe with innovative formats and spaces for continuous professional development. To reach these goals, the *teff* proposal and the design of all teaching and learning opportunities addressed to students-future teachers and in-service teachers have been oriented towards the development of professional standards for future teachers. Based on the previously mentioned overview of the literature on professional standards and on outcome-based approaches, the design of all *teff* learning opportunities has followed a common approach based on the work of Biggs and Tang (2007; 2011). In line with *constructive alignment*, fully aligned, active, experiential, and participatory teaching and learning methods have been proposed to achieve the Intended Learning Outcomes consistent with defined profes-

sional standards (Del Gobbo et al., 2023; Del Gobbo et al., 2025; Frison et al., 2025). Furthermore, aligned assessment methods and tools have been identified (Biggs & Tang, 2007). Under the four main work packages of the *teff* project, focusing on digital skills (WP3), sustainability (WP4), diversity and inclusion (WP5) and well-being (WP6), a diverse team of scholars, teacher educators, and teachers, defined Intended Learning Outcomes and designed learning opportunities to be addressed to students and in-service teachers. Each WP team was invited to:

1. analyse theoretical and/or methodological frameworks on digital skills, sustainability, diversity and inclusion, and well-being, if any (e.g. DigComp, GreenComp);
2. formulate professional standards in the field of digital skills, sustainability, diversity and inclusion, and well-being, inspired by these frameworks;
3. formulate Intended Learning Outcomes (ILOs), coherent with professional standards grounded on what teachers (students, early career teachers, in-service teachers) need to achieve;
4. identify Teaching and Learning Activities (TLAs) aligned with ILOs;
5. identify formative and summative assessment strategies and Assessment Tasks (ATs) fully aligned with ILOs and TLAs.

To design the *teff* learning opportunities, each WP team followed an ad hoc design grid (Table 1).

Table 1: Outcomes-based design grid serving as a guide for the design of *teff* learning activities

***teff* Learning Activities – Outcomes-Based Design Grid**
Professional Standard(s) Definition of Professional Standards related to the WP
Intended Learning Outcomes (ILOs) List of Intended Learning Outcomes related to Professional Standard(s) • [The teacher is able] to • [The teacher is able] to • [The teacher is able] to
Teaching and Learning activities (TLAs) to achieve ILOs Details of Teaching and Learning Activities aligned to the ILOs
Assessment Tasks (ATs) Details of Assessment Tasks aligned to ILOs and TLAs

4.1 Example of Grids Based on the *teff* Model

All produced grids have been collected and analysed to ensure that all *teff* initiatives follow the same model. *teff* activities include lecture and seminar series, learning modules, Makerspaces, Educathons, and Urban Laboratories developed, tested, researched, and disseminated among all partners. Examples related to Digital Skills (WP3 – Table 2) and Well-being (WP6 – Table 3) are provided.

Table 2: Outcomes-based design grid on digital skills WP3

***teff* Learning Activities – Outcomes-Based Design Grid WP3** **Digital Skills**
Professional Standard(s) 1. Digital skills for teaching and learning 2. Knowledge of how digital environments both challenge and influence pedagogical practices 3. Integration of digital tools and resources in professional practice to enhance learning 4. Engagement in professional reflections and discussions about digital literacy in teaching and learning
ILOs (examples for Professional Standard 1) 1. Digital skills for teaching and learning – Teachers understand the changes and development related to digitalisation and their impact on society and education – Teachers are aware of both risks and opportunities as well as the ethical considerations of digitalisation, and integrate materials and examples that reflect these aspects – Teachers are able to reflect on their own digital skills and actively seek to enhance them in line with recent and relevant developments […]
Teaching and Learning activities (TLAs) to achieve ILOs Online course on digital competences with six modules: Agile and reflective mindset (1. educator's reflections and attitude) The educator's pedagogical competencies (2. digital resources, 3. teaching, 4. feedback and assessment, 5. empowering learners) Facilitating learners' digital competences (6. learners' competencies)
Assessment Tasks (ATs) – Variety of quizzes (multiple-choice, true/false, fill-in-the-gaps, drag-and-drop) throughout the modules – Reflective tasks throughout the modules, including possibilities of exchange with peers from other European countries

Table 3: Outcomes-based design grid on well-being skills WP6

***teff* Learning Activities – Outcomes-Based Design Grid WP6** **Well-being (Chapter on *Be the change you want to see! Teacher/Professional Agency*)**
Professional Standard(s) – Knowing factors associated toTeacher Well-Being (TWB) – Knowing the role of professional agency toward TWB
ILOs – Teachers analyze and reflect on (TWB) – Teachers understand the interplay of TWB, job satisfaction, and school culture – Teachers develop and strengthen teacher agency and leadership – Teachers explore job crafting and personalization of work
Teaching and Learning Activities (TLAs) to achieve ILOs – The Well-Being Barometer to reflect on individual TWB – Scenario Analysis focused on well-being challenges teachers deal with in the school context
Assessment Tasks (ATs) – Reflective task and quiz on the TWB factors

The grids above show the design process followed by all WP teams to ensure a common approach despite the number of Countries and partners involved in the project.

5. Conclusion and Reflections for the Future

The design process and the supporting literature overview highlight the lack of empirical research on the subject of professional standards (in Europe) needed to face the new educational challenges as well as on the impact of professional standards on the definition of consistent and aligned learning outcomes for (future) teachers. The first phase of the *teff* Academy – aimed at building a common methodological framework for the design of the numerous activities planned by the project – revealed a number of challenges.

1) Difficulties in defining Intended Learning Outcomes and assessment tasks emerged during the process, revealing a general design approach to prioritise *content* rather than *learning outcomes,* to ensure both students and teachers achieve.
2) Further research is needed on potentiality and criticalities related to the application of an outcome-based approach in the field of teacher education and professional development. While an extensive body of literature has grown on in the field of Higher Education, the recognition by universities of ILOs formulated and established in the field of teacher education and teacher professional development remains a challenge.
3) A third challenge concerns the recognition processes for ILOs achieved. While the various activities promoted by *teff*, in particular the Digital Learning Modules, issue a certificate of participation, this certificate, however, does not lead to ECTS recognition in the educational path of participating students. As "formal" certificates recognised in national career-progression systems have been considered impracticable, the generation of "lighter" forms of certification – the documentation of attendance, credits and contents – have been tested.
4) Furthermore, micro-credentials have been considered as an effective framework for the substitution of international certification. The three year work within *teff* culminated in a proposal presented in November 2025 at the University of Florence for a Blended Intensive Programme on "Well-being of Future Teacher and Education Professionals." This programme led to the creation of a badge which certifies the learning outcomes of the short-term learning experience. This badge system offers a flexible and targeted way to support students in developing the knowledge, skills, and competencies needed for their personal and professional development.

References

AITSL [Australian Institute for Teaching and School Leadership]. (2015). *Accreditation of initial teacher education programs in Australia*. Australian Institute for Teaching and School Leadership. https://www.aitsl.edu.au/docs/default-source/national-policy-framework/accreditation-of-initial-teacher-education-programs-in-australia.pdf

AITSL [Australian Institute for Teaching and School Leadership]. (2018). *Australian professional standards for teachers*. https://www.aitsl.edu.au/docs/default-source/national-policy-framework/australian-professional-standards-for-teachers.pdf

Biggs, J., & Tang, C. (2007). *Teaching for quality learning at university*. Open University Press.

Biggs, J., & Tang, C. (2011). *Teaching for quality learning at university*. Open University Press.

Biggs, J., Tang, C., & Kennedy, G. (2022). *Teaching for quality learning at university*. Open University Press / McGraw-Hill Education.

Centre of Study for Policies and Practices in Education (CEPPE). (2013). *Learning standards, teaching standards and standards for school principals: A comparative study*. OECD Publishing. https://doi.org/10.1787/5k3tsjqtp90v-en

Ceulemans, C., Simons, M., & Struyf, E. (2012). Professional standards for teachers: How do they "work"? An experiment in tracing standardisation in the making. *Pedagogy, Culture & Society, 20*(1), 29–47. https://doi.org/10.1080/14681366.2012.649414

Del Gobbo, G., Frison, D., Bresges, A., Dawkins, D. J., Springob, J., Solis Becerra, J. A., Túri, I., & Hersant, M. (2023). Sustainability, health care, well-being and inclusion: Toward new professional standards for the teachers of the future. *Nuova Secondaria Ricerca, 5*, 146–154.

Del Gobbo, G., Frison, D., & Springob, J. (2025). Professional standards on sustainability and well-being for the teachers of the future: Initial reflections on a university alliance. In F. Gomez Paloma, P. A. Di Tore, & G. R. J. Mangione (Eds.), *Teacher training and student learning: Past values, present uncertainties and future prospects* (pp. 1–14). IntechOpen. https://doi.org/10.5772/intechopen.1009938

European Commission/EACEA/Eurydice. (2006). *Quality assurance in teacher education in Europe*. Publications Office of the European Union.

European Commission/EACEA/Eurydice. (2021). *Teachers in Europe: Careers, development and well-being*. Publications Office of the European Union.

European Commission. (2023). *A whole school approach to learning for environmental sustainability*. Directorate-General for Education, Youth, Sport and Culture.

Fink, L. D. (2003). *Creating significant learning experiences: An integrated approach to designing college courses*. Jossey-Bass.

Forde, C., McMahon, M., Hamilton, G., & Murray, R. (2016). Rethinking professional standards to promote professional learning. *Professional Development in Education, 42*(1), 19–35. https://doi.org/10.1080/19415257.2014.999288

Frison, D., Del Gobbo, G., Funari, C., Springob, J., & Soeffner, J. (2025). New professional standards for future-oriented teachers: The teff Academy model. *QTimes Webmagazine, 2*(2025), 350–363. https://doi.org/10.14668/QTimes_17229

General Teaching Council for Scotland. (2022). *Professional standards for teachers in Scotland*. https://www.gtcs.org.uk/knowledge-base/articles/a-guide-to-the-professional-standards

Harden, R. M. (1999). What is an outcome-based education? *Medical Teacher, 21*(1), 7–14. https://doi.org/10.1080/01421599979969

Harden, R. M. (2007). Outcome-based education: The future is today. *Medical Teacher, 29*(7), 625–629. https://doi.org/10.1080/01421590701729930

Interstate Teacher Assessment and Support Consortium. (1992). *Model standards for beginning teacher licensing and development: A resource for state dialogue*. Council of Chief State School Officers.

Interstate Teacher Assessment and Support Consortium. (2011). *InTASC model core teaching standards: A resource for state dialogue*. Council of Chief State School Officers.

Interstate Teacher Assessment and Support Consortium. (2013). *InTASC model core teaching standards and learning progressions for teachers 1.0: A resource for ongoing teacher development*. Council of Chief State School Officers.

Ingvarson, L. (2002). *Development of a national standards framework for the teaching profession*. Australian Council for Educational Research. http://research.acer.edu.au/teaching_standards

Ingvarson, L., & Kleinhenz, E. (2007). *Standards for teaching: Theoretical underpinnings and applications*. New Zealand Teachers Council. https://research.acer.edu.au/teaching_standards/1/

Lewis, S., Savage, G. C., & Holloway, J. (2019). Standards without standardisation? Assembling standards-based reforms in Australian and US schooling. *Journal of Education Policy, 35*(6), 737–764. https://doi.org/10.1080/02680939.2019.1636140

Mulcahy, D. (2011). Assembling the "accomplished" teacher: The performativity and politics of professional teaching standards. *Educational Philosophy and Theory, 43*(1), 94–113.

OECD. (2013). *Learning standards, teaching standards and standards for school principals: A comparative study*. OECD Publishing. https://doi.org/10.1787/5k3tsjqtp90v-en

OECD. (2018). *The future of education and skills: Education 2030 – The OECD learning framework 2030*. OECD Publishing. http://www.oecd.org/education/2030/E2030%20Position%20Paper%20(05.04.2018).pdf

OECD. (2021). *Building the future of education*. OECD Publishing.

Toledo, D., Révai, N., & Guerriero, N. (2017). Teacher professionalism and knowledge in qualifications frameworks and professional standards. In S. Guerriero (Ed.), *Pedagogical knowledge and the changing nature of the teaching profession* (pp. 73–95). OECD Publishing. https://doi.org/10.1787/9789264270695-5-en

UNESCO Institute for Statistics. (2021). *ISCED-T 2021: International standard classification of teacher training programmes*. UNESCO.

UNESCO. (2021). *Reimagining our futures together: A new social contract for education*. UNESCO.

Wiggins, G., & McTighe, J. (2005). *Understanding by design*. Association for Supervision and Curriculum Development.

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Oliver Holz & Robin Schaeverbeke

Sustaining the Erasmus+ Teacher Academy *teff* Beyond the Project's Lifecycle

Abstract
This article investigates how the Erasmus+ Teacher Academy *teff* can sustain cross-European collaboration and innovation in teacher education beyond the project's lifecycle. The project shows that *teff* strengthened teacher education by integrating futures literacy, i.e. digitalization, sustainability, inclusion, and well-being skills, into both pre-service and in-service programs. The project created durable networks across ten European regions, enhanced institutional cooperation, and developed resilient communities of practice. Furthermore, agile governance, and long-term partner agreements ensure that durability is centered on cultivating adaptive, interconnected, and forward-looking educational environments.

Keywords: sustainability, (project) durability, impact, resilience

1. Introduction

The *European Education Area* sets ambitious goals for teacher education. It calls for systems that prepare competent, motivated, and highly qualified educators, while also promoting continuous professional development and research-based practice (European Commission, 2024). Recent EU initiatives, such as the Council Resolution 2019 or the Digital Education Action Plan (2021–2027), underline the urgency of equipping teachers with the skills to navigate rapid technological change and environmental challenges, and to foster inclusion, diversity, and well-being. Erasmus+ Teacher Academies are conceived as a response to these priorities, aiming to strengthen cooperation among teacher education providers, enhance mobility, and build capacity for innovation across Europe.

However, these aspirations confront persistent challenges: teaching remains insufficiently attractive (European School Education Platform (ESEP) Survey, April 2024), demographic trends signal looming shortages (OECD, 2025), and professional development opportunities are unevenly distributed (Vasileios et al., 2025; UNESCO, 2023). Mobility and collaboration are often limited by structural and policy barriers. Against this backdrop, the Erasmus+ Teacher Academy *teff* positions itself as a transformative initiative. It seeks not only to address these systemic issues but also to re-

imagine teacher education for a world in flux – one marked by complexity, uncertainty, and interdependence. Through its model-framework, *teff* integrates digital, sustainable (green), diversity and inclusion, and well-being skills with a European dimension, creating agile learning opportunities such as Makerspaces, Urban Laboratories, and Digital Learning Modules. These innovations aim to empower educators as future-literate change agents and ensure that teacher education remains adaptive, inclusive, and – the focus of this article – sustainable well beyond the project lifecycle.

Despite the ambition and scope of Erasmus+ Teacher Academies, durability[1] remains a pressing concern – as is the case with many third-party funded projects, both nationally and internationally. Many projects struggle to maintain momentum once funding ends. Networks often dissolve without clear governance structures, and innovative resources risk becoming static repositories rather than living tools for transformation. Financial sustainability is equally fragile: while Erasmus+ provides initial support, long-term funding streams, whether national or private, are rarely secured during the project phase. These vulnerabilities underscore the need for *teff* to move beyond short-term deliverables and design mechanisms that guarantee continuity, scalability, and relevance. Addressing these durability issues is not optional; it forms the foundation for *teff*'s critical framework and shapes the challenges explored in the next section.

2. Critical Challenges for *teff*

Erasmus+ Teacher Academies aim to create long-lasting, transformative impacts on teacher education systems across Europe, and this ambition raises several critical challenges for *teff*:

1) Exploitation:
   How can the project ensure that its innovative models, tools, and practices are not only developed, but actively embedded into teacher education programs and institutional structures? This requires moving beyond producing outputs to guarantee their uptake and integration into existing systems. What strategies secure the active use of project results by partners and stakeholders, so that they influence policy and practice rather than remain isolated? Closely linked to this is the need for robust mechanisms to measure the adoption and effectiveness of outputs during and after the project lifecycle.
2) Dissemination:
   How does *teff* ensure that its results reach teacher education providers, policymakers, public authorities, and the wider educational community in ways that are clear, targeted, and sustained beyond the project's duration? This demands carefully designed activities, timelines, and communication channels, as well as lev-

1 In this article, we use the term *durability* – alongside concepts such as *future-proofing*, *continuity*, and *resilience* (Gravett and Peterson, 2023; Day et al., 2011; ESEP, 2024) – to describe the long-term viability of *teff*'s activities, innovations, partnerships and products. This framing acknowledges that environmental and ecological sustainability is an important strand of the *teff* project. We use the term *durability* to avoid confusion and to emphasize the structural, institutional, and pedagogical endurance of the project results.

eraging platforms such as *eTwinning* and *ESEP* which have already been used in *teff*.

3) Impact:
   How can *teff* strengthen professional competencies, foster institutional collaboration, and build capacity for innovation to ensure that its influence extends from participants and partner organizations to teacher education systems at local, regional, national, and European levels? To achieve this, *teff* must define measures, targets, and indicators that allow monitoring and assessment of progress in terms of teacher education quality, mobility, and European cooperation.
4) Durability:
   What governance structures, scaling strategies, and financial pathways will ensure that *teff*'s networks, resources, and professional development opportunities endure beyond EU funding? The existing network of pre-service and in-service teacher education providers have to identify routes for securing European, national, and private resources.

3. Impact of *teff* Activities and Products

The *teff* Academy seeks to generate impact in futures literacy across four primary target groups – student teachers, in-service teachers, teacher educators, and policymakers – while indirectly benefiting pupils. The objectives agreed upon by the consortium include:

1. Strengthening a European network on teacher education
2. Developing innovative learning opportunities to build teachers' futures literacy
3. Creating spaces for practice-based knowledge exchange
4. Supporting teachers' well-being to enhance the attractiveness of the profession

Student teachers benefit from comprehensive and innovative learning opportunities such as on- and offline learning spaces that complement traditional study programs. These include mobility opportunities like Welcome Weeks, Educathons, Urban Labs, and Makerspaces (all introduced in this volume in more detail), positioning student teachers in a broader European perspective while addressing agile methods and topics often missing from standard curricula. All of this is developed and offered by numerous colleagues in the teacher training faculties and subjects of the *teff* partner universities – often with the help of in-service teachers. This ensures that these courses are gradually integrated into the training of prospective teachers across Europe.

In-service teachers gain accessible, hands-on, continuous professional development opportunities co-designed with *teff* partners and student teachers. These formats create a European space for reflection that enhances futures literacy and strengthens the social value of the teaching profession. Teacher educators access structured exchange within a European network, adapting and expanding their teaching through innovative methods and shared resources. Finally, policymakers and public authorities benefit from evidence-based recommendations through White Papers. These will

inform national and European strategies and contribute to the objectives of the European Education Area.

teff creates impact at several interconnected levels. At the local and regional level, the Academy strengthens partnerships between schools and universities and fosters communities of practice that encourage collaborative innovation. At the national level, *teff* co-designs learning opportunities aligned with policy priorities, ensuring relevance and scalability. At the European level, the Academy introduces a cross-phased model that links initial and continuous teacher education, promoting multilingualism and intercultural collaboration across borders.

To secure long-term impact beyond the project's lifetime, *teff* has implemented a comprehensive strategy. This includes a Quality Assurance Plan supported by co-designed impact indicators, and an Action Plan for sustainability that outlines governance and funding pathways. *teff* ensures open access to its resources by publishing Open Educational Resources (OER) and integrating these resources into *ESEP*. A strong *teff* brand and dissemination strategy – through a dedicated website, multimedia campaigns, and conferences – amplifies visibility. Additionally, the consortium is actively identifying new funding streams to guarantee continuation beyond 2026. The following table summarizes the short, mid and long-term core impact that the *teff* Academy will have on the target groups listed above:

Table 1: Impact on target groups

Target group	Short-term impact	Mid-term impact	Long-term impact
Student teachers	• Opportunity to participate in the co-design of meaningful learning opportunities around *futures literacy* skills to be implemented at universities (and other providers of initial teacher education). • Being able to express the needs of their community	• Being part of the feedback loop to evaluate and improve the learning opportunities implemented at the level of initial education. • Participating in a local and European community of teacher education actors.	• Benefitting from a cross-phased educational model that (i) welcomes them into the world of teaching from day one, (ii) provides them with essential and futures skills that they will use throughout their career and (iii) ensures that they will continue having learning opportunities once in service.
In-service teachers	• Opportunity to participate in the co-design of meaningful learning opportunities around *futures literacy* skills, to be implemented at schools (and other providers of continued teacher education). • Being able to express the needs of their community	• Being part of the feedback loop to evaluate and improve the learning opportunities implemented at the level of continued education. • Participating in a local and European community of teacher education actors.	• Benefitting from a cross-phased educational model that provides them access to a range of professional development opportunities throughout their career, carefully balanced with their other day-to-day responsibilities.

Target group	Short-term impact	Mid-term impact	Long-term impact
Teacher educators	• Opportunity to participate in the co-design of meaningful learning opportunities around *futures literacy* skills. • Opportunity to exchange on innovative teaching methods with other teacher educators from around Europe in a structured manner and with a common goal in mind. • Being able to express the needs of their community	• Driving the implementation of such educational opportunities (either pre-service or in-service) and being at the core of the evaluation and improvement processes.	• Being at the forefront of teacher education and becoming (more) active contributors to the objectives of the European Education Area. • Being part of a support structure through which they can propose (and benefit from) innovative best practices in teacher education.
Policymakers and public authorities	• Being offered the position of external advisors in the *teff* project, thus having the opportunity to influence and contribute to the design and implementation of the activities of a European Teacher Academy.	• Having direct access to the research- and practice-based output being generated by the *teff* activities on the topic of teacher education (white papers, etc.).	• Having a direct line of support for decision-making regarding education and training within the European Education Area and beyond (2030).

4. Durability After the End of EU Funding

Without question, *teff* is a game-changer for teacher education across Europe by improving quality, accessibility, and cross-phase coherence, supporting employability and lifelong learning in line with the European Skills Agenda and the European Education Area 2025. Durability is embedded in all project activities, which are designed to create lasting structures, partnerships, and capacities.

1) To ensure that *teff*'s innovations do not remain isolated, outputs modules, frameworks, and learning tools are embedded or connected as much as possible into study programs. One specific example is the Learning Module on Diversity & Inclusion which is integrated in a Blended Intensive Program (BIP)[2] frequented by many students from *teff* universities.
2) All products are published as Open Educational Resources (OER) and will remain online on the project's website. Furthermore, all products are advertised (and will continue to be) via social media.
3) Transnational collaboration forms the backbone of *teff* 's durability. By maintaining strong partnerships across borders, *teff* fosters ongoing exchange between (local) schools, universities, and teacher education providers. These networks have a realistic chance to further mature beyond the funding of *teff*.

2 Footnote: BIP (as in all other volume papers mentioning the BIPs)

4) The brand name "*teff*" was secured so that work could potentially continue under the same umbrella and be used to secure more funding. Dissemination channels to policymakers and the public, supporting long-term contribution to European education priorities, have been established and will not be shut down immediately.
5) *teff* – with its resilient networks and communities of practice – also encourages spin-off projects, such as Blended Intensive Programmes (BIP), publications, and conferences, to expand outreach and influence.
6) To ensure *teff*'s results reach the widest possible audience and remain relevant beyond the project lifecycle, *teff* will leverage established European networks and tools, including *eTwinning* and *ESEP*, to share resources and foster collaboration among schools and teacher education providers. Project outputs will also be promoted through Erasmus+ dissemination channels, *teff*'s own website, and social media campaigns targeting educators and policymakers.
7) As partners, *teff*-teams will further the team's expertise in future collaborations – using existing networks (EUniWell or TEN) and (international) conferences/meetings.

5. Conclusion

While *teff*'s multidimensional strategy, anchored in transnational collaboration, professional development, and epistemological foundations, lays a strong basis for continuity and resilience, several challenges remain. Embedding *teff*'s resources into institutional structures is essential to prevent outputs from becoming static repositories rather than living tools for transformation. Equally critical is ensuring exploitation: project results must actively shape policy and practice, supported by mechanisms that monitor adoption and effectiveness beyond the funding period. Dissemination requires sustained and targeted communication to reach teacher education providers, policymakers, and the wider educational community, leveraging existing platforms such as *eTwinning*. Finally, durability depends on credible governance structures, scaling strategies, and financial pathways that secure *teff*'s networks and resources for the long term. Addressing these challenges is not optional; it is the foundation for *teff*'s ambition to create systemic, future-proof impact across European teacher education.

Continuity and resilience in the *teff* context are multidimensional and strategically embedded, permeating all aspects of Teacher Academies' – and in particular *teff* Academy's – design and operations. Transnational, curricular, digital, and epistemological frameworks create a resilient teaching context for educators to proactively navigate the above-mentioned future educational challenges. Strategic pathways embed *teff* innovations institutionally, cultivate communities of practice, and ensure accessibility through open resources. Strong governance and context-sensitive integration reinforce long-term viability.

Ultimately, *teff* demonstrates that project durability is not merely maintaining programs but cultivating adaptive, interconnected, and forward-looking educational envi-

ronments. By embedding its practices into structures, cultures, and strategies, *teff* positions itself as a lasting force for transformative, futures-oriented teacher education across Europe.

References

Day, C., Edwards, A., Griffiths, A., & Gu, Q. (2011). *Beyond survival: Teachers and resilience*. University of Nottingham.

European Commission. (2024). *Erasmus+ guide 2024* (Version 1). European Commission.

European School Education Platform (ESEP). (2024). *Survey on reinforcing the attractiveness of teacher careers – Results*. https://school-education.ec.europa.eu

European School Education Platform (ESEP). (2025). *A future-proof skill set for educators* [Practice article]. https://school-education.ec.europa.eu

Gravett, S., & Peterson, N. (2023). *Future proofing teacher education*. Routledge.

OECD. (2025). *Education at a glance 2025: OECD indicators*. OECD Publishing. https://doi.org/10.1787/1c0d9c79-en

UNESCO (United Nations Educational, Scientific and Cultural Organization). (2023). *Global report on teachers: Addressing teacher shortages*. UNESCO.

Vasileios, S., Guberman, A., & Cooper, R. (2025). Addressing teacher shortages in an international context: Implications for the quality and status of teacher education. *European Journal of Teacher Education, 48*(1), 1–8. https://doi.org/10.1080/02619768.2025.2447968

B.
Sustainable Futures:
Fostering Sustainability (Green) Skills

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Wilfried Admiraal, Glenda Galeotti, & Stefan Dittmann-Zöllner

Education for Sustainable Development in Teacher Education: What Could Universities Offer?

Abstract
Education for Sustainable Development (ESD) is increasingly recognized as essential for training future teachers to address the urgent ecological, social, and economic challenges of our time. This essay examines the importance of integrating ESD into teacher education programs, arguing that it is crucial for cultivating environmentally literate and socially responsible citizens. The integration of ESD faces various obstacles, including a lack of institutional leadership, misunderstandings about the role of ESD, and fragmented approaches within education faculties. The goals of ESD in teacher education are to enhance environmental literacy, promote interdisciplinary teaching, foster a sense of agency among students, and support the implementation of sustainability-focused curricula. By equipping teachers with comprehensive ecological knowledge, teachers can inspire students to appreciate and protect the environment and engage in sustainable practices. Furthermore, the multimodal implementation of ESD, such as across curriculum areas, as a dedicated core subject, as part of existing subjects, and through elective offerings, allows for a broader and more impactful understanding of sustainability. Each approach offers unique strategies for integrating sustainability into education, encouraging critical thinking and active participation of students. Ultimately, investing in ESD in teacher education not only equips future teachers with essential knowledge and skills but also promotes a culture of sustainability within educational systems. By preparing teachers to embrace sustainability principles, we are able to cultivate a generation ready to assume environmental and social responsibilities, thereby ensuring a healthier planet and a more sustainable society for future generations. As such, one of the main tasks of the *teff* project was to explore the university offerings for ESD in teacher education.

Keywords: Education for sustainable development, ESD, Teacher education, Approaches

1. Introduction

Education for Sustainable Development (ESD) encompasses all forms of education aimed at enabling people to develop the knowledge, skills, values, and attitudes needed to contribute to a sustainable future (https://www.unesco.org/en/sustainable-development/education). It is increasingly recognized as essential for preparing future educators to tackle the complex and urgent challenges our planet faces. ESD serves as an

umbrella term encompassing various related concepts, including environmental education, sustainability education, education for sustainability, and ecological education. Incorporating sustainability into teacher education programs is not just a pedagogical enhancement; it is a necessity for cultivating environmentally literate, socially responsible, and engaged citizens. Despite the growing demand and expectations to integrate ESD into teaching and learning (UNESCO, 2020), the extent to which it has been incorporated into initial teacher preparation remains unclear.

2. Key Rationales for Providing ESD in Teacher Education

Enhancing Environmental Literacy

The world faces numerous pressing challenges, including climate change, resource scarcity, social inequalities, and biodiversity loss. These global challenges require an educated population that can think both critically and creatively about solutions. One of the primary goals of incorporating sustainability education in teacher training is to enhance environmental literacy. Teachers in primary and secondary education who are equipped with a strong understanding of ecological principles are better prepared to inspire their students to appreciate and protect the environment. By educating teacher candidates about ecosystems, biodiversity, and the effects of human activities on the planet, we can foster a generation that values sustainability and recognizes its role in preservation. Environmental literacy enables educators to teach students about pressing environmental issues, empowering them to form informed opinions and adopt proactive attitudes toward sustainable practices (Kouam, 2025).

Promoting Interdisciplinary Teaching and Learning

Sustainability is inherently an interdisciplinary concept, drawing on knowledge from various fields, ranging across science, social studies, economics, and the arts. Providing education about sustainability in teacher training encourages future teachers, including those in primary and secondary education, to adopt an interdisciplinary approach in their teaching practice. This approach reflects the interconnected nature of sustainability issues, enabling students to make meaningful connections across various subject areas. When teacher candidates learn to incorporate diverse perspectives on sustainability, they can cultivate critical thinking and creativity in their students. This enables students to analyze problems from various angles and develop comprehensive solutions (Didham et al., 2024; Hsiao & Su, 2024).

Fostering a Sense of Agency and Responsibility

A key component of sustainability education is cultivating a sense of agency and responsibility among students. Teachers who are trained in sustainability can empower their students to take initiative and contribute to environmental and social sustainability efforts at both local and national levels. Developing a sense of agency helps students understand their ability to create change, engage with their communities, and

advocate for sustainable practices. Teacher education programs that focus on sustainability prepare future educators to foster resilience and responsibility in their students, supporting them to become proactive citizens in addressing the climate challenges we face (Sheldrake et al., 2025; Walker, 2017).

Supporting Curriculum Development

As education systems evolve to prioritize sustainability, it is crucial that teacher education programs also adapt to include ESD in their curriculum. Teachers trained in sustainability are better positioned to develop and implement curricula that emphasize sustainability principles and practices. This includes not only teaching about sustainability but also modeling sustainable practices in their teaching methods. For example, incorporating resource-efficient classroom management, promoting eco-friendly materials, and applying sustainable technologies are all practices that future educators can implement. By fostering a culture of sustainability within educational settings, teacher training programs can set a consequential example (Fischer et al., 2022; Martínez Valdivia et al., 2023).

Lifelong Learning of Teachers and Students

In addition to supporting curriculum development, ESD encourages a mindset of lifelong learning among both teachers and students. Sustainability is a dynamic field that continuously evolves with new research and practices. By integrating sustainability education into teacher training, we instill in future teachers in primary and secondary education the value of remaining informed about emerging issues related to sustainable development. This commitment to lifelong learning is essential in preparing teachers to adapt their teaching approaches to align with new knowledge and foster a similar mindset in their students, promoting continuous engagement with sustainability throughout their lives.

3. Approaches of ESD in Teacher Education

As concerns about climate change, resource depletion, and social justice grow stronger, future teachers in primary and secondary education need to be equipped with the knowledge and skills to promote sustainable practices in their classrooms and communities. There are four distinct approaches to integrating sustainability education into teacher preparation programs (Evans et al., 2017):

1. Integration across various curriculum areas and courses
2. Inclusion of a dedicated core or compulsory subject
3. Incorporation as a component of a core or compulsory subject
4. Offering as a dedicated elective subject

For each approach, examples will be provided to illustrate effective implementation strategies.

ESD Across Curriculum Areas and Courses

The first approach focuses on incorporating sustainability education across various subjects and courses. This method encourages a multidisciplinary perspective, highlighting the interconnectedness of the social, environmental, and economic aspects of sustainability. It fosters a holistic understanding of sustainability among future teachers.

Environmental Science and Social Studies Integration

Many teacher education programs have successfully combined Environmental Science with Social Studies to create a comprehensive curriculum that emphasizes the relationship between local ecosystems and cultural practices. For instance, students may examine local environmental issues, such as water quality or deforestation, while also exploring the historical and social contexts of the communities affected by these challenges. Through projects that involve both scientific inquiry and community engagement, prospective teachers encourage a nuanced understanding of sustainability rooted in real-world contexts (Bragdø, 2022).

Art and Science Collaboration

An innovative approach can be found in programs where art and science faculty collaborate to teach sustainability concepts. Students might undertake projects that involve creating artistic representations of ecological systems, nurturing creativity while simultaneously learning scientific principles. These interdisciplinary efforts not only enhance student engagement but also empower prospective educators to convey complex sustainability topics through various modes of artistic expression (Hsiao & Su, 2021).

Mathematics and Economics Integration

Integrating mathematics with economics offers another avenue for exploring sustainability concepts. Teacher candidates can analyze statistical data related to resource use, understand economic models that illustrate the impact of consumption patterns, and participate in budgeting exercises that reflect sustainable practices. This approach allows students to examine the quantitative aspects of sustainability and provides them with a realistic and practical perspective on the subject (Li & Tsai, 2022; Moreno-Pino et al., 2022).

Example From the teff-Consortium

An example from the *teff* consortium is the interdisciplinary 3ECs online course Lesson Zero for Sustainable Development. It integrates six interdisciplinary modules and one subject specific module to not only raise awareness amongst master students but also foster critical thinking and personal growth.

ESD through a Dedicated Core or Compulsory Subject

The second approach focuses on designing a specific core or mandatory subject solely dedicated to sustainability education. This structure ensures that all teacher candidates engage deeply with sustainability principles and practices, regardless of their primary teaching focus.

Core Course on Sustainability Education

Several teacher education programs have implemented a dedicated course titled „Sustainability in Education" as part of their core curriculum. This course typically covers key sustainability frameworks, pedagogical strategies for teaching sustainability, and methods to engage student teachers in sustainability practices within their future classrooms. Such programs often include field experiences and practical projects, bridging theory and practice (del Carmen Pegalajar-Palomino et al., 2021; Fischer et al., 2022).

Environmental Education Module

A dedicated module on Environmental Education within teacher preparation programs has proven effective in equipping prospective teachers with the knowledge to critically examine ecological issues and teach them effectively. This module may involve discussions on climate change, conservation efforts, and participatory teaching methods aimed at engaging students in local environmental initiatives (Fischer et al., 2022; Reddy, 2021).

Sustainability and Social Justice Course

Another example is a core course that combines sustainability education with social justice perspectives. This course emphasizes the intersectionality of environmental issues and social equality, preparing future teachers in primary and secondary education to understand and teach the socio-political dimensions of sustainability. Engaging discussions, along with community projects, enhance the learning experience by connecting sustainability concepts to lived experiences (Reddy, 2021).

Example From the teff-Consortium

An example from the *teff*-consortium is a compulsory, on-site course on ESD as part of the primary teacher education at the University of Murcia. It includes eight two-hour sessions, in which student-teachers work in small teams on projects related to ESD approaches in class.

ESD as a Component of a Core or Compulsory Subject

The third approach incorporates sustainability education as a component of broader core or compulsory subjects. This strategy allows for the integration of sustainability topics into existing curricula, enhancing teachers' awareness and pedagogical skills without requiring a standalone course.

Science Education Curriculum
In a Science Teacher Education curriculum, sustainability concepts can be integrated into coursework related to ecology, biology, and physical sciences. For example, the study of ecosystems can include discussions on human impact and conservation efforts. This integration promotes critical thinking about how scientific concepts are connected to global sustainability challenges (Fischer et al., 2022; Hogan & O'Flaherty, 2021).

History Curriculum on Industrialization
In History teacher education, discussions on industrialization can include sustainability topics related to environmental degradation, resource exploitation, and social movements advocating for sustainable practices. This approach provides context for historical events and encourages future teachers to reflect on the lessons learned from past actions and how they relate to current sustainability issues (Persada et al., 2024).

Educational Psychology Course
An Educational Psychology course can feature modules on promoting prosocial behavior related to sustainability among students. These modules can explore how social norms, identity, and motivation influence individuals' responses to sustainability issues, effectively equipping future teachers with the psychological insights needed to foster environmentally responsible behavior in their classrooms (Fischer et al., 2022; Ronen & Kerret, 2020).

Example From the teff-Consortium
An example from the *teff*-consortium is a seminar series, Ecological and Ethical Education at the University of Cologne, consisting of weekly on-site seminars. In these seminars, student-teachers discuss various topics, such as how daycare centers can transform themselves into places of ecological and ethical education.

ESD Through a Dedicated Elective Subject

The final approach involves offering a dedicated elective course focused on sustainability. This allows teacher candidates the flexibility to deepen their understanding of sustainability issues and caters to those who may wish to specialize in this area.

Elective Course in Critical Pedagogy and Sustainability
An elective course on Critical Pedagogy can expose students to pedagogical frameworks that prioritize sustainability and ecological consciousness. In this course, students will critically engage with texts and practices that reflect eco-centric values, which are values that prioritize the health of ecosystems and the intrinsic worth of all life, including non-human organisms and non-living elements. Key principles include recognizing that nature has value independently of its use to humans and advocating for practices that support ecological balance, sustainability, and biodiversity. This approach considers how teaching can challenge dominant paradigms and promote transformative educational experiences (Misiaszek, 2025; Welsh & Murray, 2003).

Outdoor Education Elective
The Outdoor Education elective enables prospective teachers to connect students with the natural environment. This hands-on approach emphasizes experiential learning and situates sustainability within the context of conservation, sustainable practices, environmental literacy, and outdoor skills. Student-teachers will learn to develop curricula that utilize outdoor settings for Education for Sustainable Development (ESD) (Hu & Mou, 2025).

Global Sustainability Issues Course
Lastly, a course on Global Sustainability Issues can equip student-teachers with a comprehensive understanding of international sustainability challenges, such as climate change, biodiversity loss, and global inequality. By integrating current events, case studies, and global solutions, this course encourages student-teachers to explore their roles in fostering global citizenship and environmental responsibility (Fischer et al., 2022).

Example From the teff Consortium
An example from the *teff* consortium is a 3-EC online elective from the University of Helsinki, which introduces the concept and practices of ESD for students in the university. At the end of the course, students have become acquainted with the complexity and multidisciplinarity of sustainability issues and the ethical and philosophical dimensions of sustainability.

4. Concluding Remarks

Integrating ESD within teacher education is essential for cultivating a generation of teachers prepared to address the pressing global challenges of our time. The four approaches identified – education across curriculum areas, dedicated core subjects, components of compulsory subjects, and dedicated electives – each present unique opportunities to engage future teachers with sustainability principles. By fostering a multifaceted understanding of sustainability, teacher preparation programs can empower future teachers to instigate positive change within their classrooms and communities. As the education landscape continues to evolve, embracing these diverse approaches to ESD will be critical in promoting sustainable development and creating a better future for all.

References

Bragdø, M. B. (2022). Education for sustainable development in social studies: A scoping review of results from Scandinavian educational research. *Nordidactica: Journal of Humanities and Social Science Education, 12*(4), 101–123.

del Carmen Pegalajar-Palomino, M., Burgos-García, A., & Martinez-Valdivia, E. (2021). What does education for sustainable development offer in initial teacher training?

A systematic review. *Journal of Teacher Education for Sustainability, 23*(1), 99–114. https://doi.org/10.2478/jtes-2021-0008

Didham, R. J., Fujii, H., & Torkar, G. (2024). Exploring interdisciplinary approaches to education for sustainable development. *Nordic Journal of Comparative and International Education, 8*(2). https://doi.org/10.7577/njcie.5877

Evans, N., Stevenson, R. B., Lasen, M., Ferreira, J., & Davis, J. (2017). Approaches to embedding sustainability in teacher education: A synthesis of the literature. *Teaching and Teacher Education, 63*, 405–417. https://doi.org/10.1016/j.tate.2017.01.013

Fischer, D., King, J., Rieckmann, M., Barth, M., Büssing, A., Hemmer, I., & Lindau-Bank, D. (2022). Teacher education for sustainable development: A review of an emerging research field. *Journal of Teacher Education, 73*(5), 509–524. https://doi.org/10.1177/00224871221105784

Hogan, D., & O'Flaherty, J. (2021). Addressing education for sustainable development in the teaching of science: The case of a biological sciences teacher education program. *Sustainability, 13*(21), 12028. https://doi.org/10.3390/su132112028

Hsiao, P. W., & Su, C. H. (2021). A study on the impact of STEAM education for sustainable development courses and its effects on student motivation and learning. *Sustainability, 13*(7), 3772. https://doi.org/10.3390/su13073772

Hu, R., & Mou, S. (2025). Outdoor education for sustainable development: A systematic literature review. *Sustainability, 17*(8), 3338. https://doi.org/10.3390/su17083338

Kouam, A. W. F. (2025). Teachers as environmental educators: Exploring perceptions and practices of green pedagogies in fostering eco-literacy. *Journal of Applied Learning and Teaching, 8*(S1), 37–46. https://doi.org/10.37074/jalt.2025.8.S1.5

Li, H. C., & Tsai, T. L. (2022). Education for sustainable development in mathematics education: What could it look like? *International Journal of Mathematical Education in Science and Technology, 53*(9), 2532–2542. https://doi.org/10.1080/0020739X.2021.1941361

Martínez Valdivia, E., Pegalajar Palomino, M. D. C., & Burgos-García, A. (2023). Active methodologies and curricular sustainability in teacher training. *International Journal of Sustainability in Higher Education, 24*(6), 1364–1380. https://doi.org/10.1108/IJSHE-05-2022-0168

Misiaszek, G. W. (2020). Ecopedagogy: Teaching critical literacies of "development," "sustainability," and "sustainable development." *Teaching in Higher Education, 25*(5), 615–632. https://doi.org/10.1080/13562517.2019.1586668

Moreno-Pino, F. M., Jiménez-Fontana, R., Domingo, J. M. C., & Goded, P. A. (2022). Training in mathematics education from a sustainability perspective: A case study of university teachers' views. *Education Sciences, 12*(3), 199. https://doi.org/10.3390/educsci12030199

Persada, S. S., Anto, R., & Brata, I. B. (2024). Building global and environmental awareness: Integrating sustainability education in history learning. *ICoCSE Proceedings, 1*.

Reddy, C. (2021). Environmental education, social justice and teacher education: Enabling meaningful environmental learning in local contexts. *South African Journal of Higher Education, 35*(1), 161–177. https://doi.org/10.20853/35-1-4427

Ronen, T., & Kerret, D. (2020). Promoting sustainable wellbeing: Integrating positive psychology and environmental sustainability in education. *International Journal of Environmental Research and Public Health, 17*(19), 6968. https://doi.org/10.3390/ijerph17196968

Sheldrake, R., Walshe, N., & Hargreaves, E. (2025). Agentic action as an aim for sustainability education: Views from secondary school teachers in England. *Environmen-*

tal Education Research, 31(6), 1117–1134. https://doi.org/10.1080/13504622.2025.2464240

UNESCO. (2020). *Education for sustainable development: A roadmap*. UNESCO.

Walker, C. (2017). Tomorrow's leaders and today's agents of change? Children, sustainability education and environmental governance. *Children & Society, 31*(1), 72–83. https://doi.org/10.1111/chso.12192

Welsh, M. A., & Murray, D. L. (2003). The Ecollaborative: Teaching sustainability through critical pedagogy. *Journal of Management Education, 27*(2), 220–235. https://doi.org/10.1177/1052562903251415

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Xinlan Zhang, Iina Hyyppä, Antti Laherto, Lida Klaver, Heidi Krzywacki & Ilona Södervik

Digital Learning Modules for Sustainability Education

Abstract
To support teachers in addressing the contemporary challenges of education, one of the key objectives of the Erasmus+ Teacher Academy *"Teacher Education for a Future in Flux"* (*teff*) is to enhance European student teachers' and in-service teachers' sustainability competencies. To achieve this goal, the online course on Sustainability Education was designed in cooperation with the *teff* project partners. The course consists of three digital learning modules: the first module focuses on supporting learners' understanding of sustainability as a complex and multifaceted concept, the second module aims to familiarize the student with the various frameworks and approaches for sustainability education, and the third module supports teacher students in embedding sustainability in their own teaching. In addition to the self-studied learning materials, the course includes various interactive activities and self-assessment tasks that encourage students to evaluate their own learning progress. While the course design enables independent self-pacing, it also includes assignments that encourage learners to share ideas and discuss the topics with others, as well as collects learners' feedback to guide future online course design. All course materials and assignments are openly available and accessible for all student teachers, teachers and teacher educators across Europe.

Keywords: Sustainability, Sustainability Education, Digital Learning Module, Online Course

1. Introduction

Education plays a key role in worldwide efforts to address the global sustainability crises. In European teacher education, there is a burning need for pedagogical frameworks and competencies in sustainability and sustainability education. In the Erasmus+ Teacher Academy "Teacher Education for a Future in Flux" (*teff*) project, sustainability was recognized as one of the four skill areas of transversal futures literacy. Recognizing the pronounced need for further development of sustainability and sustainability education competencies in teacher education, *teff* planned and developed Digital Learning Modules (DLM) for Sustainability Education. Teacher educators can incorporate the digital learning materials into their broader teaching concept allowing

the competencies to be further strengthened in practice. The course is available for everyone online: https://zfl-lernen.de/online-kurs/teff_sustainability-education/

2. Overview of the Online Course on Sustainability Education

This online course is structured around three interconnected topics that form the learning modules. These modules guide learners from foundational theories through a deeper exploration of educational frameworks and, ultimately, to the application in practice. The online course focuses on the theme of sustainability education, with a simple and user-friendly design, allowing easy access to all learning materials with a single click. The landing page offers a clear overview, presenting the key topics of sustainability education in a progressive manner: (1) Sustainability as a Concept, (2) Sustainability Education Approaches, and (3) Sustainability Education Planning. The intended learning outcomes, core contents, and the assessment methods of each of the three modules are presented in Table 1.

Table 1: Sustainability education digital learning modules

Intended Learning Outcomes	Core Contents	Assessments
Module 1. The student is able to recognize sustainability as a complex and multifaceted concept	• Strong & Weak sustainability • Planetary boundaries • Doughnut Economics • Entry points for Sustainability • Transformations • Eco-social Bildung	• Pre-post mind map • Multiple-choice questionnaire • Self-evaluation questionnaire
Module 2. The student is able to identify different frameworks and approaches for sustainability education	• Transformations in sustainability education • Pedagogical approaches • Implementation of Sustainability Education	• Comparative reflection tasks • Multiple choice questionnaire • Self-evaluation questionnaire
Module 3. The student is able to plan a constructively aligned learning activity to address sustainability education	• Planning Learning Outcomes, Objectives, Activities & Assessments • Operationalisation of Sustainability Skills	• Learning activity planning • Self-evaluation questionnaire

2.1 Module 1: Sustainability as a Concept

Module 1 introduces a framework of sustainability theories. Students will be able to recognize sustainability as a complex and multifaceted concept. Through exploring key ideas such as *weak* and *strong* sustainability (Giddings et al., 2002), planetary boundaries (Rockström et al., 2009), doughnut economics (Raworth, 2017), and eco-social Bildung (Kothari et al., 2019), students develop an understanding of sustainability transformations and their multiple entry points (United Nations, 2019).

Learning is supported by reflective tools including pre–post mind maps, multiple-choice questionnaires, and self-evaluation questionnaires.

By introducing a range of conceptual frameworks, this module helps learners develop a foundational understanding of sustainability as a multifaceted construct. Building on this conceptual grounding, the module gradually guides learners towards a synthesis, encouraging them to build an integrated understanding rather than treating the concepts in isolation. It further guides the learners to think about how these theoretical perspectives can inform transformative actions in education and society. During the module, learners test their knowledge by answering quiz questions. If they answer incorrectly, they can click to view the solution alongside an explanation and retry.

Creating and developing mind maps both before and after learning helps learners organize their thoughts throughout the learning process. They are encouraged to upload their mind maps to the collaborative EduMaps space, where they can share their work, view the work of other learners, and give comments and feedback (see Figure 2).

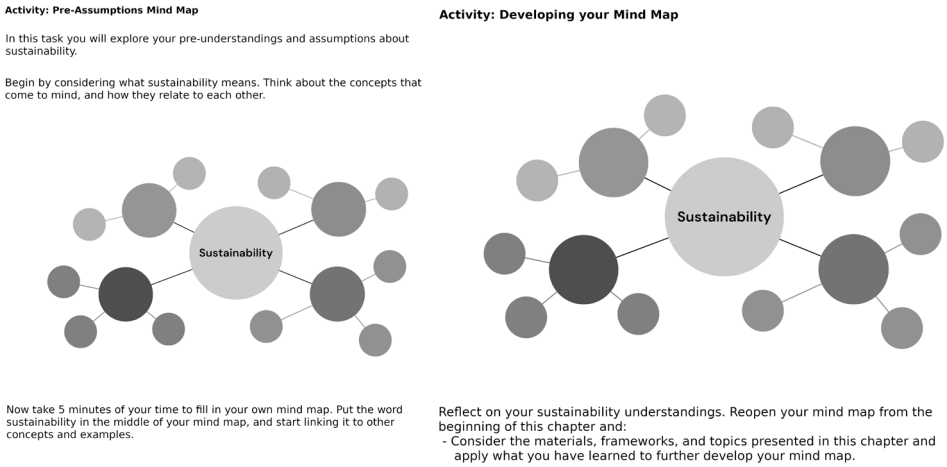


Figure 2: Mind maps before and after learning – Module 1

At the end of the learning module, there is a personal self-evaluation matrix available for learners to reflect on their learning.

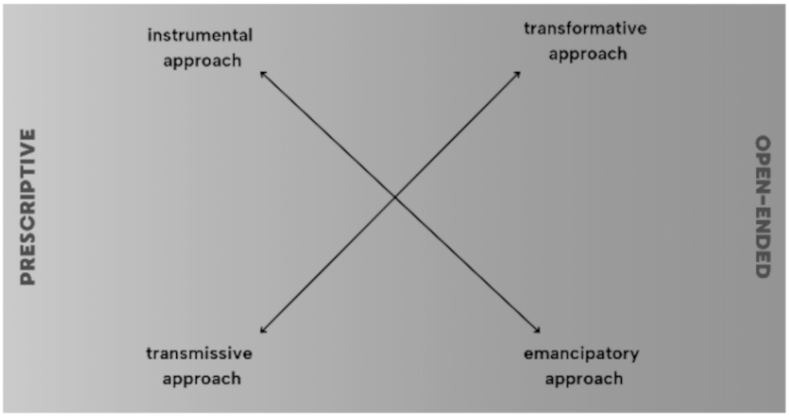
This module was developed based on University of Helsinki's online courses: "*Sustainability starts with us*" for staff (the Centre for University Teaching and Learning (HYPE)); and the "*Sustainability course*" (SUST-001) for students (University of Helsinki).

2.2 Module 2: Sustainability Education Approaches

Module 2 introduces various frameworks for sustainability education. This module examines key transformations in sustainability education (Mochizuki, 2016) and introduces diverse pedagogical approaches (Papenfuss et al., 2019). Finally, the module explores sustainability implementation (Wals et al., 2024) that promotes sustainability-oriented teaching and learning.

Using a visualization, the module provides information about the prominent publications (e.g., *The limits of growth* by the Club of Rome), conferences, and educational concepts (e.g., 'Environmental Education' and 'Education for Sustainable Development') regarding sustainability education. Furthermore, the various features that characterize approaches to sustainability education are also introduced through a visualization (see Figure 3), highlighting both the prescriptive and open-ended features of sustainability education and the role of knowledge and action of various approaches.

Learners can check their understanding of the different approaches through three multiple choice questions. These questions invite learners to think about which approach fits best with a given description from frameworks and official documents on sustainability education. Moreover, using open questions and answer suggestions for inspiration, learners are stimulated to reflect on the consequences of the multitude of approaches to sustainability education.



Graphic by Larissa Vlase-West, University of Cologne, adapted from Favier et al.2024, licensed with CC BY 4.0

Figure 3: Pedagogical approaches – Module 2

Moreover, the module explains what it means to implement the *whole school approach*: a systemic redesign of the whole school to integrate sustainability and sustainability education into every aspect of school life (European Commission, 2023; Zachariou et al., 2024). Both the voices of students and creating opportunities for student engagement are described as key factors of the whole school approach to sustainabil-

ity (Bjønness et al., 2024). Seven open questions (e.g., about the professional development of staff) encourage learners to reflect on their specific context and the possibilities and challenges for implementing a whole school approach to sustainability.

2.3 Module 3: Sustainability Education Planning

Module 3 guides learners in applying the knowledge from modules 1 and 2 to their specific teaching context, with their own students. By guiding learners step-by-step, the module aims for students to plan effective and constructively aligned learning activities (Biggs & Tang, 2007).

The module starts with a self-evaluation in which learners are asked to rate their level of confidence in carrying out tasks related to planning a sustainability education learning activity (e.g., identifying local opportunities and challenges). What follows is an explanation of how to plan for sustainability education (see Figure 4). Concrete examples and aids for the formulation of and decision-making on (intended) learning outcomes, teaching and learning activities, and assessment are given. The examples are based on the work by the Centre for University Teaching and Learning, University of Helsinki (n.d.), and cover systemic thinking, futures thinking, consideration of values and ethics, interaction and cooperation skills, and strategic thinking and action.

ILO3 design redrawn by Robin Schaeverbeke (Faculty of Architecture KULeuven) from Biggs & Tang, 1999.

Figure 4: Key aspects for planning sustainability education – Module 3

To make this even more concrete, the four steps – (I) identifying local opportunities and challenges related to sustainability in the educational context, (II) setting learning outcomes, (III) defining learning method(s) to achieve the set objectives, and (IV) establishing strategies for the assessment – are all worked out for the example of waste management and recycling practices in a community or campus setting.

In addition to the multiple-choice questions at the end of the module, the learners are invited to evaluate their learning more qualitatively. They are invited to elaborate

upon a template presentation to work out a sustainability education activity, following the four steps that were previously explained. Using seven criteria (e.g., does the activity establish learning outcomes in three domains: cognitive, socio-emotional and behavioural), the learners can evaluate their own learning progress.

After completing all the three modules, learners are directed to a feedback page where they can share their reflections on the online course. Upon submitting their feedback, they can download a certificate of completion, which includes both confirmation of participation of the DLM and an overview of the key contents of all three modules.

4. Outlook

This course with three digital learning modules provides an open educational resource for institutions and associations in the educational sector, as well as for individual teachers, teacher students and teacher educators. Looking ahead, we expect the course "Sustainability Education" to contribute to developing educators' sustainability competencies, fostering future-oriented thinking, and strengthening their capacity to address the complexities and uncertainties related to teaching about the global sustainability crisis.

Acknowledgements
We sincerely thank all *teff* partners and colleagues who contributed to the development of this online course: Oslo Metropolitan University, University of Cologne, University of Murcia, University of Florence, Nantes Université, Saxion University of Applied Sciences and Utrecht University, the reviewers who took part in the piloting and feedback, and the webpage developers for their technical support.

References

Biggs, J., & Tang, C. (1999). *Teaching for quality learning*. Open University Press.

Bjønness, B., Eikeland, I., Sinnes, A., & Wals, A. E. J. (2024). It takes a whole school: A synthesis. In A. E. J. Wals, B. Bjønness, A. Sinnes, & I. Eikeland (Eds.), *Whole school approaches to sustainability: Educational renewal in times of distress* (pp. 325–330). Springer. https://doi.org/10.1007/978-3-031-56172-6_1

Center for University Teaching and Learning, University of Helsinki. (n.d.). *Examples of the operationalisation of sustainability skills*. https://flamma.helsinki.fi/documents/37210/0/Appendix+2.+Examples+of+the+operationalisation+of+sustainability+skills.pdf/c8730e46-8303-2fba-99ab-ee2657957f36?t=1636527112050

European Commission. (2023). *European Education Area strategic framework: Working group on schools, sub-group on education for environmental sustainability – A whole school approach to learning for sustainability*. Publications Office of the European Union.

Giddings, B., Hopwood, B., & O'Brien, G. (2002). Environment, economy and society: Fitting them together into sustainable development. *Sustainable Development, 10*(4), 187–196. https://doi.org/10.1002/sd.199

Kothari, A., Salleh, A., Escobar, A., Demaria, F., & Acosta, A. (2019). Crisis as opportunity: Finding pluriversal paths. In A. Ziai (Ed.), *Postdevelopment in practice: Alternatives, economies, ontologies* (pp. 100–116). Routledge. https://doi.org/10.4324/9780429492136-8

Mochizuki, Y. (2016). Educating for transforming our world: Revisiting international debates surrounding education for sustainable development. *Current Issues in Comparative Education, 19*(1), 109–125. https://doi.org/10.52214/cice.v19i1.11538

Papenfuss, J., Merritt, E., Manuel-Navarrete, D., Cloutier, S., & Eckard, B. (2019). Interacting pedagogies: A review and framework for sustainability education. *Journal of Sustainability Education, 20*. https://susted.com/wordpress/wp-content/uploads/2019/04/Papenfuss-JSE-April-2019-General-Issue-PDF.pdf

Raworth, K. (2017). *Doughnut economics: Seven ways to think like a 21st-century economist*. Penguin Random House.

Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin, F. S., Lambin, E., Lenton, T. M., Scheffer, M., Folke, C., Schellnhuber, H. J., Nykvist, B., De Wit, C. A., Hughes, T., Van der Leeuw, S., Rodhe, H., Sörlin, S., Snyder, P. K., Costanza, R., Svedin, U., … Foley, J. (2009). Planetary boundaries: Exploring the safe operating space for humanity. *Ecology and Society, 14*(2). https://doi.org/10.5751/ES-03180-140232

United Nations. (2019). *Global sustainable development report 2019: The future is now – Science for achieving sustainable development*. https://go.nature.com/2jScAoW

Wals, A. E. J., Eikeland, I., Bjønness, B., & Sinnes, A. (2024). It takes a whole school: An introduction. In A.E. Wals, B. Bjønness, A. Sinnes, & I. Eikeland (Eds.), *Whole school approaches to sustainability. Education Renewal in Times of Distress* (pp. 1–6). Springer. https://doi.org/10.1007/978-3-031-56172-6_1

Zachariou, A., Hadjiachilleos, S., Chrysanthi-Kadji, B., & van Raaij, R. (2024). Insights, challenges, and prospects on whole school approach to sustainability in the UN Economic Commission for Europe (UNECE) region. In A. E. J. Wals, B. Bjønness, A. Sinnes, & I. Eikeland (Eds.), *Whole school approaches to sustainability: Educational renewal in times of distress* (pp. 35–56). Springer. https://doi.org/10.1007/978-3-031-56172-6_3

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Finnja Vickus, Greta Pieper, Fabian Schemann & Dorothea Wiktorin

Learning About, for and Through Transformation: Designing a Workshop Format for (Future) Teachers on Transformative Education and Urban Change

Abstract
Global challenges require profound processes of social transformation. Innovative educational approaches that empower learners to actively participate in shaping such processes are increasingly recognised as key to sustainable development. As part of the Erasmus+ Teacher Academy *teff*, the University of Cologne has designed and evaluated a hybrid workshop format entitled *Urban Laboratory: Changing Cities*. This workshop serves the purpose of the principles of transformative learning becoming practically experienceable and implementable. The workshop format is designed according to the principles of transformative learning. Participants from various European countries analyse how participation and empowerment can turn cities into learning spaces for sustainable transformation. The didactic structure is designed in such a way that the format can be used as an adaptable model for transformative teacher training in a wide variety of thematic contexts.

Keywords: Transformative education, Teacher education, Urban change

1. Introduction

Global crises are shaping the 21st century and presenting humanity with existential challenges (Richardson, 2023). The *Wissenschaftliche Beirat der Bundesregierung Globale Veränderungen* (WBGU 2011) in Germany speaks of a major transformation, in other words a profound process of social change, that must be actively shaped. Education is increasingly seen as a key response to global challenges as it can make a significant contribution to actively shaping societal transformation (Meyer, 2023; Sterling, 2024). Teachers are recognised as change agents and facilitators of societal transformation. The question that arises is how we, as educators, can enable our students to not only cope with, but actively participate in the epic transformations of the 21st century.

The aim of transformative education is to empower learners in a process of emancipation and to create learning opportunities that understand transformation not as a distant goal, but as something that can be shaped in the here and now (Grana-

dos-Sánchez, 2022; Wilmot et al., 2025). To make this possible, transformative formats for teacher training and continuing education are needed (Lotz-Sisitzka et al., 2022; Vogelsang & Meyer, 2023). This chapter presents a workshop format that was developed as part of the *teff* Academy at the Department of Geography at the University of Cologne. At the *Urban Laboratory* in Cologne, educators from across Europe explored urban transformation and reflected on how these hands-on experiences can inspire transformative learning in the classroom.

2. Transformative Learning

At the beginning of the 1990s, the concept of sustainability gave rise to the idea of education for sustainable development. This concept has gained importance globally in a wide variety of education systems, particularly because it has since played an important role in the agendas and programmes of the United Nations, for example, with regard to the Sustainable Development Goals (SDGs) targeted for 2030. The understanding of what the goals of education for sustainable development (ESD) are and how they should be designed has changed significantly in educational science in recent years. The main criticism of ESD is that it focuses too strongly on promoting a particular way of thinking and acting sustainably, thereby encouraging specific behaviors aimed at producing a certain type of citizen (Pettig & Ohl, 2023). This understanding of ESD is characterised as instrumental ESD or ESD 1 (Vare & Scott, 2007). Distinct from ESD 1, other approaches have emerged that view the future as open and malleable, and assume that a sustainable future can only be achieved through social debate; these are referred to as ESD 2 and 3 (Pettig & Ohl, 2023). These approaches are not intended to promote specific sustainable behavior, but rather to encourage learners' ability to participate. ESD 2 integrates emancipatory approaches and thus aims to address the criticism of ESD 1's lack of reflexivity by promoting the search for, questioning, discussion, and summary of possible paths and alternatives (ibid.). ESD 3, on the other hand, includes transformative approaches and aims to empower learners to participate in shaping a good life for all in the face of an uncertain future (ibid.).

Building on this change, the approach of transformative education has gained importance in recent discussions on geography education (Mittrach, 2023; Ammoneit & Reudenbach, 2024). In the spirit of an emancipatory and critical education, learners are meant to question existing power structures and, on the basis of diverse perspectives within a dialogical interaction, be empowered to participate in the transformation towards a more sustainable and socially just society (Schreiber & Nöthen, 2023). This approach assumes an uncertain but malleable future that requires joint engagement with controversial social issues (Pettig, 2021). Another essential aspect of this understanding of learning is the openness of the learning process to diverse outcomes, which is based on the assumption that "it is not possible to directly control transformative learning processes, but only to shape the framework conditions" (Bormann et al., 2022). In this understanding, social change towards greater sustainabili-

ty is increasingly seen as a socio-ecological transformation, which, according to Seitz (2018), has the character of a social search process.

Transformative learning offers a valuable pedagogical approach to address the persistent mind-behaviour gap, the discrepancy between cognitive awareness (e.g. frustration, disappointment, moral concern) and actual behaviour, or self-efficacy in sustainable action. According to Mezirow (2009), adults learn most effectively through biographical crises that provoke irritation. As Bähr et al. (2019) emphasize with regards to the context of secondary education, such crises need not be existentially threatening; irritation may result from perceived dilemmas or moments of dissonance. In teaching, irritation can be understood as a productive learning opportunity rather than a disruption. Irritation can be intentionally initiated by confronting learners with radically new perspectives. For example, encounters with unfamiliar cultures or value systems can challenge existing assumptions and trigger reflective engagement. Teachers can also induce irritation by breaking institutional routines, such as using unconventional methods, presenting content in unexpected ways, or introducing sensory and affective learning experiences (Bähr et al., 2019). Encouraging self-reflection, and the questioning of personal beliefs and knowledge systems further deepens this process. Creating tensions between everyday perceptions and scientific concepts, or deliberately slowing down interpretation processes, allows learners to dwell in uncertainty and develop more complex understandings (Combe & Gebhard, 2009).

Teachers need to be aware of the challenges inherent in such a process and find strategies to make it bearable for both their students and themselves. Singer-Brodowski et al. (2022) argue that educators should work towards creating „safe-enough spaces“ for learners to engage with the climate crisis through transformative learning. This process involves equipping learners with resources to manage negative emotions and reduce stress, making space for conversations that feel safe and constructive to everyone involved, and questioning the education system and its entanglement in problematic social structures. Initiating learning processes through a focus on solutions and then engaging with the underlying problems as a second step, is another approach which may help to avoid extreme emotional responses that prevent the engagement of learners (Hoffmann, 2022). Importantly, this dialogical approach also implies that the teacher must take on a different role: In transformative learning, teachers do not act as mediators of knowledge, but as facilitators of a dialogue in which they themselves partake as learners as well. They thus explore different scenarios of what a more sustainable future may look like along with their students, model an open-minded approach, and encourage all students to participate in a process of co-creation (Pettig, 2021). Transformative education can be particularly relevant in the context of urban change, as cities act as laboratories for social transformation.

3. Urban Transformation

By 2050, more than two-thirds of the world's population is expected to live in urban areas. This underscores the growing importance of cities for global climate change and sustainability (UNDESA, 2019). In the European Union, 38.9 % of the population already lived in cities in 2021, with a further 35.9 % living in small towns and suburbs (Eurostat, 2022). Today, cities are hotspots of consumption, resource use, and environmental pollution. At the same time, climate change makes urban areas particularly vulnerable to extreme events such as heat waves, droughts, and floods. Rising temperatures increase the frequency and intensity of heat waves and exacerbate the urban heat island effect. Around 70 % of global greenhouse gas emissions come from urban areas, making cities key drivers of climate change (Lwasa et al., 2023). Urban structures such as sealed surfaces and a lack of green spaces further exacerbate these effects (Oke et al., 2017).

The consequences of extreme events hit cities particularly hard and have a negative impact on health and well-being. Noise and air pollution, often combined with a lack of green spaces, can lead to stress and respiratory or cardiovascular diseases. Despite advances in air pollution control, a significant health risk remains, especially in large cities (WBGU, 2016). A future rise in temperature will further increase the number of heatwave days and place greater strain on particularly vulnerable groups, such as children, older people, and low-income households (Hamdi et al., 2020). This illustrates how disproportionately urban areas influence the global climate and how crucial environmental factors are for the physical and mental health of their inhabitants. In view of these challenges, comprehensive strategies and the active participation of the population are necessary to aid cities in adapting to climate change. Education and participation formats promote an experience-based understanding of climate risks, strengthen social integration, and increase the willingness to implement effective adaptation measures (Schneider et al., 2025). Climate-friendly urban development therefore requires both targeted management and the active participation of citizens. Public participation increases the legitimacy of political decisions and strengthens identification with local adaptation approaches (Coenen, 2015).

4. Urban Laboratory: Workshop Format

As part of *teff*, a hybrid learning format focusing on transformative learning was developed at the University of Cologne, using *Changing Cities* as the theme. In two workshops held in April and September 2025 in Cologne, participants tested current scientific findings in practice in the context of an international exchange. The programme was continuously evaluated and adapted based on feedback and focus group discussions to ensure ongoing optimisation. The aim of the workshop was to enable participants to implement the concept of transformative learning in their geography lessons by experiencing it firsthand at the workshop. To this end, participants were invited to experience the perspective of learners for two days, participate in joint excur-

sions, and work on their own project. The transformative workshop concept is versatile and can be adapted to address other topics, such as energy, mobility or nutrition.

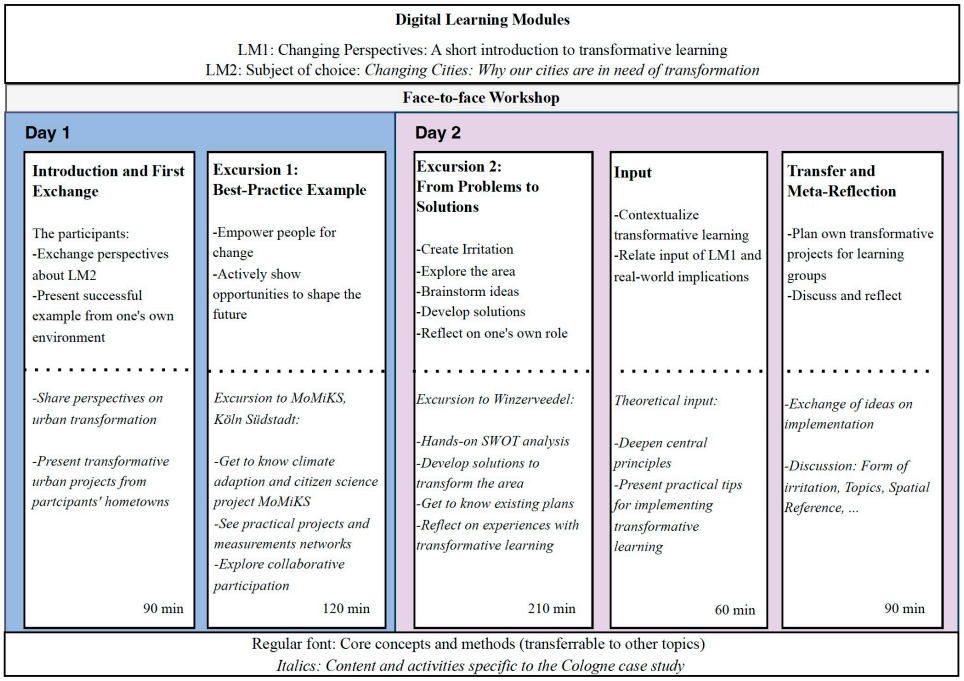


Figure 1: Workshop schedule and structure (own illustration)

Prior to the workshop, participants attend an online meeting and complete two digital learning modules. The first learning module, *Changing Perspectives,* introduces the didactic foundations of transformative learning, while the second, *Changing Cities,* outlines subject-specific issues. On the first day of the workshop, participants got to know each other, explored a best practice example of urban change, and came up with solutions to identified problems. As part of the workshop, participants went on an excursion to the climate adaptation project *‚MoMiKS‘* in Cologne's *‚Südstadt‘* district. There, citizens act as co-researchers by installing weather stations on their homes to provide data on the urban microclimate (Eingrüber et al., 2022). Such citizen science projects promote understanding and acceptance of adaptation measures as well as strengthen social engagement and self-determination through direct participation. A key part of the excursion involved an exchange with a local family who provided practical insights into the project's implementation and their experiences in the participation process.

On the second day, an excursion to another learning location in the *‚Winzerveedel‘* neighbourhood, close to the University of Cologne, was organised. This district is particularly emblematic of urban challenges. Unlike the best-practice example of the *‚Südstadt‘* district, the intention here was to deliberately cause irritation. The groups conducted a SWOT analysis on site to map the neighbourhood's strengths, weakness-

es, opportunities, and threats. Recurring issues such as soil sealing, heavy traffic, and a lack of green spaces were evident. Based on this analysis, the participants developed ideas and solutions to improve quality of life and sustainability in this area. This process was divided into two phases. The first was an open vision phase, supported by a digital "toolbox" describing practical steps for implementing various co-creative urban development measures (Agora Köln e.V., 2025). The second phase focused on the feasibility of the proposals. The resulting solutions were presented and compared to existing plans for the transformation of the neighbourhood developed by local citizens.

In the second phase, the participants stepped out of their roles as learners to reflect on their experiences and develop their own project ideas. To this end, they were provided with supplementary theoretical input on the central principles and goals of transformative learning, as well as practical implementation tips. Inspired by the previous activities, the participants designed individual projects to show how transformative learning could be implemented in their own learning groups back home. There was also an opportunity to reflect on and discuss the specific challenges of transformative learning processes, with a particular focus on how the participants themselves had perceived transformative learning throughout the workshop.

5. Conclusion

The workshop format developed as part of *teff* provides an example of how opportunities for transformative learning can be created through practice-oriented learning settings. By combining digital preparation and on-site activities, the format creates spaces where participants can not only acquire knowledge about transformative learning and urban transformation, but also experience it firsthand and learn how to implement it in their own teaching. Through direct involvement in participatory projects, participants are able to experience how transformation can be initiated and come to see citizens as indispensable, active agents of social change. These experiences give concrete form to the previously abstract concept of transformative learning, allowing participants to experience it as an approach that can be implemented in their own teaching. The consistent embedding of the workshop format in real social contexts combines sustainable thinking, collective responsibility, and active action. The Urban Laboratory is also characterised by a high degree of adaptability, with the methods developed being transferable to diverse thematic contexts, increasing the reach of transformative educational processes. Overall, this *teff* project makes a significant contribution to supporting teachers in designing innovative learning spaces, in which learners can understand the future as a malleable and experiential space and actively help to shape it – all over Europe.

References

Ammoneit, R., & Reudenbach, C. (2024). Ist BNE im Geographieunterricht zukunftsweisend? *GW Unterricht, 174*, 43–55.

Bähr, I., Gebhard, U., Krieger, C., Lübke, B., Pfeiffer, M., Regenbrecht, T., Sabisch, A., & Sting, W. (2019), *Irritation als Chance* (pp. 3–39). Springer Fachmedien Wiesbaden.

Bentz, J., & O'Brien, K. (2019). Art for change: Transformative learning and youth empowerment in a changing climate. *Elementa: Science of the Anthropocene, 7*(52). https://doi.org/10.1525/elementa.390

Bormann, I., Singer-Brodowski, M., Taigel, J., Wanner, M., Schmitt, M., & Blum, J. (2022). *Transformatives Lernen im Kontext sozial-ökologischer Transformationsprozesse*. Umweltbundesamt.

Coenen, F. H. J. M. (2015). Participation in social and technical innovations in climate actions. Paper presented at the *2nd International Conference on Public Policy (ICPP 2015)*.

Combe, A., & Gebhard, U. (2009). Irritation und Phantasie: Zur Möglichkeit von Erfahrungen in Lernprozessen. *Zeitschrift für Erziehungswissenschaft, 12*(3), 549–571.

Eingrüber, N., Korres, W., & Schneider, K. (2022). Microclimatic field measurements to support microclimatological modelling with ENVI-met for an urban study area in Cologne. *Advances in Science and Research, 19*, 81–90. https://doi.org/10.5194/asr-19-81-2022

Granados-Sánchez, J. (2022). Levels of transformation in sustainable curricula: The case of geography education. *Sustainability, 14*(8). https://doi.org/10.3390/su14084481

Hamdi, R., Kusaka, H., Doan, Q., Cai, P., He, H., Luo, G., Kuang, W., Caluwaerts, S., Duchêne, F., Van Schaeybroek, B., & Termonia, P. (2020). The state-of-the-art of urban climate change modeling and observations. *Earth Systems and Environment*, *4*, 631–646.

Hoffmann, T. (2022). Viewpoint: How to teach global challenges? A solution-focused approach. *Southern African Journal of Environmental Education, 37*. https://doi.org/10.4314/sajee.v37i1

Lotz-Sisitka, H., Wals, A. E. J., Kronlid, D., & McGarry, D. (2015). Transformative, transgressive social learning: Rethinking higher education pedagogy in times of systemic global dysfunction. *Current Opinion in Environmental Sustainability, 16*, 73–80. https://doi.org/10.1016/j.cosust.2015.07.018

Lwasa, S., Seto, K. C., Bai, X., Blanco, H., Gurney, K. R., Kılkış, Ş., Lucon, O., Murakami, J., Pan, J., Sharifi, A., & Yamagata, Y. (2023). Urban systems and other settlements. In *Intergovernmental Panel on Climate Change (IPCC)* (Ed.), *Climate change 2022: Mitigation of climate change* (pp. 861–952). Cambridge University Press. https://doi.org/10.1017/9781009157926.010

Meyer, C. (2023). Bildung für nachhaltige Entwicklung. In E. Nöthen & V. Schreiber (Eds.), *Transformative geographische Bildung* (pp. 109–116). Springer.

Mezirow, J. (2009). Transformative learning theory. In J. Mezirow & E. W. Taylor (Eds.), *Transformative learning in practice* (pp. 18–32). Jossey-Bass.

Mittrach, S. (2023). *Subjektive Theorien von Geographielehrkräften zur „Großen Transformation"* [Doctoral dissertation]. Leibniz Universität Hannover.

Oke, T. R., Mills, G., Christen, A., & Voogt, J. A. (2017). *Urban climates*. Cambridge University Press.

Pettig, F. (2021). Transformative Lernangebote kritisch-reflexiv gestalten: Fachdidaktische Orientierungen einer emanzipatorischen BNE. *GW-Unterricht, 1*, 5–17. https://doi.org/10.1553/gw-unterricht162s5

Pettig, F., & Ohl, U. (2023). Transformatives Lernen für einen sozial-ökologischen Wandel. *Praxis Geographie, 53*(1), 4–9.

Richardson, K. (2023). Earth beyond six of nine planetary boundaries. *Science Advances, 9*(37), eadh2458. https://doi.org/10.1126/sciadv.adh2458

Schneider, K., Dlugoß, V., & Eingrüber, N. (2025). Partizipative Zugänge zu Klimawandelanpassungen in Städten. In W. L. Filho & V. Scherenberg (Eds.), *SDG 13: Maßnahmen zum Klimaschutz* (pp. 405–427). Springer. https://doi.org/10.1007/978-3-662-70588-9_26

Schreiber, V., & Nöthen, E. (2023). Transformative geographische Bildung. In E. Nöthen & V. Schreiber (Eds.), *Transformative geographische Bildung* (pp. 1–6). Springer.

Seitz, K. (2018). Globales Lernen als transformative Bildung für eine zukunftsfähige Entwicklung. In VENRO (Ed.), *Globales Lernen: Wie transformativ ist es? Impulse, Reflexionen, Beispiele* (pp. 7–11). Diskussionspapier.

Singer-Brodowski, M., Förster, R., Eschenbacher, S., Biberhofer, P., & Getzin, S. (2022). Facing crises of unsustainability: Creating and holding safe enough spaces for transformative learning in higher education for sustainable development. *Frontiers in Education, 7*. https://doi.org/10.3389/feduc.2022.787490

Sterling, S. (2024). *Learning and sustainability in dangerous times*. Agenda Publishing.

United Nations, Department of Economic and Social Affairs, Population Division. (2019). *World urbanization prospects: The 2018 revision*. United Nations.

Vare, P., & Scott, W. (2007). Learning for a change: Exploring the relationship between education and sustainable development. *Journal of Education for Sustainable Development, 1*(2), 191–198. https://doi.org/10.1177/097340820700100209

Vogelsang, S., & Meyer, C. (2023). Methoden für transformatives Lernen. Körperbasierte, emotionale und reflexive Zugänge im Kontext von Bildung für nachhaltige Entwicklung. In Julia Gillen (Ed.), *Reflexiv handlungsfähig* (S. 329–347). Academia. https://doi.org/10.5771/9783985721269-329

WBGU – Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen. (2011). *Welt im Wandel: Gesellschaftsvertrag für eine Große Transformation.* WBGU.

Wilmot, D., Bednarz, S. W., Fatima, M., Garcia De La Vega, A., Grob, R., Mäsgen, J., & Wilson, S. (2025). Transformative learning in geography education: International perspectives and practices. *International Research in Geographical and Environmental Education, 34*(3), 254–273. https://doi.org/10.1080/10382046.2025.2473104

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Moritz Langer, Simon Höfting, Kathleen Ann Falconer & André Bresges

Learning by Making: Hands-On Insights Into Sustainability Education Onboard a Maritime Makerspace

Abstract
This practical contribution documents the development and implementation of the *teff* Maritime Makerspace, an international format for integrating education for sustainable development (SDG) into teacher training. The aim was to investigate how constructivist learning approaches in makerspaces can promote the skills of future teachers in the area of SDG 14 "Life Below Water." The three-phase model combined virtual preparation, practice-oriented classroom work at the Ecological Rhine Station, the research vessel of the University of Cologne, and reflective follow-up work. Key elements included the independent development of learning stations, testing of the learning stations with school classes, and the use of 3D printing, which proved to be a valuable tool for iterative, problem-solving learning. The *teff* Maritime Makerspace offered a transferable model for integrating sustainability and technological skills into international teacher training by linking the theoretical foundations of maker education with practical implementation and demonstrating concrete implementation options for makerspaces.

Keywords: Makerspace, education for sustainable development, SDG 14, teacher training, 3D printing

1. Introduction

Makerspaces are innovative learning environments that foster creative problem-solving, collaborative work, and development of technological skills (Schön et al., 2019). Originating from the maker movement, they provide access to both digital tools, such as 3D printers and microcontrollers, and traditional craft materials, enabling users to turn their own ideas into tangible products (Schön et al., 2019).

In recent years, the number of makerspaces at German universities has grown steadily (Späth, 2019). These innovative learning environments promote interdisciplinary learning and strengthen students' self-efficacy through hands-on experiences. In addition, there are significant positive effects on student learning in the areas of creativity and problem-solving skills (Hayat et al., 2025). Rooted in constructivist epistemology, makerspaces support iterative learning processes (Otieno, 2017) and

emphasize that learners actively construct knowledge by gathering and reflecting on experiences through their own actions and experimentation (Kurti et al., 2014).

The integration of the makerspace ideals support a holistic approach to social, economical, and ecological sustainability, aiming to address global challenges such as poverty, inequality, and climate change. In Europe, sustainability is considered a hallmark aspect of maker education, though not all projects explicitly address it (Schön et al., 2016a). The makerspace discussed in this article aligns with the United Nations Sustainable Development Goal (SDG) 14 "Life below water". The SDG 14 promotes the protection and sustainable use of oceans, seas, and marine resources and includes objectives such as reducing marine pollution, managing coastal ecosystems sustainably, ending overfishing, and establishing marine protected areas (United Nations, 2024).

2. *teff* Maritime Makerspace

The international format of *teff* Maritime Makerspaces aimed to incorporate the above goals into teacher training in order to raise awareness of sustainable development among future generations of teachers and to empower them to take action. At the same time, the format was open to all phases of teacher education and was designed to enable cross-phase collaboration.

2.1 Development

The *teff* Maritime Makerspaces format was developed within Work Package 4 (WP4) on sustainability, which comprised four deliverables, including the two Maritime Makerspaces presented here. The format is founded upon a student exchange within EUniWell in 2023, in which international future teachers worked with a school class on-board the Rhine station. Building on this experience, the first *teff* Makerspace was created in 2024 with a clear focus on sustainability and the SDG "Life below water." Key elements such as school visits and international student participation were retained, but the schedule and methodology were adapted to the new sustainability goals. Following the successful implementation and evaluation in 2024, the second Maritime Makerspace was held in 2025, with specific adjustments derived from the evaluation results.

2.2 Second Maritime Makerspace

Since the second *teff* Maritime Makerspace was an iterative development from 2024, the following description focuses upon the 2025 implementation. The Maritime Makerspace followed the characteristics of makerspaces described in the literature, which combined structured curricular guidelines with self-directed, interest-oriented learn-

ing (Kurti et al., 2014; Hayat et al., 2025). The Maritime Makerspace used a three-phase model that combined virtual preparation, self-directed and practice-oriented classroom work, and reflective follow-up.

The specific process is shown in the following figure (Fig. 1).

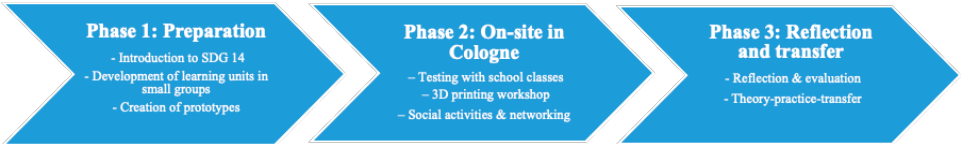


Figure 1: Second Maritime Makerspace process (own illustration)

Phase 1: Preparation Phase (2 Online Sessions)

The first phase consisted of two online sessions in two consecutive weeks. The first session served as an introduction for the participants and laid the groundwork for the scientific and educational content. Participants from different countries exchanged ideas about different education systems and were introduced to the SDG 14 „Life below water" target. Between the first and second online sessions, initial ideas for an interest-driven focus on a SDG 14 topic were developed.

The second online session focused on the independent development of learning modules in small groups. The creation process of the modules reflected the constructivist principle of maker education, in which learners initiated the learning process themselves and teachers acted as guides (Kurti et al., 2014). Participants were provided with materials and thematic ideas, but worked largely in self-supported teams of two people. Interactions and exchange between the teams were possible and were greatly encouraged.

The concepts were further developed and refined between the second online session and the in-person phase in Cologne. During this time, the prototypes for the teaching modules on their topic related to the sustainability goal were developed. The modules were tested with a school class in phase 2. Participants had the opportunity to contact and interact with the instructors between sessions to clarify questions and/or discuss materials. This phase allowed participants to explore, experiment, and freely try out new ideas – key elements of makerspaces (Buxton et al., 2022). The aim of the first phase was to develop technical competencies in understanding of SDG 14, strengthening self-organization skills, and promoting creative problem-solving approaches.

Phase 2: On-Site Phase in Cologne (3 Days)

The in-person phase formed the central element of the *teff* Maritime Makerspace experience and enabled the practical implementation of the developed modules and ideas. The first day was spent completing the learning modules for the school visit at the Cologne Rhine Station. By testing the experiments and materials in context, it was possible to identify potential pitfalls and to make adjustments. In addition, the ini-

tial introduction to the 3D printing workshop took place. This first day of the second phase aimed to consolidate the technical skills, develop an understanding of the ship as a place of learning, test new technologies such as 3D printing, and allow participants to get to know one another. Through the iterative process of testing all the experiments and materials in practice, potential errors could be identified and corrected.

The central component formed the focus of the second day. A school class visited the ship and participated in the developed stations from the modules. During the school visit, the students switched from the role of participants to the role of instructors and received feedback from their participating pupils. In the 2024 implementation, there was no opportunity for the participants to observe other groups. The 2025 implementation of the Maritime Makerspace sought to correct this by having smaller group sizes so all participants could be present at all stations and give each other direct feedback. This corresponds to the relevance of mutual exchange in makerspaces (Schön et al., 2019). After the school class visit, a focused initial reflection session occurred. This second day of the second phase aimed to promote a broad range of skills including: pedagogical and didactic skills through guiding students, teamwork skills through group work, reflective skills through immediate feedback and reflection, and sustainability skills through engaging with the content of „Life below water." Moreover, the social interaction and group culture was also enhanced through these efforts.

The third day included part two of the 3D printing workshop and a short tour of the university. The participants were then free to explore the city on their own as the second phase was completed.

The activities mentioned above, including shared meals as well as city and university tours, were intended to strengthen the social dimension, as makerspaces should promote not only technological skills but also social skills and networking (Kaden & Freyberg, 2023; Becker & Jacobsen, 2020).

Phase 3: Reflection and Transfer (1 Online Session)

The final online session served as an opportunity for participants' critical reflection on the school visit and for developing suggestions and implications for their own school practice. In this final reflection stage, the *teff* Maritime Makerspace was evaluated. A written questionnaire was completed and a focus group was led by the instructors. The third phase was intended to promote the transfer of theory into practice. Reflection and asking questions are central components of learning in makerspaces and enable deeper learning (Kurti et al., 2014). A distinctive feature of reflection in this Makerspace is that students came from diverse backgrounds, allowing the transfer of theory into practice to be tailored to each individual.

3. The Ecological Rhine Station as a Place of Learning

A key aspect of the *teff* Maritime Makerspace design was the choice of the Ecological Rhine Station in Cologne as the venue, which offered a wide range of learning and experiential opportunities as an extracurricular learning location. Extracurricular learning venues have the capacity to create authentic learning opportunities where learners can engage in action-oriented learning through direct interaction with real phenomena. These direct experiences with the learning environment and the high degree of practical relevance support sustainable learning processes (Forum Verlag, 2022). The Ecological Rhine Station is located on a former Rhine ship on the left bank of the river Rhine in Cologne. The Cologne Rhine Station functions as an extracurricular learning center and research facility for the study of the Rhine ecosystem (University of Cologne, n.d.). The unique features of this environment were leveraged in the Maritime Makerspace. The location directly on the Rhine provided immediate access to the topic of „Life below water" and enabled students to experience SDG 14 in an authentic context. The Cologne Rhine Station included two seminar rooms which are used as an extracurricular learning location by the University of Cologne for university and school classes.

In accordance with the ecological principles of the creation of the Cologne Rhine Station, the ship serves as a practical example in the use of renewable energies. Equipped with a generator and photovoltaic systems, the systems demonstrated concrete applications for sustainable energy supply. The on-board research laboratories facilitate students' insights into the scientific method and process. The Rhine and its surroundings provide many different opportunities for scientific experimentation, from water current studies to water quality analyses and water depth measurements. The geographical structure of the river system, the investigation of existing renewable energies, and research into the Rhine ecosystem are further thematic focal points. This combination of theory and practice, scientific research and applied education makes the Rhine Station an ideal location for the Maritime Makerspace.

4. 3D Printing in the Makerspace

A central element of the second *teff* Maritime Makerspace was the 3D printing workshop, which, over two days, provided a hands-on experience of the entire development process, from the initial design idea to the finished object. This workshop was based on a teacher professional development program entitled "3D-Printing at Schools: A Fundamentals Workshop for Teachers", which was offered in the context of the MNU Conference 2024. While the conference workshop itself did not include catapults, these served as learning objects in the actual workshop setting for mastering the 3D printing process. This technology was particularly suitable for constructivist learning approaches in makerspaces, as it enabled iterative thinking, hands-on problem solving, and the physical manifestation of abstract ideas. Kurti et al. (2014) emphasized that maker education was based on constructivist principles, in which

learners construct knowledge through active design. Participants went through a development process – from hand-sketching a functional catapult to digital modeling to completing and testing the physical object. Specific design parameters (size restrictions, tolerance distances for moving parts) challenged participants to find creative solutions within realistic constraints. The long-distance throwing challenge on the second day provided immediate feedback on the functionality of the catapult designs and initiated iterative learning processes. This form of "learning by making" combined physical concepts (lever arm, slanted throw) with practical application and created a deeper conceptual understanding of the underlying scientific principles (Buxton et al., 2022).

3D printing offered a wide range of applications for the sustainability goal "Life below water." The technology enabled the creation of models for visualizing marine ecosystems, the development of educational materials for water protection, and the construction of prototypes for sustainable solutions. The workshop combined development of technological skills with a reflection on possible applications in inclusive STEAM teaching. Moreover, this workshop enabled participants to develop proficiency in slicer software, enabling them to autonomously develop 3D printing projects for their teaching practice in the future. Additionally, participants had the opportunity to integrate 3D printing into the learning units they developed during the workshop, allowing them to directly apply the acquired skills within their own educational contexts.

5. Conclusion

This article presented the implementation of an international three-phase makerspace format that combined education for sustainable development with teacher training. The *teff* Maritime Makerspace demonstrated how constructivist principles of maker education – in which learners initiated the learning process themselves and teachers acted as guides (Kurti et al., 2014) – were linked to SDG 14 "Life below water." The Ecological Rhine Station, as an extracurricular learning location, provides practical learning opportunities through direct contact with real phenomena (Forum Verlag, 2022).

The 3D printing workshop exemplified the potential of digital technologies in makerspaces. The collaborative workshop enabled exploration, experimentation, the freedom to try out new ideas (Buxton et al., 2022), combined iterative learning processes (Otieno, 2017), and opened up a wide range of applications for the sustainability goal "Life below water."

The collected artifacts, observations and the evaluations indicated that the *teff* Maritime Makerspace design has been shown to promote pedagogical and didactic skills, teamwork, reflective thinking, and sustainability competence. The international composition enabled mutual exchange (Schön et al., 2019) and individually designed theory-practice transfer. As places of co-creation, makerspaces promote not only technological but also social skills and networking (Kaden & Freyberg, 2023; Beck-

er & Jacobsen, 2020) and offer a transferable model for initial and continuous teacher training in the field of sustainability.

References

Becker, S., & Jacobsen, M. (2020). Becoming a maker teacher: Designing making curricula that promotes pedagogical change. *Frontiers in Education, 5*(83). https://doi.org/10.3389/feduc.2020.00083

Buxton, A., Kay, L., & Millen, L. (2022). Developing a makerspace learning and assessment framework. *FabLearn Europe / MakeEd 2022.*

Forum Verlag Herkert, Online Editorial Team. (2022). *Extracurricular learning locations: Definition, examples, and practical tips.* Forum Verlag Herkert GmbH.

Hayat, S., Shahzad, F., Mahmood, K., Akhtar, M. N., & Batool, S. (2025). The role of makerspaces in academic libraries: A systematic literature review. *Sociology & Cultural Research Review, 4*(1), 536–550.

Kaden, B., & Freyberg, L. (2023). Makerspaces and library labs in academic libraries: Between physical space and research orientation. *LIBREAS. Library Ideas, 44.* https://doi.org/10.18452/28269

Kurti, R. S., Kurti, D. L., & Fleming, L. (2014). The philosophy of educational makerspaces. *Teacher Librarian, 41*(5), 8–11.

Otieno, C. (2017). *Makerspaces: A qualitative look into makerspaces as innovative learning environments*. Doctoral dissertation, University of Northern Colorado.

Schön, S., Boy, H., Brombach, G., Ebner, M., Kleeberger, J., Narr, K., Rösch, E., Schreiber, B., & Zorn, I. (2016a). Making activities with children and young people. In S. Schön, M. Ebner, & K. Narr (Eds.), *Handbook of creative digital design* (pp. 8–24). Books on Demand.

Schön, S., Ebner, M., & Grandl, M. (2019). Makerspaces as creative and learning spaces: Workshops with digital tools from the perspective of adult education. *Magazin erwachsenenbildung.at, (35–36).* https://doi.org/10.25656/01:16672

Späth, K. (2019). Distribution and design of makerspaces at universities in Germany. *o-bib. The Open Library Journal, 6*(3), 40–55.

United Nations. (2024). *Sustainable Development Goals.* Retrieved November 12, 2025, from https://unric.org/de/17zi

University of Cologne. (n.d.). *Ecological Rhine Station*. Retrieved November 12, 2025, from https://rheinstation.uni-koeln.de

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Annette Schmehl-Postaï

Teaching Experiments as Part of a *teff* Seminar: What Brief Oral Presentations Tell Us About Pupils' Conceptions of Climate Change

Abstract
As part of a *teff* hybrid seminar on climate change, teachers experimented with a didactic tool and applied it in "practice lessons" that led pupils to give short oral presentations. In three presentations, we will analyse the pupils' enunciative posture as a trace of the ongoing construction of a new thematic discourse. This discourse refers to the development of scientific and political concepts, but also to the positioning of individuals who are becoming aware of the interconnectedness of beings. Therefore, we will examine the use of personal pronouns, syntax, verb semantics, and thematic progression, as these are significant discursive indicators of pupils' positioning regarding the issues they are required to address. The didactic questions guiding our work are as follows: Do we gain a better understanding of the objects evoked by the tool *Climate Fresk*? Has new knowledge been constructed through the practice lessons? Does the tool lead young learners to a stronger personal commitment to environmental issues and establish a sense of responsibility? The analysis will demonstrate that ultimately, very few of the objectives are achieved and the time spent on the activity may even generate more confusion about epistemic objects and reinforce feelings of guilt, without empowering pupils to actively seek solutions within their reach.

Keywords: teaching climate change, educational tool, enunciative positioning, syntax, verbal choices

Introduction

Approaching the climate change problem in school cannot be limited to conveying scientific knowledge alone, it is a socially acute issue involving ethical, political, and social decisions. This type of wicked problem (Rittel & Webber, 1973) or super-pernicious problem (Fabre, 2021a, 2021b) must be addressed didactically through its five overlapping dimensions: polysemy, potential conflictuality, complexity, critical temporality, and the absence of a direct solution. The *teff* hybrid seminar "Teaching Climate Change" focused on those didactics and provided an opportunity to teach and reflect on the teaching of this complex, socially acute topic. The hybrid seminar consisted of

a preparatory phase online, practice lessons held in the participants' home countries, and an on-site meeting at Nantes Université in France. During the online sessions, practices in different European countries were discussed. Furthermore, the *Climate Fresk* by Cédric Ringenbach was introduced as a tool; its use in classrooms was collaboratively explored and discussed among the participants. After that, each teacher took the time to test this tool in practice lessons held in their own country and teaching context. To finish, the on-site training session in Nantes provided an opportunity to share with each other their teaching experiences with the tool. During these discussions in Nantes, we focused on the emotional, political, and interdisciplinary dimensions of climate education.

The practice lessons in France, Germany, Sweden and The Netherlands enabled us to collect materials and testimonials documenting the different teaching and learning experiences. In this chapter, through three transcribed videos from one class, we will analyse the pupils' enunciative posture as a trace of the ongoing construction of a new thematic discourse (Jaubert & Rebière, 2021). This discourse pertains not only to the development of scientific and political concepts, but also to the positioning of individuals who are becoming aware of the interconnectedness of beings (Lehtonen et al., 2019). Therefore, the use of personal pronouns, syntax, verb semantics, and thematic progression will be closely examined, as these are significant discursive indicators of pupils' positioning regarding the issues they are required to address.

The questions we aim to find answers to are as follows: Will the experiment enable a deeper understanding of the knowledge involved? Can we observe signs of new knowledge being constructed among the pupils? Does the game lead young learners to a stronger personal commitment to environmental issues?

The *Climate Fresk* at the Heart of the Experiment

The *Climate Fresk* is a tool designed for collaborative workshops focused on climate education. The tool exists both for kids and adults and was initially designed as a mediation tool for the general public, but is now widely used by teachers at various levels of education. In approximately three hours, the tool aims at activating the group's collective intelligence by linking the causes and effects of climate change. The surrounding workshop itself and the group discussions happening within it, motivated by the material, are meant to help participants to better understand the systemic nature of climate challenges.

The *Climate Fresk* consists of 42 cards[1] presenting facts derived from scientific publications, primarily the IPCC reports. The goal is to activate the group's collective intelligence by linking the causes and effects of climate change. The workshop and the group discussions about this material are meant to help participants better understand the systemic nature of climate challenges.

The cards are divided into five sets that combine biological, physical, chemical, ecological, economic, and social dimensions. The final set introduces concrete, dra-

1 In the version used in 2025: https://restore.fresqueduclimat.org/memo/en-GB/game/grid

matic consequences for humanity (heatwaves, wild fires, famines, human health, climate refugees, armed conflicts). The cards always feature an illustration on the front – such as symbolic photos, graphics, diagrams, maps – and explanations of the phenomenon on the back. Between reading and understanding the cards, as well as discussing and debating where each card should be placed, the group may consult the teacher for explanations or clarifications. The logic of the game dictates that all cards in a set should be laid out before introducing new cards.

The Didactic Context

The aforementioned videos which were recorded in the practice lessons of one colleague are going to be analysed in the following. They feature presentations of 14- to 15-year-old pupils. Their teacher is responsible for teaching history, geography, religion, and civics. In this cultural context, all these subjects can also be taught in English, which is not the pupils' native language. As a result, the pupils make an additional effort to talk about these specific subjects in English. Although some of the vocabulary was already familiar, several specific new terms had been recently memorised. One can imagine that the pupils' discourse would not be the same if they had carried out the puzzle activity with cards written in their native language. They would, naturally, find it easier to put into words the causal links between the phenomena illustrated by the 42 cards. Nevertheless, their verbalisation bears traces of discursive choices (unconscious, of course) that we wish to highlight without taking a critical view of any grammatical errors.

The teacher planned a sequence of four lessons. In the first session, the pupils became familiar with the cards, and difficult cards were explained. In the second session, the pupils worked on placing and organising the cards. In the third session, each group briefly presented the work they had completed in the previous session. The fourth session was then dedicated to reflection with the entire class.

The teacher divided the class into groups of four to five pupils. Our three video transcriptions are taken from session three, when pupils present the results of their group work. The group work consists in discussing the sense of the cards and collectively arranging them to a "fresk"[2], reflecting on the links between the biological, physical, chemical, ecological, economical, and social dimensions.

These brief group statements are spontaneous and reflect recent attempts to establish links between causes and consequences. The way in which these pupils orally express the knowledge they have gained through the cards reveals the current structure of their understanding of climate change. Linguistic markers like their enunciative position (personal pronouns), syntax, verb semantics, and the thematic progression of their discourse are discursive clues (Jaubert & Rebière, 2021) about their relationship to the knowledge presented in the Fresk cards.

2 The result of a fresk may look like this: https://restore.fresqueduclimat.org/memo/en-GB/game/network

The Pupils' Presentations

Since the three transcripts are very short, we have decided to reproduce them in their entirety here, allowing readers to fully appreciate the coherence of these statements.

Group A

So, it starts with buying different stuff.

We can buy cars, a bus ticket, a flight ticket.

We buy heat and air conditioner.

We buy food, meat. [inaudible]

When we buy this, the carbon dioxide increases, which leads to the greenhouse effect.

The greenhouse effect changes the temperature.

So, the temperature gets warmer, which leads to heat waves.

The heat waves can dry out different crops, rivers, lands.

And when this happens, the food… [inaudible] changes

Group A refers to climate change (or another phenomenon) impersonally using the pronoun *it*. The following four sentences form a sequence with the same subject *we*, which conveys a sense of causality – or even guilt – attributed to the first-person plural. This may refer specifically to the group of pupils or, more broadly, to humanity. In any case, the sense of causality is clearly unidirectional: we act, and as a result, things happen. Although the syntactic agent remains the same throughout, there is an impression of detachment or at least a neutralising effect, as in the phrase "scientifically describable things happen". Even if the temporal implication is realised ("when we do X, things happen"), this only leads to a list of effects observable by scientists. It is quite possible that pupils feel overwhelmed by the sheer number of catastrophic events presented on the cards. In other experiments, we have observed that students exhibit varied reactions to the cards, ranging from strong emotional responses to emotional distancing.

This entire sequence is governed by the same verb *buy* (which occurs five times). The semantic value of this single action – highlighted as a human activity that potentially triggers harmful consequences – appears to be the easiest for pupils to relate to their own experiences. It is also possible that they have encountered such criticisms many times before or that this is the easiest activity to imagine in their daily lives. Bad consumption habits are indeed frequently used as a flagship example of human impact in the Anthropocene.

When this group verbalises the part of their fresk comprising the first card sets ("*The greenhouse effect changes the temperature […] which leads to heat waves*"), the three sentences exhibit a very orderly thematic progression, suggesting that these

pupils are accustomed to constructing an argumentative structure. The rheme[3] of each sentence is systematically adopted as the theme of the following sentence (*greenhouse effect*, *temperature*, *heat waves*), enabling listeners to easily follow their line of reasoning. These three major themes selected by the pupils are certainly topics previously addressed at school and commonly encountered in media discourse accessible to 14- and 15-year-olds. However, none of these themes are specified or explored in depth. This superficiality raises questions about the added value of the teaching tool, which appears to reinforce existing representations in pupils' minds without facilitating a deeper understanding of environmental issues through research-based knowledge.

Naive and spontaneous knowledge is ultimately reinforced, but has new knowledge been constructed through the fresk lessons? Does the tool tested in class lead to a more scientifically structured learning process?

Group B

When you buy stuff you either buy tickets at the planes, buses or cars or heat conditions or [inaudible]

they make carbon dioxide and when you eat [inaudible]

The cows mostly make methane by [inaudible]

and all both methane and carbon dioxide make the greenhouse effect increase.

When it increases, temperature increases also.

They make heat waves and the [inaudible].

When the water in the oceans becomes warmer.

Also standing [inaudible]

Group B does not use the first-person plural at all; the enunciative positioning differs significantly from that of group A. The first sentence has a second-person subject. This *you* can be interpreted either as an address to a person or as a generalisation. The human activity is also based on *buying* and opens to *eating*, but the discourse quickly shifts from human activity to the agricultural dimension (*the cows*). Without a clearly identified syntactic agent, a sum of factors "make carbon dioxide". This effect appears somewhat detached from human activity. Furthermore, in the phrase "methane and carbon dioxide make the greenhouse effect increase" a direct human influence cannot be identified, the syntax softens the causality by creating an enunciative distance from the subject. These pupils present climate change as an unavoidable cycle, as if events were almost predetermined.

On three occasions, pupils employ a logical chain structure: "When x, then y". What significance does this have for the human subject? Is there an awareness of a direct causal link between human behaviour and harmful effects on the Earth's future? Or does the playful juxtaposition of cards containing various ideas create con-

3 The rheme is the part of the sentence that provides new information about the theme. Theme refers to the starting point or given information in a clause.

fusion, making it impossible to establish a sense of responsibility? In any case, the subject's stance does not appear to be encouraged by the classroom activity.

Group C

> *So, to start, we talk about how we create carbon dioxide and it's mostly because of us by traveling by using quality of life such as heating and air conditioning*
>
> *and when we buy stuff for ourselves, we make the factories that produce the things, it makes carbon dioxide and then cows they create methane and together they create the [inaudible] which then leads to the temperature rising*
>
> *and the temperature risings can lead to the heating of oceans and that can cause cyclones and it can also disturb the water cycle*
>
> *and the heating of the oceans also melts the ocean ice and the glaciers*
>
> *and when the glaciers melt it can increase the water levels of the oceans*
>
> *and that can lead to floods both in rivers and coasts.*
>
> *And so, the [inaudible] rising also leads to heat waves which causes droughts.*
>
> *And then the droughts and also river floods make the food production worse which leads to starvation.*
>
> *And the starvation leads to climate refugees and biological diversity.*
>
> *and even the floods, coast floods lead to climate refugees and biological diversity.*

The final group, group C, begins with a clear enunciative embedding "we talk about" – which signals both a strong positioning of the individuals within the group and a certain mastery or even reflexive distancing from the subject matter. The causality is explicit here: "because of us", and the following argument is supported by various examples. These pupils take the opposite approach, reasoning from their consumer behaviour back to the industry and agricultural sectors.

The syntax is significantly more developed and varied than in the other two groups, and the vocabulary is also richer. When examining frequent verbs, we observe a high number of occurrences of the verb *lead to* (7) which highlight causal connections. The verb *cause* emphasizes related phenomena (*cyclones* and *droughts*). Regarding the modal values of the selected verbs, *disturb* has a negative connotation; *create*, *melt*, *increase* are neutral or positive but are used in contexts associated with negative effects. The pupils in group C verbalise the most cards and also pointed at them while speaking. Nevertheless, we question whether there is a deep understanding of the objects evoked by the cards. When we encounter the syntactic association "climate refugees and biological diversity", we may have serious doubts about the pupils' appropriation of the issues raised by the cards. The problem with the fresk cards is that some are presented by a positive wording in the title (e.g. *Terrestrial Biodiversity*, *Marine Biodiversity*, *Access to Freshwater*, *Human Health*), which can easily mislead pupils. Therefore, the available equipment alone does not guarantee more reasoned

learning. Classroom debates are essential to ensure that problems are constructed in a reasoned manner.

Conclusion

This discourse analysis sheds light on the possibilities for further didactic exploration of these discursive achievements and identifies key considerations for teacher training, as we had the opportunity to put it to the test during the hybrid *teff* seminar on teaching climate change. The questions raised by each transcript analysis demonstrate that the tool does not replace explicit teaching that guides pupils in constructing their knowledge. The *teff* teacher participants realized that the fresk seems to reinforce pre-existing representations of the pupils, rather than promoting a deeper understanding of environmental issues based on scientific knowledge. While the activity may strengthen intuitive or spontaneous beliefs, it remains unclear whether it supports the development of new, scientifically grounded knowledge. Establishing logical chains seems to have a limited impact on the human subject's ability to connect individual actions with broader environmental consequences. This activity does not consistently promote awareness of a direct causal relationship between human behaviour and the harmful effects on Earth's future. Instead, the juxtaposition of diverse ideas during the card-sorting exercise may generate confusion, thereby hindering the development of a sense of responsibility. Overall, there is no evidence that the classroom activity effectively encourages pupils to adopt a more engaged or reflective attitude toward environmental issues.

The activity raises significant questions about pupils' deep understanding of the concepts represented on the cards. Some pupils' formulations suggest that there is a superficial or misguided appropriation of the issues at stake. Participants in our *teff* seminar became aware of their essential role in teaching about climate change: without close supervision by an expert teacher, pupils tend to misinterpret or oversimplify the intended messages. The research results presented by Delplancke & Chalak 2025 also point to the need to work in class on feedback loops so that pupils do not remain stuck in a sequential view.

References

Delplancke, M., & Chalak, H. (2025). La fresque du climat pour former les enseignants à l'éducation au changement climatique : Quelle éducation au politique possible ? *Éducation et didactique*, *19*(2), 49–63. https://doi.org/10.4000/14b8a

Fabre, M. (2021a). Problématologie des questions socialement vives. Repères épistémologiques pour l'école. *Revue française de pédagogie. Recherches en éducation*, *210*. https://doi.org/10.4000/rfp.10118

Fabre, M. (2021b). *Un avenir problématique : Éducation et responsabilité d'après Hans Jonas*. Éditions Raison et passions.

Jaubert, M., & Rebière, M. (2021). Un modèle pour interpréter le travail du langage au sein des « communautés discursives disciplinaires scolaires ». *Pratiques*, *189–190*. https://doi.org/10.4000/pratiques.9680

Lehtonen, A., Salonen, A. O., & Cantell, H. (2019). Climate Change Education: A New Approach for a World of Wicked Problems. In J. W. Cook (Ed.), *Sustainability, Human Well-Being, and the Future of Education* (pp. 339–374). Springer International Publishing. https://doi.org/10.1007/978-3-319-78580-6_11

Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, *4*(2), 155–169. https://doi.org/10.1007/BF01405730

C.
Learning Without Borders:
Connecting (Future) Teachers Across Europe

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Inna Enns, Hege Knudsmoen & Rossella Certini

Mobility Models for a Future in Flux: Exploring Alternatives in European Teacher Education

Abstract
Mobility has become a key element in European teacher education, aiming to equip future educators with intercultural skills, transnational perspectives, and the ability to teach in diverse and dynamic contexts. Traditionally, long-term mobilities – often supported through Erasmus+ – have shaped the landscape of international experiences in initial teacher education. However, these longer formats are not suitable for all students due to time, financial, and/or curricular constraints. The Erasmus+ Teacher Academy (*teff*) focuses on short-term mobility models as a complementary alternative. This contribution presents experiences and findings from *teff*, which piloted various forms of short mobility, including virtual, hybrid and blended learning formats. The experiences suggest that while short mobilities cannot replace the depth of long-term mobility, they offer accessible and scalable opportunities to internationalize teacher education and prepare future teachers for a profession in flux.

Keywords: Teacher Education, Mobility, Internationalisation

Introduction

The internationalisation of higher education in Europe has been a goal for most European countries, and the European Union for many years. Building on ideas which first appeared in the 1960s, the aim was to create international networks and collaborations, support lifelong learning, initiate intercultural competence, and encourage a more democratic and inclusive living environment (International Labour Organization, 1966; UNESCO, 2023; Pedersen, 2023). Sieber and Mantel (2012) outlined the strategic value of internationalisation of teacher education and how international discourses shape local teacher education programmes. The European Union mentions the importance of (future) teachers as multipliers for next generations (European Ministers Responsible for Higher Education, 2015; Pedersen, 2023). This is linked to the expectation that future teachers who have spent time abroad or dealt with global cross-cutting issues will have a higher level of intercultural competence, knowledge of global networks, and a positive perspective on heterogeneous classrooms (Mantel et

al., 2022). In general, it is expected that this will positively influence future teachers' professional personalities (Leutwyler & Meierhans, 2016).

Building on these goals, the international networking of universities and the opportunities to work together abroad with support of Erasmus+ have become increasingly important in teacher training. At the same time, obstacles to study and stay abroad still exist. Missing mobility windows in teacher training programmes, recognition of international academic achievements, caring responsibilities at home and financial burdens are all common examples that highlight the difficulties posed by experiences abroad (Leutwyler, 2014; Mantel et al., 2022; Pedersen, 2023). Taken together, these factors highlight the necessity of innovative new forms of shorter mobility programs. This article briefly outlines a selection of the various mobility options available to teacher training students and presents contributions made by *teff in this domain.*

'Traditional' Mobility Models in Teacher Education

The European Union's focus on lifelong learning has gradually become a guiding principle for all policies and strategies promoted at European level, starting with the Lisbon Strategy launched in March 2000. The Lisbon European Council included, among the priorities of Community employment policy, the need to give greater importance to lifelong learning, considering it the foundation of the European social model (European Parliament, 2000). Based on these political choices, all exchange and international mobility programs between the various countries of the European Union are strengthened and the Erasmus+ program acquires central value, especially for the training of students and teachers, both in schools and universities.

Over time, Erasmus+ has funded practical exchanges, with steadily rising numbers of participants (Amendola & Restaino, 2017). These internships and academic exchanges allow students to acquire practical and academic skills, and also increase their instrumental and methodological knowledge compared to other work contexts. Through longer academic exchanges and internships in schools, students can gain language competencies, practical knowledge, and new perspectives on their profession, while simultaneously developing professional and personal skills (Klein & Wikan, 2019). Therefore, longer exchanges funded through Erasmus+ have immense value for teacher education. Longer exchanges offer the opportunity to follow a more structured study path and improve one's learning performance. This encourages the development of a supranational sense of belonging, the building of a profound intercultural mindset, and the transformation of future life plans (Nada & Legutko, 2022). An extended time window allows for a more complete cultural and educational immersion, the experimentation with multiple teaching and working strategies in different institutions and an immersive experience regarding human relationships. However, novel forms of short-term mobility can also offer an enriching experience of educational practices abroad – and can be understood as an expansion of the mobility portfolio for the diverse group of students.

New Mobility Models in Teacher Education

Firstly, The Virtual Exchange (VE) concept encompasses various online collaborative learning initiatives that connect students and educators across diverse cultures under structured academic guidance (O'Dowd & Dolly, 2022). VE allows students to gain intercultural experience without traveling, while teacher educators engage in global collaboration. Gutiérrez et al. (2021) emphasise that VE's strength lies in its accessibility and ability to reach diverse learners globally, however, it is not inherently inclusive. Its success depends on how well projects represent diverse cultures and ensure equitable participation (O'Dowd, 2023).

Secondly, Blended Mobility Programmes (BIPs), introduced under Erasmus+ 2021–2027 (KA131), strategically combine online learning phases with short periods of physical mobility. BIPs offer short, intensive, and innovative educational experiences, that combine virtual collaboration with brief, in-person mobility (O'Dowd & Werner, 2024, European Union, 2022).

Blended mobility is implemented by the *teff* project and offers numerous opportunities to all participants. The utilization of BIPs ensures greater accessibility, allowing more students to participate in mobility throughout their teacher education, due to lower costs and sufficient financial coverage. Moreover, it gives teacher educators the chance to implement agile new teaching formats, fresh perspectives and cross-cutting topics in teacher training programmes. Thus, blended mobility gives rise to an international experience that did not create excessively long interruptions from study or work commitments at home.

Mobility Opportunities in *teff*: Examples

teff offered several different mobility models. Essential to all *teff* activities was a cross-phased strategy (Springob et al., 2023). A core feature of *teff* activities and events is their inclusion across the entire span of teacher education: students, teacher trainees, and in-service teachers. to future This has always been a central feature in the design of *teff* activities and has led to innovative and generative learning scenarios in which participants could learn from one another and co-create. In the following sections, a selection of examples are briefly presented.[1]

A) Makerspace and Urban Laboratory

Working on future scenarios and challenges, the *teff* Future Fiction Makerspace and the Maritime Makerspace, the Urban Laboratory on Changing Cities, and the Hybrid Seminar on Teaching Climate Change all followed similar structures: preparatory online sessions, a two-day workshop on-site in one of the partner countries, and an online follow up meeting. Basic theoretical concepts, methods, and tools were introduced in the preparatory online sessions. The on-site events were used to allow cre-

1 These formats are outlined in other chapters of this volume.

ative collaboration **r** in unique settings, real-world laboratories, with experts and/or pupils. The Hybrid Seminar on Teaching Climate Change also included a testing phase at the respective home location of each participant. Learning, creating, and testing knowledge and methods led to theory-practice transfers. All of these activities centered around problem solving and future thinking scenario methods based on design-based thinking methods.

B) teff Educathon

The *teff* Educathon is "designed to enable student teachers, working teachers, stakeholders from educational practice and practitioners from the EdTech scene come together in interdisciplinary teams to find solutions to current challenges in the digital transformation of the education system […]" (Benincasa et al., 2025, p. 303). Even though the Educathon can be implemented entirely on-site, the first *teff* Educathon has been organised in a hybrid manner, to engage as many partners as possible. The Educathon included online input, presentations, and group pitches, while teams worked collaboratively at their local institutions.

C) Virtual Lecture & Seminar Series

teff organized two lecture and seminar series. The lecture and seminar series "#teachingtomorrow: Cultivating Diversity and Inclusion in Schools" invited participants not only to 14 online events, but also provided extensive online reading material on the different topics. The lecture series "#teachingtomorrow: Sustainability Education – Preparing Future Teachers for a Changing World" followed a clear structured and moderated discussion, based on presentations by experts from at least two countries/universities per topic.

Conclusion

Due, in part, to the efforts of Erasmus+, international mobility is no longer seen as a rare experience, but as a standard component of training and professional development. International mobility requires careful organization, which unfortunately does not always meet the needs of all participants. A solution to this problem in teacher education lies in the implementation of many different forms/formats of mobility. Mobility can be adapted to suit the aims and needs of an activity and/or its participants, and can be used to introduce innovative ideas in teacher education.

At the beginning of this article, we mentioned 'traditional' mobility formats consisting of longer educational exchanges (Bryła, 2015; Kurnaz C, 2020); these, however, are not always possible for all students. To accomodate even more students and in-service teachers, with their different needs and interests, it is important to find a balance between long- and short-format mobility, which we have attempted to explore here within *teff*. The type of event and the specific target group are two important criteria when choosing the best form of mobility. The lecture and seminar series, for example, took place online to reach as many participants as possible. The Mak-

erspaces, on the other hand, took place in blended learning formats and included on-site elements, attempting to create real-world laboratories.

The activity's objective should always align with the chosen mode of mobility. For example, the first *teff* Educathon was initially planned to be carried out on-site. However, when designing the activity, the mode of mobility was changed to test and evaluate the Educathon with as many European partners and stakeholders as possible. Changing the setting to online allowed students, teacher educators and teachers to work together over one day across Europe – without travelling anywhere. This way, international exchange was made possible without any organisational burdens for participants.

Generally regarding mobility, well-planned communication strategies are required to make offers and relevant information available and accessible. Information must be made available promptly and comprehensively to advertise effectively and respond to any queries from potential international participants. This creates additional work in a project involving many collaborators and untested structures. Within and beyond the *teff* network, partners develop and implement Erasmus+ BIPs and report rising applications and great interest of students. From the perspective of *teff* partners, the additional opportunities offered by new innovative mobility options are an attractive complement to longer stays abroad, which can focus on new and/or interdisciplinary topics and methods, and contribute to international exchange. The implementation of BIPs and the associated funding from Erasmus+ are ideally suited for this purpose.

References

Amendola, A., & Restaino, M. (2017). An evaluation study on students' international mobility experience. *Quality & Quantity, 51*(2), 525–544. https://doi.org/10.1007/s11135-016-0421-3

Benincasa, D., Geunis, L., Holz, O., & Springob, J. (2025). Why not ask them? The Educathon tackling challenges in education with and for students. In V. Chiou, L. Geunis, O. Holz, N. O. Ertürk, J. Ratkowska-Pasikowska, & F. Shelton (Eds.), *Research and evidence-based perspectives in education: Diverse discourse, connected conversations* (pp. 301–312). Waxmann.

Bryła, P. (2015). The impact of international student mobility on subsequent employment and professional career. *Studies in Higher Education, 40*(4), 702–723.

European Commission. (2022). *Blended mobility implementation guide for Erasmus+ higher education mobility KA131*. https://data.europa.eu/doi/10.2766/467485

European Ministers Responsible for Higher Education. (2015). *Yerevan Communiqué*. European Higher Education Area.

European Parliament. (2000). *Lisbon European Council 23.–24.03.2000: Conclusions of the Presidency.*

Gutiérrez, B. F., Glimäng, M. R., O'Dowd, R., & Sauro, S. (2021). *Mentoring handbook for virtual exchange teachers: Strategies to help students achieve successful synchronous and asynchronous online intercultural communication.* Stevens Initiative.

International Labour Organisation. (1966). *ILO – UNESCO recommendation concerning the status of teachers.*

Klein, J., & Wikan, G. (2019). Teacher education and international practice programmes: Reflections on transformative learning and global citizenship. *Teaching and Teacher Education, 79*, 93–100. https://doi.org/10.1016/j.tate.2018.12.003

Kurnaz, C. S. (2020). As an EU education programme, the effect of Erasmus exchange mobility on intercultural communication and language learning. *Acta Universitatis Danubius, 14*(2). https://www.ceeol.com/search/article-detail?id=933757

Leutwyler, B. (2014). Between myths and facts: The contribution of exchange experiences to the professional development of teachers. *Journal of Curriculum and Teaching, 3*(2), 106–117.

Leutwyler, B., & Meierhans, C. (2016). Effects of international student exchange on pre-service teachers: A quasi-experimental study. *Intercultural Education, 27*(2), 117–136. https://doi.org/10.1080/14675986.2016.1144713

Mantel, C., Kamm, E., & Buschor, C. B. (2022). International teaching internships for future teachers: Potential and challenges for learning. *Educational Research for Policy and Practice, 23*, 215–227. https://doi.org/10.1007/s10671-022-09313-4

Nada, C. I., & Legutko, J. (2022). "Maybe we did not learn that much academically, but we learn more from experience": Erasmus mobility and its potential for transformative learning. *International Journal of Intercultural Relations, 87*, 183–192. https://doi.org/10.1016/j.ijintrel.2022.03.004

O'Dowd, R. (2023). *Internationalising higher education and the role of virtual exchange.* Routledge.

O'Dowd, R., & Dooly, M. (2022). Exploring teachers' professional development through participation in virtual exchange. *ReCALL, 34*(1), 21–36.

O'Dowd, R., & Werner, S. (2024). The first steps of blended mobility in European higher education: A survey of blended intensive programmes. *Journal of Studies in International Education*, 1–20. https://doi.org/10.1177/10283153241235704

Pedersen, T. D. (2023). *Making mobility meaningful: A study of policy and practices of international student mobility in Norwegian teacher education*. Doctoral dissertation, Oslo Metropolitan University.

Sieber, P., & Mantel, C. (2012). The internationalization of teacher education: An introduction. *Prospects, 42*(1), 5–17. https://doi.org/10.1007/s11125-012-9218-x

Springob, J., Benincasa, D., & Berninger, I. (2023). Bridging boundaries: Defining and discussing the potentials of a cross-phase approach for a future-oriented teacher education. In V. Chiou, L. Geunis, O. Holz, N. O. Ertürk, J. Ratkowska-Pasikowska, & F. Shelton (Eds.), *Digital transformation in education: Perception, action and prospect. Proceedings of the 3rd International Conference on Innovation in Learning Instruction and Teacher Education (ILITE 3)* (pp. 472–488). University of Education Publishers.

UNESCO. (2023). *Recommendation on Education for Peace and Human Rights, International Understanding, Cooperation, Fundamental Freedoms, Global Citizenship and Sustainable Development*. https://www.unesco.org/en/legal-affairs/recommendation-education-peace-and-human-rights-international-understanding-cooperation-fundamenta

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Dagmar M. Benincasa, Floor Kamphorst, Anne Laaredj-Campbell & Bodil Svendsen

Click, Connect, Collaborate. Exploring *eTwinning* in the World of Erasmus+ Teacher Academies

Abstract
This paper examines the integration of the digital platform initiative *eTwinning (European School Education Platform)* within the Erasmus+ programme into initial and continuing teacher education, highlighting its potential to foster international collaboration, competence development, and sustainable professional networks. Accelerated by the digitalization of education, *eTwinning* enables structured, cross-border project work that links theory and practice in teacher training. Three case studies from the Erasmus+ Teacher Academies illustrate these potentials and demonstrate how *eTwinning* supports interdisciplinary, inquiry-based learning, strengthens digital and intercultural competences, and fosters environmental and civic awareness. Overall, the findings show that *eTwinning* provides a low-threshold, digitally mediated form of international cooperation that complements Erasmus+ mobility, enhances competence-based teacher education, and promotes sustainable European networks for future educators.

Keywords: *eTwinning*, digital platform, ICSE Academy, innovative mobility formats, mobility

1. Introduction

Rapid technological change has led to increasing digitalisation in (teacher) education worldwide. Today's classrooms are shaped by digital tools, apps, and online environments – a trend accelerated by the COVID-19 pandemic, which triggered "an urgent need for critical, up-close scrutiny of how this digitization is reshaping the worlds of education" (Decuypere et al., 2021, p. 1). While digital platforms first emerged from necessity, their potential as sustainable spaces for collaboration and exchange remains clear: they "facilitate the structuring, sharing and archiving of information and can also support communication among individuals that are not part of one group or institution" (Kottmann et al., 2023, p. 3). This chapter explores how *eTwinning*, the digital collaboration initiative within Erasmus+ hosted on the *European School Education Platform* (ESEP), can support European initial and continuing teacher education.

eTwinning projects implemented within the European School Education Platform highlight the role of *eTwinning* in connecting a diverse European community. *eTwin-*

ning describes itself as "a safe and free platform for teachers and pupils across Europe to work together on projects, discuss in online groups, exchange best practice and develop their professional skills" (European Commission, n.d.-a). Extending this to initial teacher education (ITE), *eTwinning for Future Teachers* enables student teachers to "implement project-based and multidisciplinary teaching, develop ICT and language skills, and engage in intercultural exchanges" (European Commission, n.d.-b).

eTwinning, therefore, directly contributes to the European Commission's *Union of Skills* initiative (2025), launched to enhance Europe's competitiveness by investing in education, training, and lifelong learning. It promotes developing and connecting skills across sectors and borders to support upskilling, mobility, and talent development. For ITE, this implies shifting from mastering only subject knowledge and pedagogy to developing integrated competences in transnational, digitally mediated contexts. The *eTwinning* annual theme 2025–26, "Skills for Life," further provides a framework for implementing the *Union of Skills* through cross-border projects addressing these competencies (European Commission, 2025).

Integrating *eTwinning* into teacher education offers a low-threshold, digital form of international collaboration that complements or precedes Erasmus+ mobility. After registering, in- and pre-service teachers can create their own *TwinSpace* projects, inviting students or colleagues and sharing results publicly. Such cooperation enriches both digital and physical exchanges, fostering sustainable professional development through the European School Education Platform (ESEP, 2025). *eTwinning*-based projects also allow student teachers to design and reflect on transnational, competence-integrated learning activities (Tosi, 2023). The synergy between *eTwinning*, Erasmus+, and the Erasmus+ Teacher Academies (TAs) thus aligns closely with the *Union of Skills* perspective, emphasising sustainability of networks, outcomes, and learning impact. The following three *eTwinning* projects, all developed within the Erasmus+ TAs *teff* and *ICSE Academy*, illustrate how the synergy between *eTwinning* and Erasmus+ TAs can foster the development of future-oriented elements in teacher education.

2. *eTwinning* in Initial Teacher Education (ITE): The *Citizen Science: Plant Biodiversity* Project

The *Citizen Science: Plant Biodiversity* project is aimed at ITE student teachers and was developed within the Erasmus+ TA *ICSE Academy*[1]. The project, which was realised in the spring of 2025, engaged student teachers from the University of the Aegean (Greece) and the Norwegian University of Science and Technology (NTNU, Norway). The project focuses on exploring plant diversity across different European countries using the *iNaturalist* app, contributing to raising global biodiversity awareness. Through this approach, students are exposed to the rich variety of plant life across diverse biomes, climates, and cultural regions. This allows students to gain an

1 Find more information on the ICSE Academy in the chapter "ICSE Academy – Professional development for STEM teachers in the 21st century" (Kamphorst et al.).

understanding of how regional ecosystems support different species and community interactions. The project further aims to build practical skills in recognizing plant forms, habitats, and life cycles, while providing opportunities for the participating students to engage with identifications and discussions on observations, ask questions, and learn from expert contributors.

The project consisted of four sessions (see figure 1). The first session introduced the platform and facilitated registration for the project. This session was also an online introductory meeting for participants to meet and establish project expectations, conduct icebreaking activities focused on team building, and introduce the project theme of plant biodiversity. The second session featured a lecture presented by NTNU on didactics and teaching biodiversity to young learners, followed by discussions, and finally, the third session included a lecture by Aegean University about citizenship concepts.

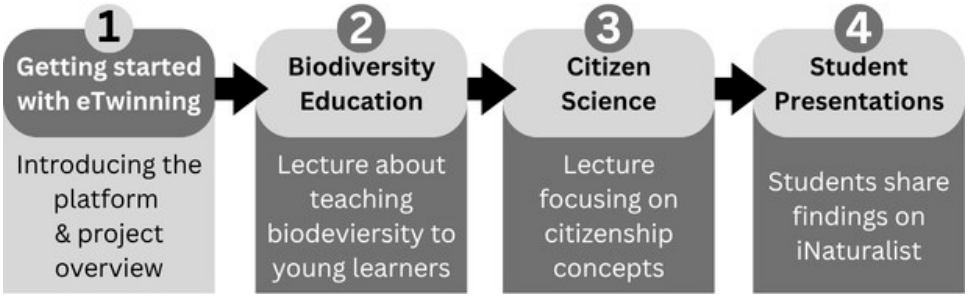


Figure 1: Overview of the four phases in the *Citizen Science: Plant Biodiversity* project

Between the third and fourth session, students registered their plant biodiversity observations in *iNaturalist*, a citizen science app and online platform – combining mobile photography with community-based species identification and contributing data to biodiversity science – which enables users to observe, identify, and share their observations on nature. In the *Citizen Science: Plant Biodiversity* project, students could upload photos or recordings of plants, receive identifications from the community, and engage in editing and discussion. The purpose of this was to document and monitor biodiversity, engage people in nature, and provide researchers with large, open datasets. At the end of the project, all students presented their findings from plant biodiversity registrations in *iNaturalist*.

Feedback on the project indicated that participants were able to develop practical skills in plant morphology, habitat assessment, and phenology, while becoming motivated to critically evaluate identifications through engagement with expert contributors. Feedback from students further revealed that they found it interesting to learn about plants in another country, were excited to use and work with the iNaturalist app, and made new European friends.

For future projects, equal participation from all participating countries should be encouraged as – in this case – there were relatively few NTNU students involved, due to the fact that, in contrast to the students from the University of the Aegean, the

course was not mandatory for them. Establishing the project as a mandatory component within the ITE curricula in many European countries could ensure more consistent participation and reduce dependency on students' schedules and personal motivation.

3. *eTwinning* in Continuous Professional Development: The *European Workshop Series*

The *European Workshop Series* is one of three core activity formats of the *ICSE Academy*. The Academy sustained the whole concept on the *eTwinning* platform by publishing the workshop lectures and activities in the *ICSE Academy TwinSpace*. This online continuous professional development (CPD), cross-phase activity targeted pre- and in-service STEM (Science, Technology, Engineering and Mathematics) teachers at all grade-levels and STEM-disciplines of education. Focussing on European key priorities in STEM education, the aim of the workshops is to prepare teachers for the future, by deepening their knowledge on current best practices and insights from research and teaching in the STEM subjects (Doorman et al., 2025).

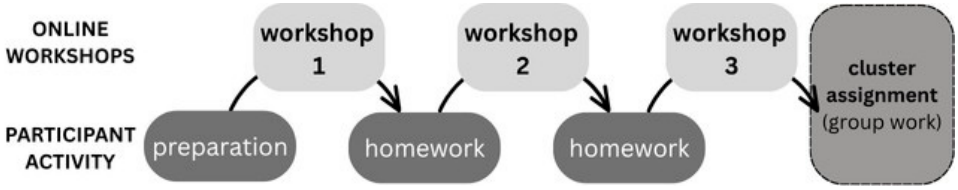


Figure 2: Format for each cluster in the *ICSE Academy European Workshop Series*

In four clusters, the following topics are addressed, all focusing on different future skills for teachers: (1) Tools and approaches to address sustainability issues in STEM education, (2) Diversity and inclusion in STEM, (3) STEM in the digital era, and (4) Innovative assessment in STEM education. Each cluster consists of three online sessions that includes lectures, interactive group work, and homework assignments. Participants then consolidate their learning by completing a final cluster assignment (see figure 4). In fall 2023 and spring 2024, The *European Workshop Series* was organized as a synchronous online activity, where all (future) teachers participated at the same time.

The solid and relevant content of the workshop series was appreciated by teachers. The future skills addressed in the clusters were directly connected to STEM-content, for example in the cluster on diversity and inclusion in STEM: "By incorporating elements from various cultures into the […] design, students connect mathematical concepts to cultural diversity. This not only makes the lesson more engaging but also highlights the relevance of mathematics in understanding and appreciating different cultures" (Doorman et al., 2025, p. 16). As illustrated here, the content of the workshops, as well as working in international teams, allowed teachers to develop their in-

tercultural competence. This was also stimulated by the emphasis that was placed on groupwork: roughly half of the workshop time was dedicated to focused groupwork. All in all, the online format of the *European Workshop Series* enabled STEM teachers from all over Europe to participate, fostering international collaboration.

To sustain the workshop series for future use, it was adapted to an asynchronous/synchronous online activity on *eTwinning*. Recordings and presentations of the workshop clusters were made available in the *ICSE Academy TwinSpace,* which is frequented by a vibrant community of STEM teachers from *ICSE Academy* and STEM-interested *eTwinning* teachers. Small groups of teachers go through the materials at their own pace and regularly meet online to exchange on the group assignments. Outcomes and progress on the workshop series still continue to be shared and reported on in a dedicated forum of the *ICSE Academy TwinSpace.*

4. *eTwinning* as a Project Hub: The *Hybrid Horizons* Project

The *eTwinning* project *Hybrid Horizons – Shaping Future Mobilities*[2] was a short-term initiative led by members of the TAs *ICSE* and *teff*. Inspired by the 2024 European conference for initial teacher education "Fostering citizenship education through *eTwinning* for future teachers," it took place in the spring of 2025 and aimed to connect TAs across Europe around the theme of future-oriented mobility formats. The project offered participants low-threshold access to *eTwinning*/ESEP, opportunities to gain hands-on experience, and a chance to build a broader network between TAs. Its main outcome – a set of *Future Mobility Infographics* – was designed as a sustainable *Open Educational Resource (OER)* beyond the project's lifetime.

Over four months, *Hybrid Horizons* unfolded in six phases (see figure 3). An online kick-off event introduced the project, registration process, and dedicated *TwinSpace*. Participating TA representatives then created short videos presenting distinctive mobility formats developed during their TAs. These videos were uploaded to *TwinSpace*, where peers from the other TAs provided feedback through the forum. Based on this feedback, each TA submitted a brief written description using a shared template, which was then transformed into a comprehensive infographic and finally published on the *teff* website.

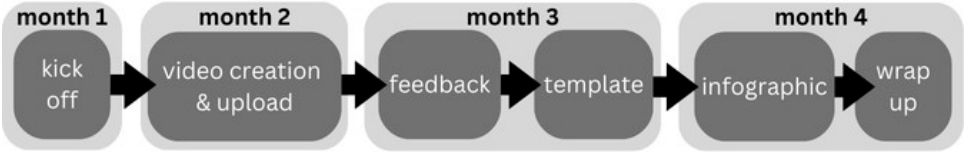


Figure 3: Overview of the six phases in the *Hybrid Horizons – Shaping Future Mobilities* project

2 Key information and the *Future Mobility Infographics* are available at: https://www.teff-academy.eu/what-we-do/etwinning

Although ambitious in duration, *Hybrid Horizons* met its main goals. It attracted wide interest from TAs, though technical and registration challenges limited participation to three TA representatives. Still, the clear structure and detailed guidance made it accessible, especially for those new to *eTwinning*. All participants reported increased confidence and motivation to continue using the platform.

The process of selecting and presenting a mobility format encouraged critical reflection on each TA's work and its broader impact. The final *Future Mobility Infographics* proved effective for disseminating results and promoting TA outcomes at conferences and events. Equally valuable was the exchange of feedback among participants, which surfaced shared challenges, such as recruiting teachers for their (*eTwinning*) projects or clarifying certification procedures. The most important result, however, was the network of new personal and professional connections among Erasmus+ TAs.

For future *eTwinning* collaborations of this kind, early contact with National Support Organisations (NSOs) would be recommended to reach a wider group of participants. Simplifying the registration process – especially for university staff – would also help increase engagement and feedback opportunities. Participants agreed that similar projects would be most effective at the beginning of a TA's lifecycle, or even during proposal stages, to inspire innovative mobility concepts early on.

5. Conclusion

The examples discussed demonstrate how the work and purpose of Erasmus+ TAs has allowed for various points of connection for *eTwinning* – and vice versa. *TwinSpaces* provide low-threshold opportunities for digital or hybrid mobility, supporting European exchange without travel and advancing the goal of internationalization at home. Embedding *eTwinning* within ITE curricula could strategically connect Erasmus+ mobility, *eTwinning* collaboration, and competence-based learning, in line with the broader *Union of Skills* agenda. Through transnational, digitally mediated collaboration, student teachers can link theory and practice while developing foundational competencies for a connected European education space. A small step towards this ideal can be taken by embedding *eTwinning* projects into ITE modules, allowing student teachers to connect theory and practice and to reflect on how these experiences relate to the foundational competences. If we want *eTwinning* to play a substantial role in the future of European education, we need to bring it to the attention of our future teachers from the very beginning of their careers.

Projects, such as the Erasmus+ TAs, can act as catalysts for *eTwinning.* In projects such as these, teacher educators and in-service teachers are encouraged to integrate *eTwinning* into their teaching, fostering both sustainable networks and cross-phase professional learning. At the same time, *eTwinning* offers the digital infrastructure for realizing and sustainably disseminating TA activities beyond individual funding cycles. Nevertheless, challenges that have limited participation should not be overlooked. Simplifying the registration process and systematically embedding *eTwinning*

into teacher education programs would be essential steps toward making digital collaboration an integral, sustainable part of European teacher education.

References

Decuypere, M., Grimaldi, E., & Landri, P. (2021). Introduction: Critical studies of digital education platforms. *Critical Studies in Education, 62*(1), 1–16. https://doi.org/10.1080/17508487.2020.1866050

Doorman, M., Maaß, K., & Weijers, M. (2025). *Overall concept for professional learning (final version)* (ICSE Academy Project, D3.1). International Centre for STEM Education. https://icse.eu/wp-content/uploads/2025/03/ICSEAcademy_Overall-concept-for-professional-learning_D3_1.pdf

European Commission. (n.d.-a). *About eTwinning*. European School Education Platform. https://school-education.ec.europa.eu/en/etwinning/about

European Commission. (n.d.-b). *eTwinning for future teachers*. European School Education Platform. https://school-education.ec.europa.eu/en/etwinning/etwinning-future-teachers

European Commission. (2025, March 5). *Union of Skills strategy to equip people for a competitive Europe*. Directorate-General for Employment, Social Affairs and Inclusion. https://employment-social-affairs.ec.europa.eu/news/union-skills-strategy-equip-people-competitive-europe-2025-03-05_en

European School Education Platform. (2025, September 3). *eTwinning annual theme 2025/2026: Skills for life*. https://school-education.ec.europa.eu/en/discover/news/etwinning-annual-theme-20252026-skills-life

Kottmann, A., Jongbloed, B. W. A., & Hladchenko, M. (2023). *Online platforms for teachers in higher education: Comparative case study* (pp. 1–16). Technopolis Group. https://heinnovate.eu/sites/default/files/shared_file/HEInnovate_Comparative%20case%20study_Platforms%20for%20teachers_0.pdf

Teacher Education for a Future in Flux. (2025). *Recommendations on cross-phase and cross-border (continuous) teacher education*. https://www.teff-academy.eu/who-we-are/news/article/recommendations-on-cross-phase-and-cross-border-continuous-teacher-education

Tosi, A. (Ed.). (2023). *Empowering future teachers for a sustainable intercultural and inclusive education: The impact of eTwinning on initial teacher education*. Carocci. (Italian National Support Organisation, eTwinning; European School Education Platform).

D.
Well-Being at the Core:
Teacher Well-Being as a Transversal Topic

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Monika Louws & Martine van Rijswijk

Life is Tough, but so Are You

Teacher Educators' Role in Enhancing Resilience for Pre-service Teachers

Abstract
Resilience involves bouncing back after challenging or adverse situations as well as thriving professionally and personally. This, in turn, can enhance teacher's well-being and commitment to the teaching profession (Mansfield et al., 2016) and is therefore an important ingredient for developing teachers. In this chapter, a conceptualization of the term 'resilience' and findings of a research project on pre-service teachers' resilience at Utrecht University are presented. The chapter concludes with food-for-thought-questions that were raised when trying to enhance pre-service teachers' resilience in teacher education.

Keywords: Resilience, pre-service teachers, well-being

Introduction

The well-being of pre-service teachers faces several challenges, which can lead to attrition and can even hamper their pupils' well-being and learning (Viac & Fraser, 2020). The teaching profession is complex and emotionally demanding due to continuous interactions between pupils and the teacher (Day et al., 2011; Ozturk et al., 2024). In addition, pre-service teachers' professional development takes place in at least two learning environments simultaneously: courses at a teacher education institute and field experience at a school. Pre-service teachers must learn to navigate and balance the requirements of both environments (Leeferink et al., 2015). Resilience is therefore vital for pre-service teachers, as it enables them to navigate challenging professional demands and sustain their well-being (Hascher et al., 2021). However, developing these robust personal skills as a teacher, who knows not only how to handle challenges, but also how to thrive, can be quite complex (du Plessis & Razmjoee, 2025).

Little is known about how to help pre-service teachers develop resilience. Previous research into resilience has mainly focused on teachers, but not so much on the role that teacher educators can play in building resilience in pre-service teachers (Mansfield et al., 2016). For this reason, we – members of the *teff* community focus-

ing on well-being – participated in a research project with a group of Dutch researchers from four teacher education institutes called *Life is tough, but so are you* (2019–2023). The main goal of this project was to gain more insight into Dutch pre-service teachers' resilience and to investigate how teacher educators can help cultivate resilience. This chapter aims to inspire teacher educators interested in pre-service teacher well-being by providing a selection of findings from this project and our own experiences in attempting to enhance resilience in teacher education programs.

Pre-service Teacher Resilience in Teacher Education

Our research was based on the notion that teaching pre-service teachers strategies to develop resilience can enhance mental well-being. We turned to Beltman (2020), who explicitly addresses the role of teacher education in students' resilience development, as part of wider systems that encourage resilience. However, whether teacher educators feel responsible for and know how to encourage pre-service teachers' resilience remains an open question.

Inspired by the BriTE framework (Building Resilience in Teacher Education), developed by Mansfield et al. (2016) (see Table 1), we formulated the following definition of teacher resilience: The process of, capacity for, or outcome of positive adaptation and ongoing professional commitment and growth in the face of challenging circumstances. Resilience is shaped by individual, situational, and broader contextual characteristics that interrelate in dynamic ways to provide risk (challenging) or protective (supportive) factors. Resilient individuals, drawing on personal, professional and social resources, not only "bounce back" but are able to thrive professionally and personally, experiencing job satisfaction, positive self-beliefs, personal wellbeing and an ongoing commitment to the profession (Fokkens-Bruinsma et al., 2020; Mansfield et al., 2012, 2016).

This conceptualization acknowledges the *multidimensional* nature of resilience, as it views resilience as the capacity to draw on both individual capacities and external, contextual support. It also views resilience as a capacity to respond professionally in times of adverse circumstances (*bounce back*), as well as a compass to thrive professionally (*move forward*).

Specifically, pre-service teachers may develop capacity for resilience through:

- building personal resources (e.g. motivation; social and emotional competence),
- understanding ways to mobilize contextual resources (e.g. relationships, support networks), and
- developing a range of adaptive coping strategies (e.g problem solving, time management, maintaining work-life balance).

More (possible) strategies to enhance pre-service teachers' resilience, relevant for teacher education settings, can be found in Table 1. In their development as teachers, pre-service teachers should understand that resilience develops over time and with

experience (it does not end at the graduation of the teacher education program) and will have different manifestations depending on individual and context.

Table 1: Building resilience in teacher education (BRiTE framework). This table is our adaptation of the BRiTe framework as reported in Mansfield et al. (2016)

Theme	**Related concepts and competencies (Informed by the literature)**	**Examples of teaching and learning strategies (applicable to all themes)**
Building resilience	Resilience as a dynamic, multifaceted process where individuals mobilize personal and contextual resources and use coping strategies to enable resilience outcomes.	• Reflecting and discussing with peers, mentors, teachers • Examining case studies and videos illustrating professional challenges • Engaging with problem solving activities related to authentic scenarios • Analyzing videos of teachers talking about how to address challenges • Identifying and practicing adaptive coping strategies • Practicing reframing skills and optimistic thinking • Practicing effective communication skills for a range of situations • Reflecting on personal resources and strategies via self-assessment tools and planning for self-development • Conducting action research projects
Relationships	Social competence (for building relationships, support networks and working collaboratively), setting boundaries, communication	
Well-be**i**ng	Seeking renewal, work-life balance, time management	
Mo**t**ivation	Efficacy, value, sense of purpose, sense of vocation, initiative, high expectations, problem solving, professional learning, goal setting, help seeking, reflection, persistence	
Emotions	Emotional competence, optimism, empathy, hope, courage, humor, emotion regulation, mindfulness	

What Student Teachers Think About Resilience

Our research showed that pre-service teachers find (the development of) resilience to be important. The pre-service teachers we interviewed regard resilience development as a dynamic, collaborative process, involving multiple stakeholders: themselves, the teacher education program, internship schools, and external professionals (e.g., counselors). They recognize that resilience cannot be cultivated in isolation but rather requires interactions with others. Pre-service teachers consciously develop strategies and reflect on challenging situations individually or with others.

A number of concrete ways to work on strengthening resources and strategies include: observing other teachers, seeking input and feedback from both colleagues and fellow students, reflecting on one's own actions, doing exercises to develop optimism (e.g., writing down and discarding negative thoughts and retaining positive ones), and, right at the start of the internship, connecting with colleagues with whom you 'click' to build a support network. Pre-service teachers reported that their teacher education program places little emphasis on emotion regulation and balancing work and private life, in their teacher education program, even though these appear to be

among the most pivotal challenges when they enter the classroom after graduation. Furthermore, students find it difficult to ask for help, due to the assessment context (i.e. the teacher educator being their assessor), the fact that they don't know where to ask for help, or the belief that they should solve things themselves. These assumptions lead to delaying requests for help until challenges have become truly urgent. A solution to this is when teacher educators explicitly create opportunities to openly discuss problems or challenges; "it's okay to make mistakes." Students mention that the teacher education program places strong emphasis on training them to be effective teachers (teaching content, theory, didactics), while giving less attention to their personal development. Students appreciate teacher educators who support both the development of teaching self-efficacy and the well-being of the students as individuals.

How Teacher Educators Enhance Students' Resilience

The teacher educators we interviewed said they operate reactively to enhance students' resilience, meaning they respond and act upon challenges that students bring up on their own initiative. Teacher educators mainly operate individually; from their own professional vision and importance they attach to student well-being. An important issue mentioned by multiple teacher educators, with regard to implementing resilience-enhancing practices in the teacher education program, was that the program was already full and demanding. They noted that there was no space for extra topics, such as resilience, to be included structurally in the curriculum. A second problem that teacher educators mentioned is that they lacked knowledge about resilience and resilience-building strategies.

In the *Life is tough, but so are you* project, a blended learning module based on the Australian BRiTE interactive online modules (see https://www.brite.edu.au/) was implemented. Building such a module for Dutch teacher education programs included developing an online environment, translating the BRiTE modules, contextualizing it with connections to the Dutch teaching standards, testing and piloting the online environment with teachers and pre-service teachers, and instructing the teacher educators involved in the implementation of the module. The BRiTE modules are designed on four characteristics: a) personalized; they contain self-quizzes and users have the option to pin certain content to a personal toolkit, b) interactive; they activate prior knowledge, include reflective questions, and users receive feedback on choices they make in response to quizzes or scenarios, c) evidence-informed; they include citations to empirical research and supplementary sources for further reading, and d) closely connected to the teaching profession; they include videoclips with examples from practice and authentic citations from teachers.

Use of the BRiTE modules by teacher educators in the Netherlands (2022–2023), as well as discussing the model at a *teff* conference in Cologne 2024, showed that the modules provide both educators and pre-service teachers with a rich source of knowledge on various dimensions of resilience, including examples, reflection questions,

activities, and practical tips. However, it became clear that meaningful and effective resilience development requires more than simply completing the BRiTE modules independently. Discussing and interactive learning proves crucial for pre-service teachers to translate knowledge about resilience, resources, and strategies into their own personal development as resilient teachers. The teacher educator plays a key role in this by facilitating the discussion, sharing their own experiences, and helping pre-service teachers apply what they have learned in their own situations.

Conclusions and Food-for-Thought Questions

Life is tough, but so are you showed the importance of fostering pre-service teachers' resilience proactively and preventatively so they can deal with challenges effectively. It is not enough to simply offer help when problems already exist; it is crucial to provide pre-service teachers with a foundation to prevent or anticipate challenges as much as possible. To take a proactive approach to resilience development, teacher education programs and internship schools should thoughtfully explore how to integrate it into the curriculum in ways that are appropriate for their specific context.

As teacher educators and researchers we propose, based on our research, our experiences in working with student teachers and our discussions with (international) colleagues, that stimulating an ongoing discussion in a specific teacher education program is pivotal for embedding resilience. This enables discussing context-specific challenges that influence motivation and social networks of student teachers as well as opens up the discourse needed for talking about emotions and self-confidence in professional development. Questions that could guide discussions on resilience in teacher education programmes are:

1. In which learning activities could we incorporate the development of resilience? Classical settings, one-on-one meetings, or…? Should attention for resilience development be integrated in existing learning experiences, or should a new type of learning activity be created?
2. How far does the responsibility of our educators reach when it comes to pre-service teachers' personal (resilience) development, and at what point should such roles shift to external professionals (e.g. therapist, counsellor)? Can we create guidelines for our educators on how to deal with (severe) mental issues that could be triggered when pre-service teachers face challenges? And, more generally, which capacities do teacher educators need?
3. How can our educators model a safe haven for pre-service teachers' development of resilience? And can we prevent that their role as assessor hinders such a safe space?
4. How could school-based educators enhance resilience during students' internships? And how can school-based educators work together with teacher educators on embedding resilience in the teacher training program?
5. Should we differentiate among students based on their individual needs and capacities to show resilience? And if so, where should such differentiation start; based on a self-evaluation of their resilience?

Acknowledgements

The research reported on in this chapter was part of the project 'Life is tough but so are you: Enhancing preservice teachers' resilience' (40.5.18650.036) funded by the Netherlands Initiative for Education Research (NRO). We acknowledge the support of our other consortium members, including Marjon Fokkens-Bruinsma, Irene Poort, Els de Rooij, Dineke Tigelaar, Michelle Gemmink, Ellen Jansen, and Ietje Pauw.

References

Beltman, S. (2020). Understanding and examining teacher resilience from multiple perspectives. In C. F. Mansfield (Ed.), *Cultivating teacher resilience: International approaches, applications and impact* (pp. 11–26). Springer.

Day, C., Edwards, C., Griffiths, A., & Gu, Q. (2011). *Beyond survival: Teachers and resilience*. University of Nottingham.

du Plessis, A., & Razmjoee, M. (2025). The promise of a strong beginning and the reality of pre-service teachers' professional experience learning: Understanding the lived experiences of pre-service teachers preparing for teaching. *Teachers and Teaching*. https://doi.org/10.1080/13540602.2025.2512101

Fokkens-Bruinsma, M., Gemmink, M. M., & van Rooij, E. C. M. (2020). Staying BRiTE in the Dutch teacher education context. In C. F. Mansfield (Ed.), *Cultivating teacher resilience: International approaches, applications and impact* (pp. 143–158). Springer. https://doi.org/10.1007/978-981-15-5963-1_9

Hascher, T., Beltman, S., & Mansfield, C. (2021). Teacher wellbeing and resilience: Towards an integrative model. *Educational Research, 63*(4), 416–439. https://doi.org/10.1080/00131881.2021.1980416

Leeferink, H., Koopman, M., Beijaard, D., & Ketelaar, E. (2015). Unravelling the complexity of student teachers' learning in and from the workplace. *Journal of Teacher Education, 66*(4), 334–348. https://doi.org/10.1177/0022487115592163

Mansfield, C. F., Beltman, S., Broadley, T., & Weatherby-Fell, N. (2016). Building resilience in teacher education: An evidence-informed framework. *Teaching and Teacher Education, 54*, 77–87. https://doi.org/10.1016/j.tate.2015.11.016

Mansfield, C. F., Beltman, S., Price, A., & McConney, A. (2012). "Don't sweat the small stuff": Understanding teacher resilience at the chalkface. *Teaching and Teacher Education, 28*, 357–367. https://doi.org/10.1016/j.tate.2011.11.001

Ozturk, M., Wigelsworth, M., & Squires, G. (2024). A conceptual model for teacher wellbeing: Towards a holistic understanding. *Cogent Education, 11*(1). https://doi.org/10.1080/2331186X.2024.2396156

Viac, C., & Fraser, P. (2020). *Teachers' well-being: A framework for data collection and analysis* (OECD Education Working Papers, No. 213). OECD Publishing. https://doi.org/10.1787/c36fc9d3-en

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Dagmar M. Benincasa & Kaj Militzer

Onboarding in Initial Teacher Education (ITE): *Welcome Weeks* as a Foundation for Belonging and Well-Being From Day One

Abstract
This article examines the conception, planning, implementation, and evaluation of *Welcome Weeks* at the Centre for Teacher Education (ZfL) at the University of Cologne (UzK). The *Welcome Weeks* form an innovative onboarding process that reconceptualizes the transition of teacher training students into university studies and can promote early professional identity formation. The *ZfL Welcome Weeks* focus on the topic of *(teacher) well-being*. During this onboarding phase, the ZfL – as the central institution for teacher education at the University of Cologne – introduces itself to first-year students as a constant and reliable point of contact, source of support, and place of identification throughout their studies as prospective teachers. Student teachers' challenges during this crucial phase – such as belonging to multiple faculties, concerns about social well-being, and coping with initial academic and social demands – are presented in a solution-oriented manner, with *well-being* being regarded as *a* key *skill* for future teachers.

Keywords: student onboarding, Welcome Weeks, well-being, professional identity formation

Disclaimer
This chapter is an English translation of an article originally published in German as: Benincasa, D. M. & Militzer, K. (2025), "*Onboarding im Lehramtsstudium*: *Welcome Weeks* als Grundstein für Zugehörigkeit und *Well-being* von Anfang an", ZfL Discussion Papers, Volume 16. It has been translated in order to make the content accessible to a broader international readership. Where necessary for an international audience, additional information was added; verbatim quotations in German were also translated into English.

1. Introduction

You never get a second chance to make a first impression – this should apply not only to first-year students on their first day at university but also to the educational institution itself. "Statistics I" or "Introduction to Linguistics" on the very first day: this is not uncommon for many teacher training students. For many of them, their first

steps take them straight into the lecture hall; the remainder of their first days at university is spent attending a variety of specialist seminars and lectures – often rich in subject-specific content but offering little direct relevance to teaching – and learning their way around campus. Looking at the University of Cologne (UoC), there are many orientation offerings for first-year students, e.g. those provided by the General Student Committee or the various faculties, however, these do not always clearly focus on teacher training students in particular. The fact that all teacher training students in North Rhine-Westphalia study at least two different subjects/disciplines in addition to educational sciences, often at different faculties, makes it difficult from the outset to develop a clear sense of belonging to the teaching profession – a challenge that often persists over many semesters. In addition, many introductory courses are primarily designed to convey information, but rarely acknowledge that students have just taken their first step towards becoming teachers.

This chapter therefore focuses on the question: How can trainee teachers be prepared for their future teaching careers in a sustainable and forward-looking manner, right from the start of their studies? The focus here is on the aspect of (*teacher/student) well-being*, as a key skill area that (prospective) teachers should develop. As an example, the *Welcome Weeks* at the Centre for Teacher Education (CfTE) at UoC are presented as a concept that combines well-being with targeted and future-oriented onboarding of student teachers at the start of their first semester.

2. *Well-Being* a Priori: From "First Aid" to "Welcome Home!"

Out of the classroom, straight into Uni: What is often sold as the 'logical next step' is, in reality, associated with a range of emotions. In addition to excitement about this new phase of life, many students also experience fears and worries: Am I really cut out for studying at Uni? How will I find friends? Who will help me, who can I turn to? How do I find out when I need to be where? Are there deadlines and rules I have to follow? The transition to university life represents a significant milestone for young adults, characterised by personal growth, exploration and adaptation, and brings with it a mixture of excitement and adventure. First-year students are confronted with new academic and social environments, as well as increasing personal responsibilities, which in turn can lead to significant challenges to their *well-being* (Zhang, 2025; Balon, 2015). Observations like these have contributed to the topic *of student well-being* gaining considerable attention in recent decades. Student well-being is influenced in many ways by various factors in the students' immediate environment, e.g. by fellow students (as well as peers outside the educational context), by their own family circumstances, by teachers, or by certain characteristics of the course of study itself (Douwes et al., 2023). While universities cannot, of course, address all these associated challenges, they can actively take steps to ensure they do not contribute to a deterioration in *student well-being*. Reports from US universities suggest that the need and desire to settle in at university – to "feel like you belong" – have become even greater since the coronavirus pandemic (Hicks, 2024).

In the discourse on future-oriented teacher education, *well-being* should therefore already be an indispensable aspect during initial teacher education (ITE). Furthermore, the number of research papers on *well-being* at school and *teacher well-being,* in particular, has also been increasing for years (cf. Hascher & Waber, 2021; Dreer, 2023) and highlights the enormous importance of the topic for all phases of teacher training. Lemon (2021) emphasises that it is important for ITE students to create *safe spaces* at universities where they can talk about their hopes, dreams, and areas of concern in the process of becoming teachers. *Well-being* and self-care are also central components of sustainable teacher education: one of the key objectives should be to offer ITE students opportunities to develop skills and strategies that help them face inevitable professional challenges with confidence. Nevertheless, the *well-being* of ITE students has often been given less attention to date (ibid.).

Based on the findings of a study on *the well-being* of ITE students, Quickfall et al. (2025) derive the following recommendations for action for ITE:

- Prospective teachers should be given a realistic, honest picture of their future profession, taking into account everyday challenges as well as positive aspects.
- Structured opportunities for teacher training students should be promoted in order to build sustainable peer networks among teacher training students. The long-term value of these relationships for support, collaboration and professional identity should be emphasised.
- Regular, safe, and confidential opportunities should be provided for teacher training students to talk openly about their experiences without fear of judgement or negative consequences (ibid.).

Prospective teachers should therefore not only be confronted with the issue *of teacher well-being* when it is already "too late," that is, once they have already entered phases of their teacher education or early career that are known to be particularly high-stress (cf. Admiraal, 2025). Even the practical (internship) phases during their studies – phases that many students eagerly anticipate – are often associated with increased stress, as ITE students have to combine their studies and everyday life with the (albeit reduced) daily routine of a teacher for the first time. During these phases, students experience numerous critical moments, often for the first time, which force them to actively manage their *well-being* and self-care. If no attention has been paid to these areas beforehand, stress, exhaustion, and physical or psychological complaints often occur (Lemon, 2021). At the same time, it is during these phases that students recognise the high value of positive relationships for their social *well-being* (Campbell et al., 2024).

It would therefore be desirable to have a common thread of well-being running through teacher education from ITE to further training, which can be revisited throughout a teacher's working life. Introducing the topic *of well-being* to prospective teachers from day one, as part of their university welcome, could serve as a starting point for this. For already existing orientation events and programmes, this means going beyond serving as mere, sporadic, and largely context-free information events, and instead pursuing a consistent narrative centered on helping students "feel wel-

come and comfortable at university." What should the first day of teacher training look like? How can a change of perspective be achieved (yesterday a student – today a prospective teacher)? How can ITE students network across subjects and semesters? How can the foundations for (stress-relieving) collaborative work and *sharing* be laid early on? How can large universities in particular (where ITE is spread across various, large faculties and central institutions), bundle and coordinate their offerings even more effectively at the beginning of the study programme?

3. The Emergence of *Welcome Weeks* at the ZfL Cologne

The CfTE has been working for many years with UoC's teacher education faculties to expand the range of arrival and orientation events for prospective teachers. As part of the CfTE Focus Year 2024, entitled "Health and Well-being in Teacher Training," colleagues at the CfTE in Cologne addressed the questions mentioned above in order to further develop and optimise the concept of a "Welcome Week" and to place greater emphasis on *well-being in* the onboarding of first-year teacher training students.

3.1 Teacher Training Students in Search of a Home Base

As indicated in the beginning of this chapter, studying several subjects – and thus belonging to several faculties on campus – is a major challenge specific to teacher training in Germany. At UoC, over 1,000 subject combinations are possible for ITE, resulting in a potpourri of individual affiliations. Many of the approximately 11,000 teacher training students ask themselves (not only in their first semester, but also as they progress through their studies): Where is my "home base" on campus? The problem associated with this question is not limited to ITE: "Where there is no 'home,' no one is drawn back there in the later phases of professionalisation, even though universities offer programmes that can also – or even especially – benefit teachers who are already in-service" (Benincasa & Springob, 2022).

Like other teacher education centres in Germany, the CfTE at UoC describes itself as *the* central point of contact for all local ITE students. Among other things, the CfTE houses the central examination office for teacher training, an inter-faculty counselling centre and a practical education team, which designs and coordinates the practical education phases and internships in the Bachelor's and Master's programmes in collaboration with the faculties. In addition, the CfTE is a key driver of digital teaching programmes and the internationalisation of teacher training (including numerous mobility programmes for ITE students). Nevertheless, many students only become aware of the central role of the CfTE over the course of their studies – or only at the Master's graduation ceremony, which is also organised by the CfTE. This raises the question of how the role of the CfTE can be made even more prominent from the very first day of teacher education, so that it is seen not only as a place for teacher-specific advice and education, but also as a space for identification as a

(future) teacher and for fostering a sense of belonging to the teacher education community. Especially "in times of teacher shortages, early identification with the profession […] offers an interface for inspiring the 'right' people to become teachers and preparing them a priori for work in an uncertain future full of challenging surprises" (Benincasa & Springob, 2022).

The CfTE has been organising interdisciplinary orientation and welcome events for first-year students for many years. In the past, these took place in a wide variety of formats, and during the coronavirus pandemic, they were, of course, also held digitally. Proven formats are constantly evaluated, further developed and, above all, expanded in line with demand. Since 2022, there have been so-called "check-in" days – as well as "*last-minute* check-in" days for late enrolments and arrivals – with information lectures, timetable advice, counselling from various CfTE teams, and peer talks.

In addition, there have been, and continue to be, subject-specific introductory events at UoC in general, which the CfTE provides information about in the Lehramts-Navi (= Teacher Education Navigator).[1] These events are usually organised by school type or subject/faculty, and they vary widely in nature. However, not all of these offerings are explicitly aimed at ITE students, but in some cases at all students of the subject. The faculties have also been organising orientation and welcome events for many years, increasingly with a focus on teacher training. For example, the Faculty of Human Sciences (FHS) has always offered welcome events for prospective teachers, which the CfTE explicitly refers students to.[2]

3.2 The Role of the Erasmus+ Teacher Academy Teacher Education for a Future in Flux (*teff*)

At the CfTE, considerations regarding a more extensive form of first-semester events, or the previously described "check-in" days, have been revisited and expanded upon each year in the past. However, the *Welcome Week* received a decisive boost with the launch of the Erasmus+ Teacher Academy *Teacher Education for a Future in Flux (teff)*[3], which is also coordinated by the CfTE. With a total project duration of three years, *teff* set itself the goal of organising as many *teff Welcome Weeks* as possible, in as many European partner countries as possible, during this period. In addition, mutual visits to the various *Welcome Weeks* were planned for project participants to provide a change of perspective – from organisers to participants – as well as an intercultural experience. This motivated the staff of the CfTE's "Study Orientation and

1 The Teacher Education Navigator can be accessed here: https://zfl.uni-koeln.de/lehramts-navi/einfuehrungsveranstaltungen

2 More information about the FHS Welcome Week / subject welcome events at the start of the lecture period can be found at https://hf-studium.uni-koeln.de/studienorganisation/erstsemesterinformationen/welcome-week-hf-fachbegruessungen-zum-vorlesungsbeginn

3 The Erasmus+ Teacher Academy *Teacher Education for a Future in Flux (teff)* is funded by the European Union's Erasmus+ programme; more information is available at https://teff-academy.eu

Counselling" team to take concrete steps towards organising an entire *Welcome Week*. These colleagues also worked with *teff* from the outset to support the development of the *teff Welcome Weeks* concept and to bring the project idea and reality together at their own location.

The *teff* work on the European *Welcome Weeks* took place within the framework of the "*Well-being Skills*" work package[4]. Together with the work packages "*Digital Skills,*" "*Sustainability (Green) Skills,*" and "*Diversity & Inclusion Skills,*" this forms the 'core' of *teff*: Here, intensive research and work is carried out on the four *skill areas* that are indispensable for the training and further education of future-oriented teachers and which the Teacher Academy is explicitly committed to promoting.

As a first step, the digital *teff Welcome Week Activity Idea Board*[5] was created and filled with detailed descriptions of various activities, which had already been tested in similar introductory events and formatsby all partner institutions involved in the "*Well-being* Skills" work package. The board is intended to motivate people to organise their own *Welcome Week,* even beyond *teff*, to facilitate the concrete planning of such events and, above all, to promote ideas for activities with a focus on well-being. Thanks to its many years of experience with various types of event formats, the CfTE was able to provide a large number of examples.

To date, *teff* has organised various *Welcome Week Activities* at locations such as *Utrecht University*, the *University of Florence* and the *University of Murcia*. Organising a full week proved challenging in many locations due to a lack of resources or the presence of other orientation and information events scheduled during the same time frame. However, many colleagues at *teff* partner institutions decided to use the *Welcome Week Activity Idea Board* as inspiration for organising a few consecutive days or individual Welcome events. Hence, even in places where the full week was not utilised, the basic idea of the *teff Welcome Weeks* was conveyed: to focus on the *well-being* of teachers from day one.

4. Features of the *Welcome Weeks* at ZfL Cologne

In the winter semester 2024/25, approximately one month before the start of the lecture period, the CfTE in Cologne was able to hold a complete five-day *Welcome Week* for the first time, as well as a *Last Minute Welcome Day* in the last week before the start of the course. Building on the previous check-in days, the programme was expanded to include additional socialising formats, a smoothie bike with nutritional advice, and contributions from other central institutions (including *UniSport, Gesunde Uni Köln* (= Healthy University of Cologne), Inclusion Service Centre, Equal Opportunities Department, ESI Student Council). A *Padlet* was set up to provide further

4 *teff* leverages existing synergies from the collaboration of twelve European universities in *EUniWell*, one of 65 *European University Alliances*. *teff* was initiated by *EUniWell*, and Beatrix Busse, Vice-Rector for Studies and Teaching at the University of Cologne, is Chief Development Officer for both projects. For more information on *EUniWell*, visit https://euniwell.eu

5 The *teff Welcome Week Activity Idea Board* is available at https://padlet.com/teffacademy/welcome_week

information on contact points (e.g. student councils), presentation slides from the information lectures, and a designated column for student networking. Here, first-semester students could post QR codes and links to groups they have created themselves in various communication apps.[6]

The following section presents and briefly explains the special features of *the Welcome Weeks* at the CfTE Cologne; it also illustrates potential areas for optimisation for future *Welcome Weeks*.

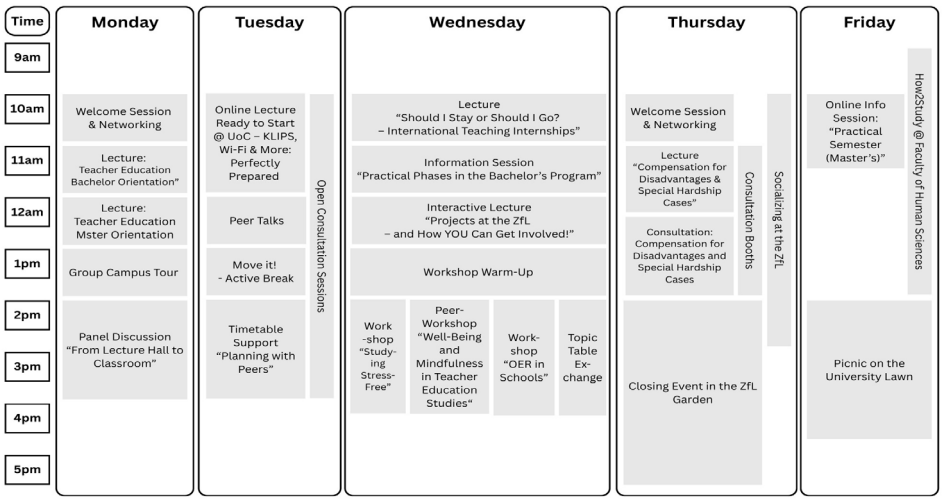


Figure 1: *Schedule for the ZfL Welcome Week at the start of the 2025/26 winter semester*

4.1 Consideration of *Well-Being* Dimensions

As can be seen in *Figure 1: Schedule for the ZfL Welcome Week at the start of the 2025/26 winter semester*, the current programme covers various dimensions of well-being according to Khatri et al. (2024): *Academic well-being* is promoted insofar as first-year students feel welcome at their university and receive enough information to find their way around both the campus and their teacher training programme; *financial well-being* is addressed in an information event organised by the *Studierendenwerk der Uni Köln* (= Cologne Student Services Organisation). However, the focus is clearly on promoting *relational well-being*, i.e. building meaningful relationships, which is supported by numerous socialising and exchange activities. Workshops such as "*Well-being* & Mindfulness in Teaching" (Peer Workshop), "Stress-free Studying," or "Easier Studying with Digital Learning Materials" address the topic of *well-being* quite explicitly and even make a clear reference to *teacher well-being*. Overall, the *Welcome Week* also aims to develop and promote *psychological (resilience) well-being*.

6 The ZfL *Welcome Week* Padlet can be found at https://padlet.com/ZfL_Beratung/studienstart_at_zfl

This can be understood as a guiding principle for the entire week, as the events all focus on the students' ability to cope with the ups and downs of student life.

4.2 Coordination and Cooperation With UoC Partners

As mentioned earlier, other events for first-year students also take place at different locations of the UoC, so the organisers of the CfTE *Welcome Week* are currently coordinating the schedule in advance with all departments to avoid overlaps. In addition, shortly before the event, there will be another detailed coordination meeting with representatives of the Faculty of Human Sciences (FHS), which has a particularly large number of teacher training students, to ensure that they are not presented with the same content. The various faculties and the CfTE are not in competition with each other, but rather synergistically support each other through targeted promotion of their respective *Welcome Weeks*; the picnic is also organised jointly. On the day that the FHS offers its "How2Study"[7] programme, the ZfL does not hold any events of high relevance for Bachelor's ITE students.

In order to continuously develop all formats, there is also a regular exchange between FHS and CfTE regarding experiences and upcoming changes that need to be taken into account during the *Welcome Weeks*. In the future, it would be desirable to intensify contact between all locations that already offer (established) activities for first-semester students at UoC in order to identify synergies and exploit them in the future. Additionally, the CfTE in Cologne is working on integrating more specialist counselling services and student councils into the *Welcome Weeks*. Here, the focus on *well-being* could serve as a useful common starting point.

Moreover, current developments at UoC, such as the newly created platform for teacher training (*University of Cologne Teacher Education Hub*), must also be taken into account. This platform offers "a structure for the further development of research-based teacher training and interdisciplinary cooperation between all those involved in teacher training at the University of Cologne" (University of Cologne, 2025, p. 4). The potential for the *Welcome Week*, such as direct contact with first-year students who automatically become members of the platform when they enrol at the University of Cologne, should therefore be carefully examined.

4.3 Informal (Peer) Counselling on an Equal Footing

In addition to specific statements in student feedback (see chapter 4.5), students' counselling needs were also identified based on the frequency of counselling requests and the content of counselling sessions, for which the CfTE keeps continuous statistics. Peer counsellors, who usually have a close relationship with first-year students, also recognise needs in peer counselling sessions. These peer counsellors play a prom-

7 More information can be found here at https://hf-studium.uni-koeln.de/studienorganisation/erstsemesterinformationen/how2study-orientierungstage-vor-vorlesungsbeginn

inent role in the *Welcome Weeks* of the CfTE in Cologne – and beyond, in day-to-day operations. They are typically employed at the CfTE as student colleagues within the "Study Orientation and Counselling" team and hold a "Peer Counselling" certificate[8], which is offered by the Central Student Advisory Service at UoC. In most peer counselling contexts, a sense of closeness arises between counsellors and those seeking advice due to shared age, life circumstances, or interests, and this proximity is greatly valued by both sides. In the spirit of a *safe space*, those seeking advice, most of whom have just left school, have the opportunity to ask questions or express concerns more freely with people who are more or less their own age. This more informal communication with peers is perceived as "*very nice, relaxed and honest,*" "*totally friendly and informative,*" or even *"competent and* authentic." Overall, the entire *Welcome Week* is perceived by students in a positive sense as a place for more informal encounters, as can be seen from the feedback survey:

> *I found that the event helped alleviate some of the apprehension about university, as it provided an opportunity to obtain information and establish contacts, while also allowing participants to engage in normal conversation with staff members from the CfTE or the various counselling and info booths, for example. This helped participants become accustomed to speaking with complete strangers, as they had not previously encountered them in the same context as their teachers.*

4.4 Timetable Advice as a Key Issue for Teacher Training Students

Despite the focus on well-being, "classic" counselling topics should not be neglected during *Welcome Week*: One key issue for all (teacher training) students is and remains the creation of their first timetable. Even in the years before *Welcome Week*, counselling on timetables has always proven to be very time-consuming; for this reason, consultation is currently offered over a long period of time, and beyond the *Welcome Week*. Consultation on this topic also takes place in groups and online in order to offer as many students as possible the opportunity to receive advice tailored to their needs (at the same time). In fact, timetable consultation is so important that it even determines the timing of *Welcome Week*: Since first-year students can only use the second course registration phase, *Welcome Week* has always taken place within this centrally specified period.

During the *Welcome Week* 2025/26 over 600 students wanted to participate in the in-person timetable counselling sessions, even though three online sessions with lively participation had already taken place, which prompted a fundamental adjustment of the timetable consultation formats. The timetable consultation is currently being further developed and is likely to be moved out of *Welcome Week* in the future, enabling students to participate in the welcome activities with their timetables already finalised and, consequently, in a more relaxed manner. The existing timetables would

8 Further information on the certificate can be found at https://verwaltung.uni-koeln.de/abteilung21/content/studierende/studierendenengagement/zertifikat_peerberatung

also make it possible to contact fellow students who are planning to attend the same courses.

This should also greatly reduce the workload for the counsellors themselves, as individual timetable consultations during *Welcome Week* tie up a lot of resources. This planned change will create (even) more space for those elements that students perceive as particularly valuable: exchange, networking and orientation on campus.

4.5 Use of Student Feedback

The evaluation of *Welcome Week* 2024/25 led to specific adjustments for the summer semester 2025 and the winter semester 2025/26. The feedback clearly showed how valuable the exchange with peers, i.e. experienced teacher training students, is for new students. One example of feedback was: "*The peer talks gave me a great deal of motivation and confidence that I can do the course.*" Against this backdrop, the peer perspective was integrated into other formats – for example, into a fishbowl discussion on the practical phases of the Bachelor's degree – and the peer talks were expanded.

At the request of the students, additional online offerings were added, as some first-year students were simply not yet on-site in Cologne at the time of *Welcome Week*. The information presentations, counselling booths, and workshops remained unchanged, as they were rated as "very helpful" or "somewhat helpful" by at least 80 % of respondents in the evaluation. Further feedback confirmed how important meeting spaces and a warm atmosphere are: "*I would like to express my sincere thanks for this great Welcome Week! I felt well supported, welcomed, taken seriously, part of a large community, and was able to take away a lot of positive energy for the start of my studies.*" The frequently expressed need for information, especially on the subject of timetable planning, was taken seriously and addressed, e.g. by increasing the number of staff available for timetable advice.

For particularly popular formats (such as the *peer talks*), a procedure will be developed in the future to limit the number of participants, as some of the events were very crowded. However, according to the feedback, the flexible approach taken by the CfTE staff was greatly appreciated: "*Thank you for making the peer talks on school types possible despite the large number of participants and for responding so spontaneously to many things!*" Activities expected, based on past experience, to attract a large number of participants should be held in lecture halls and/or offered in a hybrid or exclusively online format. This ensures that all students can follow the lecture with concentration and avoid unpleasant experiences in overcrowded seminar rooms. In principle, all formats will be reevaluated to assess their feasibility as hybrid or purely online formats, while ensuring that the promotion of *relational well-being* – better supported in face-to-face formats – is n0ot overlooked. In addition, there are plans to specifically involve international teacher training students who are spending a semester abroad at UoC. After all, they too are, for the time being, "first-year students" again – seeking information, connections, and, not least, *well-being*.

5. Conclusion

Drawing on the work on the topic of "*(Teacher)* Well-being" in *teff*, current research on *student* and *teacher well-being*, and the experiences from previous *Welcome Weeks*, it is essential to focus on *well-being* in teacher training from the very start and to firmly embed it in teacher training. The fact that promoting *well-being* of first-year students is already having an effect is illustrated by this feedback from one first-semester student: "*I had a lot of fun all week and thanks to you I met some really nice people who I still hang out with every day. Thanks to you, my first week in Cologne was a huge success, thank you so much* ❤."

With regard to their (future) *teacher well-being*, students should also be given a realistic picture of the teaching profession from the outset – not to deter or discourage them, but to enable them to prepare themselves adequately for the teaching profession. At the same time, the specific characteristics of teacher training programmes must be clearly highlighted in comparison to other degree programmes. The importance of the CfTE as a central location where students take their first steps into the teaching profession should not be underestimated: As an established hub where positive experiences are gained early on, helpful contacts are made, and where teacher training students at UoC return time and again (e.g. during practical phases or when certificates are issued), the CfTE has the potential to become a place of identification that could also be used by those involved in the later phases of teacher training.

For the further development of the *Welcome Week* concept, the idea of cross-phase teacher training – bringing together participants from all phases of teacher training (in Germany: ITE at university, teacher training and in-service professional development) – should be pursued further. Practising teachers and peers who are studying to become teachers are already involved in the *Welcome Week* programme, but this potential could be further expanded (especially with regard to conveying a realistic job profile). In addition, ITE lecturers could not only be encouraged to consider well-being as a topic for their courses, but also as an aspect of their own teaching – not least because *student well-being* and *teacher well-being* (including that of lecturers) can influence one another (cf. Kiltz et al., 2020). Particularly "against the backdrop of the high level of responsibility borne by teachers" (Klusmann, 2024, p. 400), all available resources should be pooled in the best possible way in order to "train, encourage and support prospective teachers in the best possible way. This applies to their professional competence and also to their professional well-being. Both are important characteristics and areas of competence that are highly significant for the quality of educational processes" (ibid.).

References

Admiraal, W. (2025). Attrition risk profiles of novice teachers based on their job demands, individual and school resources, and well-being. *Teaching and Teacher Education, 162*, Article 105070.

Balon, R., Beresin, E.V., Coverdale, J.H, Louie, A.K. & Weiss Roberts, L. (2015). College Mental Health: A Vulnerable Population in an Environment with Systemic Deficiencies. *Acad Psychiatry, 39*, 495–497. https://doi.org/10.1007/s40596-015-0390-1

Campbell, L., Gray, S., Dey, D., Holt, D. & Mulholland, R. (2024). 'Their best interests at heart': Exploring influences on student teachers' learning to promote health and wellbeing in the classroom. *Teacher Development*, *29*(1), 1–19. https://doi.org/10.1080/13664530.2024.2431574

Douwes, R., Metselaar, J., Pijnenborg, G. H. M., & Boonstra, N. (2023). Well-being of students in higher education: The importance of a student perspective. *Cogent Education*, *10*(1). https://doi.org/10.1080/2331186X.2023.2190697

Dreer, B (2023). On the outcomes of teacher wellbeing: a systematic review of research. *Front. Psychol.* 14:1205179. https://doi.org/10.3389/fpsyg.2023.1205179

Hascher, T., & Waber, J. (2021). Teacher well-being. A systematic review. *Educational Research Review*, 34, 100411. https://doi.org/10.1016/j.edurev.2021.100411

Hicks, M. (2024). Orientation Is the First Step to Finding Belonging in College. It Is Changing Post-Pandemic, Jul 18, 2024. https://www.edsurge.com/news/2024-07-18-orientation-is-the-first-step-to-finding-belonging-in-college-it-is-changing-post-pandemic?

Khatri, P., Duggal, H. K., Lim, W. M., Thomas, A., & Shiva, A. (2024). Student well-being in higher education: Scale development and validation with implications for management education. *The International Journal of Management Education, 22*(1), Article 100933. https://doi.org/10.1016/j.ijme.2024.100933

Kiltz, L., Rinas, R., Daumiller, M., Fokkens-Bruinsma, M., & Jansen, E. P. W. A. (2020). "When they struggle, I cannot sleep well either": Perceptions and interactions surrounding university student and teacher well-being. *Frontiers in Psychology, 11*, Article 578378. https://doi.org/10.3389/fpsyg.2020.578378

Klusmann, U. (2024). Berufliches Wohlbefinden von Lehrkräften nachhaltig fördern Warum wir mehr als Achtsamkeitstrainings brauchen. *DDS – Die Deutsche Schule 116*(4), 395–402. https://doi.org/10.31244/dds.2024.04.08

Lemon, N. (2021). Wellbeing in initial teacher education: using poetic representation to examine pre-service teachers' understanding of their self-care needs. *Cult Stud Sci Educ.*, *16*(3), 931–950. https://doi.org/10.1007/s11422-021-10034-y

Quickfall, A., Glazzard, J., Jayman, M., & Rose, A. (2025). *The wellbeing of student teachers: Co-created guidance for initial teacher education providers* (BERA Small Grants Fund research report). British Educational Research Association. https://www.bera.ac.uk/publication/the-wellbeing-of-student-teachers-co-created-guidance-for-initial-teacher-education-providers

Universität zu Köln (2025). *Ordnung der Universität zu Köln für die Plattform für Lehrer*innenbildung (University of Cologne Teacher Education Hub)*. https://am.uni-koeln.de/e45267/data/records49353/AM_2025-34_PlattformLB_ger.pdf

Zhang, K. C. (2025). "How Do I Start Strong?": Exploring the Subjective Well-Being, Beliefs, and Lifestyles of First-Year University Students in the UK. *Societies*, *15*(3), 67. https://doi.org/10.3390/soc15030067

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Dagmar M. Benincasa, Anna Bosch, María Ángeles Fernández-Vilar,
Daniela Frison, Chiara Funari, Alodía López-Sola, Chiara Lorini,
Marina Olmos-Soria & María Jesús Rodríguez-Entrena

Threading Teacher Well-Being Into Teacher Education: The Design of an Online Course

Abstract
This article presents the conception and development of an online course (OC) on teacher well-being (TWB), designed to address one of the most pressing challenges in contemporary teacher education. The OC is built on the premise that well-being is both an individual and a systemic concern and aims to equip (future) teachers with knowledge, strategies, and reflective opportunities to foster resilience, engagement, and professional growth. The OC is structured into seven interconnected Learning Modules, each focusing on a distinct dimension of TWB. The modules will be introduced in detail, highlighting their specific purposes, pedagogical strengths, and the ways in which they contribute to the overarching narrative that ties the course together. In addition, the article outlines the dissemination strategy for the course, sketching ideas for its integration into teacher education programs and professional development contexts. By combining evidence-informed content with accessible, engaging learning design, the OC aims to provide a scalable and sustainable resource that supports teachers across diverse contexts in nurturing their own well-being.

Keywords: teacher well-being, online course, life-long learning

1. Introduction

Teacher well-being (TWB) is undoubtedly a critical issue, as alarming reports from across Europe clearly demonstrate. In 2024, the German School Barometer showed that over 36 % – more than a third – of teachers in Germany feel exhausted at least several times a week, with 12 % experiencing exhaustion on a daily basis (Robert Bosch Stiftung, 2024a, p. 43). A 2025 study on teacher occupational well-being by the DCU Institute of Education Ireland showed that among over 1,000 Irish teachers surveyed, an alarming 86 % reported moderate to high levels of personal burnout (DCU, 2025). In times of high teacher shortage and retention challenges, these numbers sound even more alarming: the DCU study also found that 42 % of respondents said they were unlikely to remain in the profession long-term because of these pres-

sures (DCU, 2025). According to the German School Barometer, the vast majority of teachers (75 %) report being satisfied with their profession and their school – still, more than a quarter of teachers (27 %) would change professions if they had the opportunity to do so, a consideration particularly common among younger teachers and women in the profession (Robert Bosch Stiftung, 2024a, p. 9). Naturally, teachers who are aware of their challenged TWB seek solutions and call for an improvement of their situation: in a study conducted by the Mental Health Foundation (MHF) Scotland, an overwhelming 85 % said they believed that mental health training would help them look after their own emotional well-being as well as that of their pupils: "The Foundation has called for mental health training to be embedded in the teacher training curriculum (Initial Teacher Education) at the outset of teaching careers – a proposal backed by 92 % of teachers" (MHF, 2018).

Such training and interventions, aimed at informing teachers about – and, in the best case, improving – their well-being, already exist across Europe in various forms and formats, albeit they differ considerably in number, quality, and scope. Recent review studies indicate that most interventions developed and evaluated for teachers adopt a behavioral approach, focusing on enhancing personal resources, competencies, and coping abilities (Berger et al., 2022). Klusmann (2024) further emphasizes that interventions are often almost exclusively behavior-oriented, with a strong focus on mindfulness. These approaches seem appropriate – however, TWB is a matter which should not only be tackled individually, but also addressed systemically.

The online course "Teacher Well-being" was developed as one of the deliverables in *teff*'s Work Package 6 (WP6): *Well-Being Skills* and aims to promote TWB as a key factor in ensuring quality education and sustainable learning environments. By strengthening TWB, the course contributes to the broader goals of inclusive, equitable, and high-quality education across Europe, reinforcing *teff's* commitment to empowering educators as agents of positive change in their schools and communities. Building on an extensive body of literature on TWB, the developers of this online course made it their goal to create a learning opportunity which would not appear as 'yet another *to do*' for teachers, but rather as a collection of stimuli aiming at fostering small changes within a large system. The following article illustrates how this challenge was tackled by outlining the development process as well as the content and purpose of each module.

2. The *teff* Online Course on "Teacher Well-Being"

The entire online course was developed and designed with all participating partner institutions across Europe, drawing on their expertise and existing (teacher) well-being initiatives at each institution. Following Hascher and Waber (2021), "despite broad agreement that well-being should be conceptualized as a multidimensional construct, there is little consensus about how well-being should be defined" (p. 2). The diverse community of creators, all stemming from different cultural and academic backgrounds, did not follow one single definition of well-being. Instead, it ensured

the incorporation of different approaches to defining (teacher) well-being, in order to offer a multifaceted view on the topic. It acknowledges that "wellbeing is diverse and fluid, respecting individual, family and community beliefs, values, experiences, culture, opportunities and contexts across time and change. It is something we all aim for, underpinned by positive notions, yet is unique to each of us and provides us with a sense of who we are which needs to be respected" (McCallum & Price, 2016, p. 17). The collaborative development of the course online involved establishing a shared foundation for engaging with TWB, while at the same time providing diverse entry points to support individualized engagement with the topic. Aiming at maximum flexibility for learners, the modules are therefore not meant to be worked through one after another in a traditional succession: instead, even though the course specifically asks the learners to start with *Introduction & Foundations* (2.1.1) and end with the *Wrap-Up* (2.1.7), all so-called 'in-depth modules' in between (cf. 2.1.2–2.1.6) can be chosen based on personal motivation, prior knowledge and experience, or personal needs and interests. The course developers further ensured that all modules included an equal number of activities and tasks aimed at both individual learners and learning groups (e.g. a group of colleagues or student teachers). Another distinguishing feature of the online course is the *Action Plan,* which offers the opportunity to note learners' personal *calls for action* in a pre-structured template available for download at the beginning of every module. Designated *Action Plan Tasks* can be found throughout the course, helping participants translate insights into concrete habits.

2.1 The Modules

It was decided to split the online course up into seven modules, which will be presented in the following. All modules seek to raise awareness, provide practical strategies, and foster reflection on how teachers can enhance their emotional, mental, and psychological well-being. The course thereby supports educators in managing stress, maintaining work-life balance, and building resilience.

2.1.1 Introduction & Foundations

The *Introduction & Foundations* module is meant to create a common ground for all learners, regardless of their prior knowledge of TWB. It therefore introduces the learner to prominent definitions of key terms: the 2021 definition of well-being by the World Health Organization's (WHO) ("a positive state experienced by individuals and societies. Similar to health, it is a resource for daily life and is determined by social, economic and environmental conditions", WHO, 2021, p. 10), and (II) Viac & Fraser's (2020) definition of TWB as "teachers' responses to the cognitive, emotional, health, and social conditions pertaining to their work and their profession" (p. 18). Key concepts such as health, sense of coherence, and salutogenesis are explained, as they are also crucial to the entirety of the course: all modules are based on

the concept of salutogenesis, meaning that health, as defined by the WHO, is not only regarded as the absence of disease but the ability to adapt and self-manage across physical, mental, and social dimensions (Huber et al., 2011). Salutogenesis focuses on strengthening personal and social resources that help people cope and thrive, emphasizing the origins of health rather than disease (Mittelmark et al., 2022). The approach also highlights mental health as a key part of well-being, enabling individuals to realize their abilities, cope with stress, work productively, and contribute to their communities (WHO, 2022). The so-called "sense of coherence," central to the salutogenic approach, reflects the capacity to view life as comprehensible, manageable, and meaningful. Learners are then encouraged to learn about the impact of TWB in particular on pupils and teachers themselves. A *Ripple Effect* activity serves to help learners fully grasp the dimensions of the impact of TWB. Furthermore, prominent research approaches towards TWB, as well as theoretical models of TWB (*PERMA*, the *Flourishing Project* and the *Job Demands-Resources Theory*), are presented to allow for a research-based engagement with the topic. Lastly, influential (individual, relational, and contextual) factors are examined more closely, asking the learners to analyze the factors that influence their own TWB in greater detail.

2.1.2 Teacher Identity: Live Your Values

Aiming to help the learners answer the question, "What do I consider important for my pupils and why?," the "Teacher Identity" module presents four structured activities primarily aimed at groups working on the module collaboratively. For example, one of the activities is the *Pedagogical Priorities Game (PPG)* (developed by HAN University of Applied Sciences), a reflective and interactive tool designed to support (student) teachers in identifying, discussing, and aligning their pedagogical values and priorities in a playful and collaborative setting. By providing space for reflection and open conversation, the game supports teacher autonomy and professional identity-critical factors in promoting well-being. In particular, the *PPG* can help pre- and in-service teachers discover which pedagogical ideals are the most important motivators in their teaching. A set of cards or prompts, each representing a pedagogical priority (e.g., inclusivity, creativity, assessment, student autonomy, collaboration) is presented to the players, who are then asked, through structured rounds, to discuss and rank these priorities based on their personal beliefs, teaching contexts, or institutional goals. The results are then used to facilitate a conversation about their educational values. The game can be adapted for individual reflection, small group discussion, or whole-staff workshops (cf. Van Kan, C.A. 2013, 2020 & 2024). Prior experience with the *PPG* from Utrecht University shows that the game can be best applied during introductory phases – such as *teff Welcome Weeks* – in order to foster a dialogue about teaching values and to enhance awareness about implicit assumptions in pedagogical decision-making. Moreover, playing the game again after several months into the students' teaching practice is also encouraged, to discover whether pedagogical values have changed and, if so, what caused this change.

2.1.3 Work-Life-Balance: Stay Strong

The "Stay Strong! – Work-Life Balance" module focuses on helping teachers maintain a healthy balance between their professional and personal lives; it encourages self-reflection on priorities, time management, and personal limits. Throughout the module, learners encounter various combinations of self-assessment exercises, practical tools, and reflection activities, which support them in managing stress and preventing burnout. Learners are asked to explore their own work-life balance using instruments such as the *Perceived Stress Scale* and the *Copenhagen Burnout Inventory*, while also learning to apply time management techniques, such as the *Eisenhower Matrix* or the *Second Brain* (Forte, 2022). Overall, this module promotes awareness, balance, and resilience as essential elements of TWB. It encourages pre- and in-service teachers to care for their physical and emotional health, reinforcing the idea that sustainable teaching begins with a strong, balanced self.

2.1.4 The Social Dimension of Well-Being: Better Together

The module on "The Social Dimension of Well-being: Better Together" of the online course puts the social aspects of well-being, and the important resources that pre- and in-service learners can draw from them, in the spotlight. In a first step, learners are invited to create their own personal *Well-being Map*, providing an overview on their current social connections and resources within the university or school community (depending on their current role). The module is then split up into two in-depth chapters, one for student teachers, and one for in-service teachers. Here, special focus is placed on the role that methodological choices can play in encouraging students' and pupils' well-being and in fostering their sense of belonging and engagement in the learning environment (Barden & Caleb, 2019; Jones et al., 2021). On the basis of previous research (Brooker, McKague & Phillips, 2019; Frison & Funari, 2025), the module offers strategies and recommendations that may encourage students and teachers to consider how personal and collective approaches and methodological choices can promote well-being in the learning environment. In a final step, learners are encouraged to optimize their *Well-being Map* based on prior reflections and/or discussions inspired by the module.

2.1.5 Teacher Job Satisfaction: Rediscover What Makes Teaching Fulfilling

With the motivational slogan "Rediscover What Makes Teaching Fulfilling," the module "Teacher Job Satisfaction" informs teachers about the importance of teacher job satisfaction (TJS) as well as motivates them to take a deep dive into different factors that can make their job more fulfilling. For this, learners are asked to step out of their role as (future) teachers and receive information on occupational well-being, defined as the "positive evaluation of various aspects of one's job, including affective, motiva-

tional, behavioral, cognitive and psychosomatic dimensions" (Van Horn et al., 2004, p. 366). Subsequently, they asked to apply this content to the teaching profession, allowing for a different angle on their day-to-day job. To delve further into their own experience of TJS, learners are further invited to create a personal Job Satisfaction Timeline, identifying factors that influenced their TJS both positively and negatively. In this module, real quotes from teachers, for example on experiences regarding the school climate, serve as reflection prompts about TJS in general as well as the role of team culture and resilient teams in particular.

2.1.6 Teacher Agency: Be the Change You Want to See

This module aims to motivate teachers to take action to improve their TWB – without placing all the responsibility for their own well-being on them alone. In a section titled, 'It's not all on you!,' (future) teachers are first presented with key research findings highlighting the many factors responsible for the state of one's TWB: from the – often overstated – role of mindfulness, to the decisive role of school leaders to the importance of systematic solutions. The module then proceeds to explain key concepts such as *Agency* and *Leadership*. Learners are finally introduced to different approaches to *Job Crafting* before defining concrete actions they can do themselves in order to (re-)gain agency in their personal job context.

2.1.7 Wrap-Up: Beyond Teacher Well-Being

The Wrap-Up module offers concrete reflection prompts related to the *Action Plan,* helping participants clearly recognize the added value of this take-away and emphasizing the long-term impact of the knowledge gained today. In addition, this module extends the perspective *beyond* TWB and opens up further well-being dimensions within school contexts. Interested readers will find materials for continued exploration, such as developing a school culture of well-being, or understanding the role of well-being within the broader Future Skills framework.

3. Dissemination & Integration into Teachers' Life-Long Professional Development

Due to its high level of flexibility, the online course can be implemented in many different modalities and contexts, some of which will be illustrated here to conclude:

- Blended Intensive Programmes (BIPs)[1]: the modules can be used as preparation for a BIP – both before and during the on-site phase. They support structured reflec-

1 The module has been introduced, for example, in the BIP proposed by the University of Florence in collaboration with the Universities of Cologne, Linnaeus, Murcia and Oslomet addressed to "Well-being of Future Teachers and Education Professionals" and implemented in November 2025.

tion that feeds directly into face-to-face activities and guide participants in developing their *Action Plan* throughout the week.

- Continuous professional development for teachers (e.g., pedagogical days in schools, cross-phase initiatives): the content is well suited for professional development events, including pedagogical days or cross-phase training formats, in that it is connected to various exercises for joint exploration, discussion, and skills development across different professional stages.
- University seminars/lectures: the modules provide numerous reflection prompts and activity ideas that can be integrated into teaching – especially in hybrid settings. Individual units can be used to enrich classes, encourage discussion, or frame practical exercises in both online and in-person learning.
- Welcome Weeks/student orientation events: selected tasks work well for group-building activities during Welcome Weeks or other initial teacher education (ITE) orientation events. Some elements – particularly those focusing on student well-being – have already been tested successfully and support both engagement and community-building from day one.

In conclusion, the designed online course has the potential to serve as a cross-phase learning opportunity and, in the future, to support TWB both across different educational stages and throughout Europe.

References

Barden, N., & Caleb, R. (Eds.). (2019). *Student mental health and wellbeing in higher education: A practical guide*. SAGE.

Berger, E., Reupert, A., Campbell, T. C. H., Morris, Z., Hammer, M., Diamond, Z., Hine, R., Patrick, P., & Fathers, C. (2022). A systematic review of evidence-based wellbeing initiatives for schoolteachers and early childhood educators. *Educational Psychology Review, 34*(4), 2919–2969. https://doi.org/10.1007/s10648-022-09690-5

Brooker, A., McKague, M., & Phillips, L. (2019). Implementing a whole curriculum approach to student wellbeing. *Student Success, 10*(3), 55–63. https://doi.org/10.5204/ssj.v10i3.1411

DCU Institute of Education. (2025). *DCU study finds significant burnout and poor mental health among Irish teachers*. https://www.dcu.ie/instituteofeducation/news/2025/apr/dcu-study-finds-significant-burnout-and-poor-mental-health-among

Forte, T. (2022). *Building a second brain: A proven method to organize your digital life and unlock your creative potential*. Simon & Schuster.

Frison, D., & Funari, C. (2025). Student well-being: Supporting well-being skills development for well-being in learning and professional contexts. *Form@re – Open Journal per la Formazione in Rete, 25*(1), 398–414. https://doi.org/10.36253/form-17160

Hascher, T., & Waber, J. (2021). Teacher well-being: A systematic review of the research literature from the year 2000–2019. *Educational Research Review, 34*, 100411. https://doi.org/10.1016/j.edurev.2021.100411

Huber, M., Knottnerus, J. A., Green, L., van der Horst, H., Jadad, A. R., Kromhout, D., Leonard, B., Lorig, K., Loureiro, M. I., van der Meer, J. W., Schnabel, P., Smith, R.,

van Weel, C., & Smid, H. (2011). How should we define health? *BMJ, 343*, d4163. https://doi.org/10.1136/bmj.d4163

Jones, E., Priestley, M., Brewster, L., Wilbraham, S. J., Hughes, G., & Spanner, L. (2021). Student wellbeing and assessment in higher education: The balancing act. *Assessment & Evaluation in Higher Education, 46*(3), 438–450. https://doi.org/10.1080/02602938.2020.1782344

Klusmann, U. (2024). Berufliches Wohlbefinden von Lehrkräften nachhaltig fördern: Warum wir mehr als Achtsamkeitstrainings brauchen. *Die Deutsche Schule, 116*(4), 395–402. https://doi.org/10.31244/dds.2024.04.08

McCallum, F., & Price, D. (2016). *Nurturing wellbeing development in education*. Routledge.

Mental Health Foundation. (2018). *Shocking research reveals half of teachers affected by mental ill health due to work pressure*. https://www.mentalhealth.org.uk/about-us/news/shocking-research-reveals-half-teachers-affected-mental-ill-health-due-work-pressure

Mittelmark, M. B., Bauer, G. F., Vaandrager, L., Pelikan, J. M., Sagy, S., Eriksson, M., Lindström, B., & Meier Magistretti, C. (Eds.). (2022). *The handbook of salutogenesis* (2nd ed.). Springer. https://doi.org/10.1007/978-3-030-79515-3_1

Robert Bosch Stiftung. (2024a). *Deutsches Schulbarometer: Befragung Lehrkräfte. Ergebnisse zur aktuellen Lage an allgemein- und berufsbildenden Schulen* (Forschungsbericht). https://www.bosch-stiftung.de/sites/default/files/documents/2024-04/Schulbarometer_Lehrkraefte_2024_FORSCHUNGSBERICHT.pdf

Van Horn, J. E., Taris, T. W., Schaufeli, W. B., & Schreurs, P. J. G. (2004). The structure of occupational well-being: A study among Dutch teachers. *Journal of Occupational and Organizational Psychology, 77*, 365–375. https://doi.org/10.1348/0963179041752718

Van Kan, C. A. (2013). *Teachers' interpretations of their classroom interactions in terms of their pupils' best interest: A perspective from continental European pedagogy*. Ipskamp.

Van Kan, C. A. (2020). *Bumpy moments: Een handreiking voor het verkennen, verwoorden en bespreken van pedagogische waarden*. Friesland College.

Van Kan, C. A., & De Beer, F. (2024). Pedagogische prioriteiten: In dialoog op zoek naar de eigen pedagogische waarden en idealen. *Tijdschrift voor Lerarenopleiders*.

World Health Organization. (2021). *Health promotion glossary of terms 2021*. World Health Organization. https://www.who.int/publications/i/item/9789240038349

World Health Organization. (2022). *World mental health report: Transforming mental health for all*. https://www.who.int/publications/i/item/9789240049338

E.
A Sense of Belonging:
Fostering Diversity & Inclusion Skills

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Lotte Henrichs & Martine van Rijswijk

Attending to Sense of Belonging in Teacher Education: A Twofold Necessity

Abstract
In this chapter we reflect on the dual task of teacher educators on the topic of 'Belonging.' Dual in the sense that, firstly, teacher educators need to tend to the sense of belonging perceived by their students (the prospective teachers). Secondly, they need to educate prospective teachers about the importance of a sense of belonging experienced by their pupils and equip them with the practical skills associated with fostering a sense of belonging in school. Here, we emphasize the critical importance of belonging in urban, super-diverse schools and advocate for "brave spaces" in teacher education to cultivate belonging and model practices for prospective teachers. We conclude with discussing challenges for teacher educators in their endeavour to stay connected in diversity and the necessity of an open and collegial environment where those challenges are regarded as sources for growth. This chapter further explicates the theoretical basis of *teff* Work Package 5 on diversity and inclusion, which led to an online course and a series of lectures and workshops on sense of belonging in educational settings.

Keywords: Sense of belonging; Brave spaces; Pedagogical Considerations in Teacher Education

Introduction

Research on teacher well-being demonstrates that a sense of belonging is crucial for teachers to feel effective and at ease at work. When teachers experience a sense of belonging, they feel accepted, respected, included, and supported within their school environment (Goodenow & Grady, 1993; Walton & Cohen, 2007). Determining factors associated with both concepts (sense of belonging and teacher well-being) are described in terms of 1) personal aspects, such as perceived self-efficacy (Bermejo-Toro et al., 2016; Zee & Koomen, 2016), 2) relational aspects, such as the quality of student-teacher and colleague relationships (Spilt, Koomen & Thijs, 2011; Vanassche, 2025) and in terms of 3) working conditions, such as shared ideals and values, workload, salary, and whether or not a culture of cooperation is experienced (Borman & Dowling, 2008). Research indicates that reduced teacher well-being is closely linked to the interaction of the aforementioned factors, particularly the tensions teachers

experience in their relationships within the school, and in the extent to which they feel genuinely seen and heard – that is, in their sense of belonging (Kelchtermans, 2017).

In this chapter, we argue that attending to a sense of belonging in teacher education (both as a theoretical concept and as a lived concept) can contribute to prospective teachers' well-being on two levels. Firstly, we explore belonging at the level of connectedness that prospective teachers themselves experience within their learning environment at the teacher education institute (Tomlinson & Jackson, 2021). This touches on the core of professional identity formation: who am I as a (future) teacher, and what values and ideals do I want to promote? Creating a learning environment that allows for critical reflection, 'uncomfortable dialogue' and experimentation is crucial in this regard (van Rijswijk, 2020). Secondly, we examine how teachers can support *pupils*'[1] sense of belonging as an important tool for developing a sense of self-efficacy. This is particularly salient when teachers work with highly diverse pupil populations for whom a sense of belonging is not always self-evident (cf. Celeste et al., 2019). If we can convey to teachers during their training how important a sense of belonging is – by allowing them to experience it firsthand and equipping them with the theory, tools and skills needed to foster belonging in their pupils – we can better prepare them for their future roles and let them enter the profession with greater confidence and professional competence (Henrichs et al., 2023). Both levels we discuss are in line with the central concepts and core practices highlighted in the *teff* learning module Diversity and Inclusion Skills in Education (work package 5), especially subtheme culturally responsive teaching.

In our view, teacher educators therefore have a multi-layered task. They can be expected to support prospective teachers in their professional growth by facilitating their sense of belonging within the programme. In addition, teacher educators should encourage prospective teachers to develop the skills needed to create an inclusive learning environment for pupils, in which a feeling of belonging is crucial. We discuss why school belonging is especially important in urban and super-diverse contexts and propose using "brave spaces" in teacher education to foster belonging and model practices for teachers. An illustration of such a brave space working format can be found in Henrichs & Verhoeven, this volume (Henrichs & Verhoeven, 2026).

Sense of Belonging in a Super-diverse Context

The Graduate School of Teaching in Utrecht in the Netherlands can be characterised as an urban and occasionally super-diverse setting. The term super-diversity was coined by Vertovec (2007) to refer to a situation where the sum of groups from a non-dominant background outnumbers the dominant group. This is often the case in large cities in Europe. In such contexts, teachers must responsibly and equitably

1 We choose the word pupil here to make the distinction between our students (the prospective teachers) and the students our students teach (the pupils) more clear. Our students teach at the secondary school level, ages 12–18.

address a considerable degree of socio-economic, ethnic-cultural, linguistic, and other forms of diversity (Gaikhorst et al., 2023).

Research has shown that teachers working in urban contexts experience relatively more work-related stress and lower professional self-efficacy (Gaikhorst & Volman, 2023). As a result of these experiences, teacher attrition is also higher in these contexts (Borman & Dowling, 2008; Polderdijk et al., 2025). Furthermore, it has been found that pupils who grow up in urban and super-diverse contexts more often experience discontinuity between their home and school environment, resulting in a lower sense of school belonging (Goodenaw & Grady, 1993; Esteban-Guitart, 2023).

As a result of divergent perspectives, pupil-teacher relationships can become strained, which can have negative effects on the well-being of teachers and pupils. Although strong pupil-teacher relationships are pivotal in all education settings, they are particularly consequential for pupils growing up in adverse circumstances (Roorda et al., 2011). Therefore, particularly in super-diverse contexts, a sense of belonging is fundamental – both at the level of the teacher (Do I feel part of this community that our school should be?) and at the level of the pupil (Is this school a place where I can be myself and where my perspective is valued?). Opposite to belonging is a sense of belonging uncertainty: the fundamental doubt about whether one belongs in a particular social or professional context (Walton & Cohen, 2007). This uncertainty mainly affects members of non-dominant groups (in whatever sense) and can lead to a vicious circle in which a low subjective sense of competence undermines connectedness, which in turn negatively affects performance (Storms & McCaul, 1976). In total, to be prepared to teach in urban and super-diverse contexts, it is necessary for teachers to be knowledgeable about issues surrounding social inequality and how these relate to issues of belonging.

'Brave Space': Connecting in Diversity

Social bonds with colleagues, fellow-students and pupils are crucial for the development of a sense of belonging, as is connection with the organisational culture of the teacher education programme or with the school's vision (Kelchtermans, 2017). Connectedness in diversity requires a courageous attitude, where uncertainty and discomfort are not to be avoided and people feel unhindered to express potentially divergent perspectives (Arao & Clemens, 2013).

To foster a sense of belonging among diverse groups with different perspectives in teacher education programmes, we propose that it is important to create the conditions necessary for *brave spaces* (Arao & Clemens, 2013; Cook Sather, 2016) within the educational setting. We use Arao and Clemens' (2013) description of ways in which a *brave* space differs from a *safe* space. Table 1 shows the typical ground rules that arise when one negotiates ground rules for a group discussion on possibly sensitive topics (left column). The right column shows how ways of working in a *brave space* are slightly different and indeed appeal for bravery.

Table 1: Common rules for safe spaces, adapted from Arao & Clemens (2013)

Characteristic ground rules for a 'Safe Space'	**Nuances for a 'Brave space'[a]**
1. Agree to disagree	Conflict is not necessarily undesirable. Rather, conflict can be a natural outcome of working with a diverse group. One should strive for a deep understanding of the *causes* of conflict. In a brave space, disagreements are appreciated as a source of innovation.
2. Don't take things personally	Participants should indicate when they feel personally affected. This is a valuable learning moment. The other acknowledges the impact that was made and learns to become more conscious of the difference between intention and impact.
3. Challenge by choice (participants can decline to join in the conversation)	Just like in a safe space, no one can be forced to join in an activity or conversation. But, paying attention to the underlying factors that make one of the participants hesitant to join are worth exploring and even crucial. The facilitator must actively encourage this reflection, for the group to learn from. Also, with respect for personal boundaries, a facilitator might encourage participants to speak up to make all voices heard.
4. Show Respect	In a brave space, it is imperative to discuss what 'respectful behaviour' looks like. Respect might not look or entail the same for all participants. Discussing acceptable ways to indicate you don't agree can help to negotiate a notion of respect that works for all participants.
5. No attacks	Just like described above, in a brace space participants will discuss when an argument feels like an attack. The group needs to discuss the difference between a personal attack and an objection to an opinion or a belief. The discomfort after such an objection can induce a defensive response, without the objection being an attack. Shifting to a discussion of the causes of that discomfort is valuable for learning.

[a]Note. Nuances described by Arao & Clemens (2013) were summarized by the authors.

In teacher education programmes and in professional development, (prospective) teachers ideally develop the bravery to share their own perspective, without trying to convince others, and actively invite fellow students to share their own opinions. This creates space to learn about other perspectives and to examine and critically question one's own perspective. In doing so, prospective teachers learn that differences in perspective are not only inevitable but also productive – and desirable (cf. Alhanachi et al., 2021).

Henrichs & Verhoeven (2026) as well as van der Eng et al. (pp. 140–145) offer concrete learning activities in teacher education at Utrecht University, referring to the principles of brave spaces and belonging. In these case descriptions, we address issues of social inequality while attending to the sense of belonging on both levels discussed and highlight its importance for pupils in super-diverse contexts.

Final Considerations: Challenges for Teacher Educators

We discussed challenges and opportunities connected to belonging in teacher education in the international *teff* network. These discussions sharpened our ideas about supporting a sense of belonging in teacher education and helped us to reflect on our work as teacher educators in our own institutes. A dominant theme in our discussion is the important role of the teacher educator and the ways in which their positionality and the socio-cultural context of the professional development schools they work with might impact their work (cf. Hosseini et al., 2024).

Teacher educators can play a powerful role as advocates for inclusivity in education. However, when belonging is pursued within a (too) strongly normative group culture, there is a risk of losing the pedagogical potential of diversity, and thus, multi perspectivity (Gilani & Thomas, 2025). If that happens, students with beliefs that deviate from the norm will no longer feel empowered to express their own beliefs and pedagogical vision. This can evoke belonging uncertainty, manifesting as sadness or anger, and lead to a reduced willingness to take on pedagogical responsibility (Slepian & Jacoby-Senghor, 2021). For teacher educators, this means seeking to facilitate belonging through continuous pedagogical considerations and critical reflection on their own professional performance.

A sense of belonging in teacher education is not limited to course components and activities where 'sense of belonging' and diversity are explicit theoretical themes, but should play a role throughout the entire curriculum. The entire programme bears responsibility to remain sensitive to issues of belonging in their students. Consequently, we argue that creating conditions for open, collegial exchange within the teacher education programme is important; it is essential to move beyond the safe space and create a brave space among colleagues, in which pedagogical tensions can be used as a source of learning and growth (Gilani & Thomas, 2025).

Acknowledgements
This contribution is an adapted version of Samyn et al. (2025) that was published in the Dutch and Flemish journal for Teacher Education (*Tijdschrift voor Lerarenopleiders*). We acknowledge the contributions of our colleagues from Leuven University: Randy Samyn, Evelien Flamez and Chidia Ari.

References

Alhanachi, S., De Meijer, L., & Severiens, S. (2021). Improving culturally responsive teaching through professional learning communities: A qualitative study in Dutch pre-vocational schools. *International Journal of Educational Research, 105*, 101698. https://doi.org/10.1016/j.ijer.2020.101698

Arao, B., & Clemens, K. (2013). From safe spaces to brave spaces: A new way to frame dialogue around diversity and social justice. In L. M. Anderman (Ed.), *The art of effective facilitation: Reflections from social justice educators* (pp. 135–150). Routledge.

Bermejo-Toro, L., Prieto-Ursúa, M., & Hernández, V. (2016). Towards a model of teacher well-being: Personal and job resources involved in teacher burnout and engagement. *Educational Psychology, 36*(3), 481–501. https://doi.org/10.1080/01443410.2015.1005006

Borman, G. D., & Dowling, N. M. (2008). Teacher attrition and retention: A meta-analytic and narrative review of the research. *Review of Educational Research, 78*(3), 367–409. https://doi.org/10.3102/0034654308321455

Celeste, L., Baysu, G., Phalet, K., Meeussen, L., & Kende, J. (2019). Can school diversity policies reduce belonging and achievement gaps between minority and majority youth? Multiculturalism, colourblindness, and assimilationism assessed. *Personality and Social Psychology Bulletin, 45*(11), 1603–1618. https://doi.org/10.1177/0146167219838577

Esteban-Guitart, M. (2023). Invisible funds of identity in urban contexts. *Urban Education, 58*(7), 1449–1469. https://doi.org/10.1177/00420859211016536

Gaikhorst, L., & Volman, M. L. L. (2023). Preparing and supporting beginning teachers for the challenges of teaching in urban primary schools. In I. Menter (Ed.), *Palgrave handbook of teacher education research* (pp. 1091–1107). Palgrave Macmillan. https://doi.org/10.1007/978-3-031-16193-3_40

Gilani, D., & Thomas, L. (2025). Understanding the factors and consequences of student belonging in higher education: A critical literature review. *Journal of Learning Development in Higher Education, 34*, 1–46. https://doi.org/10.47408/jldhe.vi34.1464

Goodenow, C., & Grady, K. E. (1993). The relationship of school belonging and friends' values to academic motivation among urban adolescent students. *Journal of Experimental Education, 62*(1), 60–71.

Henrichs, L., Brummel, E., Boerma, A., & Moormann, I. (2023). How competent do (prospective) Dutch secondary school teachers feel about culturally responsive teaching? Their experiences and recommendations for teacher training programmes. *Tijdschrift voor Lerarenopleiders, 44*(1), 1–19. https://doi.org/10.63379/fjh3v905

Henrichs, L., & Verhoeven, M. (2026). Belonging as both content and practice in a diversity-sensitive teaching course. In J. Springob, D. Frison, D. M. Benincasa, G. del Gobbo, & B. Busse (Eds.), *(Re)Imagining teacher education for a future in flux. Perspectives from the erasmus+ teacher academy teff* (pp. 134–139). Waxmann. https://doi.org/10.31244/9783818851583.16

Hosseini, N., Leijgraaf, M., Gaikhorst, L., & Volman, M. (2024). Practices of social justice-oriented teacher education: A review of the literature. *Frontiers in Education, 9*. https://doi.org/10.3389/feduc.2024.1432617

Kelchtermans, G. (2017). "Should I stay or should I go?": Unpacking teacher attrition/retention as an educational issue. *Teachers and Teaching: Theory and Practice, 23*(8), 961–977. https://doi.org/10.1080/13540602.2017.1379793

Polderdijk, S., Henrichs, L. F., & Van Tartwijk, J. (2025). Warm and demanding teacher practices reviewed from an interpersonal perspective: A qualitative synthesis of urban classroom management. *Teaching and Teacher Education, 155*, 104898. https://doi.org/10.1016/j.tate.2024.104898

Roorda, D. L., Koomen, H. M. Y., Spilt, J. L., & Oort, F. J. (2011). The influence of affective teacher-student relationships on students' school engagement and achievement: A meta-analytic approach. *Review of Educational Research*, *81*(4), 493–529.

Samyn, R., Flamez, E., Ari, C., Henrichs, L., & Rijswijk, M. van. (2025). Het stimuleren van sense of belonging in en door de lerarenopleiding: Voorbeelden uit Vlaanderen en Nederland. *Tijdschrift voor Lerarenopleiders*, *46*(4), 9–24. https://doi.org/10.63379/jdwkh363

Slepian, M. L., & Jacoby-Senghor, D. S. (2021). Identity threats in everyday life: Distinguishing belonging from inclusion. *Social Psychological and Personality Science, 12*(3), 392–406. https://doi.org/10.1177/1948550619895008

Spilt, J. L., Koomen, H. M. Y., & Thijs, J. T. (2011). Teacher well-being: The importance of teacher–student relationships. *Educational Psychology Review, 23*(4), 457–477. https://doi.org/10.1007/s10648-011-9170-y

Storms, M. D., & McCaul, K. D. (1976). Attribution processes and emotional exacerbation of dysfunctional behaviour. In J. H. Harvey, W. J. Ickes, & R. F. Kidd (Eds.), *New directions in attribution research* (Vol. 1, pp. 143–164). Erlbaum.

Tomlinson, M., & Jackson, D. (2021). Professional identity formation in contemporary higher education students. *Studies in Higher Education, 46*(4), 885–900. https://doi.org/10.1080/03075079.2019.1659763

Vanassche, E. (2025). Shaping schools: School culture, professional relationships, development and leadership. In J. Elen & A. Thys (Eds.), *Learning in socially engaged education: Basic insights for teachers now and in the future* (3rd ed.). Leuven University Press.

Van Rijswijk, M. M. V. (2020). *Experiences of continuity and discontinuity in student teachers' development*. Doctoral dissertation, Utrecht University.

Vertovec, S. (2007). Super-diversity and its implications. *Ethnic and Racial Studies, 30*(6), 1024–1054. https://doi.org/10.1080/01419870701599465

Walton, G. M., & Cohen, G. L. (2007). A question of belonging: Race, social fit, and achievement. *Journal of Personality and Social Psychology, 92*(1), 82–96.

Zee, M., & Koomen, H. M. Y. (2016). Teacher self-efficacy and its effects on classroom processes, student academic adjustment, and teacher well-being: A synthesis of 40 years of research. *Review of Educational Research, 86*(4), 981–1015. https://doi.org/10.3102/0034654315626801

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Lotte Henrichs & Monique Verhoeven

Belonging as Both Content and Practice in a Diversity-Sensitive Teaching Course

Abstract
In this chapter, we present and discuss a nine-week course for teacher education at Utrecht University that was designed to help prospective teachers learn and reflect on teaching practices that do justice to a diverse classroom: diversity-sensitive teaching. We present ways in which we aimed to simultaneously foster a sense of belonging in our students (prospective teachers) and teach them about how they could foster a sense of belonging in their students when teaching themselves. This course reflects core practices that are highlighted in the subtheme 'Culturally Responsive Teaching' within the Diversity and Inclusion Skills in Education learning module, developed by the *teff* Academy.

Keywords: Diversity-sensitive teaching; Sense of belonging in teacher education; Brave space

Introduction

Social justice-oriented teacher education is essential for preparing teachers to recognize, question, and challenge structural inequalities that shape students' educational experiences. Programs that adopt such a justice-oriented perspective foster critical consciousness in their students through exercises of critical reflection on issues of power imbalance, positionality, privilege and exclusion, in order for them to recognize the socio-cultural factors that shape and reproduce inequality (Hosseini et al., 2024; Sensoy & DiAngelo, 2017). In the *teff* online learning module Diversity and Inclusion Skills in Education, these themes are discussed in subthemes Culturally Responsive Teaching and The Activist Teacher – all part of work package 5, coordinated by Utrecht University.

For prospective teachers, learning about ways in which they can foster *school belonging* in their pupils[1] is an important element of their pedagogical toolkit, which they need to contribute to breaking the cycle of inequality (Çolak et al., 2026). The concept of school belonging is defined by Goodenaw and Grady (1993, p. 80) as "the

1 We choose the word pupil here to make the distinction between our students (the prospective teachers) and the students our students teach (the pupils) more clear. Our students teach at the secondary school level, ages 12–18.

extent to which students feel personally accepted, respected, included and supported by others in the school social environment." Çolak and colleagues (2026), however, warn against studying the concept as an individual trait (an ability to 'fit in') but rather as the outcome of systemic inequalities and the positions and actions of others. Their study shows that teachers can play a pivotal and positive role in cultivating a sense of belonging in pupils. Centering the role of teacher education, Henrichs and Van Rijswijk (this volume) argue that teacher education must attend to belonging on two interconnected levels (Henrichs & Van Rijswijk, this volume): first, within the educational environment of the student teacher themselves, and second in relation to the pupils they teach. In this contribution, we offer a concrete example of how we, as teacher educators, aim to address both of these levels through an elective course on diversity-sensitive teaching at Utrecht University.

The elective course 'Diversity-sensitive teaching in practice' is a nine-week course which is taught by two teacher educators and aims to equip students with an 'asset-based' perspective of diversity in the classroom. By 'asset-based,' we mean refraining from thinking in terms of deficits and disadvantages of individual pupils (and, possibly, their communities). Instead, we invite the student teachers to focus on the knowledge, skills, and invaluable experiences their students bring to class (cf. Moll, 1992). Moreover, in doing so, we consider systemic inequalities and the student teacher's own sphere of influence in valuing and utilizing differences between pupils to provide meaningful learning opportunities for all (including the teacher). To develop this asset-based perspective, we ask the student teachers in the course to select an educational dilemma that they are encountering in their teaching practice and that is related to diversity in its broadest sense (e.g. cognitive, gender identity, ethnic, cultural, socio-economic diversity). The student teachers are then invited to determine whether a reformulation of their initial educational dilemma (often phrased in deficit terms) is needed to allow an approach from an asset-based perspective (López, 2023). The students then work together to find an alternative course of action for each of their dilemmas, also based on scientific literature. After practically trying to make use of this alternative course of action in their own teaching practice, they end the assignment by reflecting on the outcomes. The final product for students is a written report of this process and a poster they present to their fellow students and to friends, family, and interested colleagues of our graduate school.

Main Activities in the Course

1. The Cultural Iceberg

During the first of a total of nine meetings, we used the metaphor of the cultural iceberg to get to know each other and immediately begin exploring the theoretical basis of the course (Sensoy & Di'Angelo, 2017, p. 60). In this framework, each student asks the other a question about a 'surface characteristic' (visible cultural characteristics such as food, language, celebrated holidays or clothing style) and then about a 'deep characteristic' (less visible characteristics such as values regarding polite behaviour,

upbringing, or communication patterns). This is a fun and low-threshold activity that allows everyone to get to know each other while making everyone aware of how their positionality (the way they are socialized into different groups resulting in a particular position in society) shapes the way they experience and access the world around them. After an initial round of surface and deep characteristics, the teacher educators facilitate a more in-depth discussion by asking the students questions such as: How have you yourself been socialized in a specific (sub)culture (e.g. a religious community, gender role, speaker of a language other than the dominant language, omnipresent political views in their family etc.)? And how does that outcome affect your ideas about teaching and your expectations in the classroom? We discuss what defines 'culture' and students take a first step in exploring their positionalities. These exercises lay the foundation for the theoretical and personal discussions that will follow over the coming weeks.

2. Ground Rules for a Brave Space

Prior to the first meeting, students read the book chapter by Arao and Clemens (2013), "From Safe Spaces to Brave Spaces. A New Way to Frame Dialogue Around Diversity and Social Justice". This allowed the group to start from a shared knowledge base, which is supplemented in dialogue within the group. In the first meeting, we discussed that we might touch upon sensitive topics over the course of the next couple of weeks (see 'experiences' below). Therefore, we invited them to jointly articulate ground rules for respectful exchange in such discussions, and noted them on the white board. For a description of the difference between a 'safe space' and a 'brave space,' we refer to Henrichs und Van Rijswijk (this volume).

As predicted by Arao and Clemens (2013), the first rules that the group came up with were typical rules for safe spaces, such as 'be respectful,' 'participation by choice,' and 'don't take things personally.' When no more input came from the students, we as teachers challenged them to think about nuances for brave spaces. We steered towards awareness that differences of opinion can arise when working in a diverse group. We dug deeper into the rule 'be respectful,' by talking about whether respectful behavior looks alike for all of us, and what should happen when one feels hurt by another. The most important outcome of our discussion was that we agreed that even when there was disagreement or discomfort, we always wanted to learn from it. This raised the question: how do you know whether someone else has actually learned from an incident or a moment of friction? Together, we concluded that learning could be made apparent when the person that contributed a contrasting perspective was able to articulate the impact this had on someone else. This required the person that felt hurt felt safe enough to admit that they did feel personally affected (see the initial rule 'don't take things personally'). Learning from the impact one has had on someone else does not necessarily mean that you have adjusted your opinion or vision. It does, however, mean that you are aware of how this opinion is informed by your own positionality and of how this opinion may impact someone else with a different positionality. This allows you to learn from the moment of friction in a way that you can take these insights with you to the next relevant moment. This discussion clearly

allowed us to move beyond the initial 'agree to disagree' and lay the foundation for a brave space in which we try to understand each other's perspectives and show courage by disclosing our perspectives.

3. Working on the Educational Dilemmas

The dilemmas that students worked on varied widely. Last year, for example, one student worked on asset-based ways in which she could engage a hearing-impaired student. She found ways to adapt her training materials with visualizations that not only helped the hearing-impaired student but were also beneficial for the rest of the classroom. Another student observed that children from lower socio-economic backgrounds experienced a greater distance to the subject matter in her geography lesson than students from higher socio-economic backgrounds. The latter students were much more familiar with a variety of landscapes and cultures because they were generally able to travel during holidays, which is not a privilege all students enjoy. In the assignment, the student was inspired to use the funds of knowledge approach (Moll, 1992) to create a teaching guideline for geography education to make an inventory of all students' funds of knowledge so as to explore topics and examples that connect to the lived experiences of a wider variety of students in the classroom.

4. Case Discussion in Dialogue Form

Nearing the end of the course, we organized a discussion on a possibly sensitive topic in order to practice how one could go about this in their own classroom. We used a case discussion to do this. During case discussions, the teacher trainers act as moderators. The aim of the discussion is not to convince each other or find a solution, but to gain a deeper understanding of the complexity of the situation. It is about recognising and understanding different perspectives and linking concepts related to social inequality such as 'positionality', 'systemic racism,' and 'microaggression' to educational practice (Sensoy & Di'Angelo, 2017).

Recently, we chose to discuss the (authentic) case of a teacher who, while reading out the class list, asked a pupil with a non-Western-sounding surname, "Where do your roots lie?". The pupil responded angrily and irritably, "I was born here!" Using a moderated dialogue format in which students choose objects (e.g., a pencil, a figurine, a scarf) that can represent actors, factors, and emotions, they explore what makes the situation complex and what alternative courses of action there might be. The case discussion yielded a diverse range of perspectives and certainly had its moments of friction. For example, one student was able to vividly empathize with the pupil's pain and wanted to prevent something like this from happening at all costs. But there was also a student who struggled with this case: after all, the question was only asked out of interest and was not meant to be unpleasant, so why was the teacher portrayed as an aggressor? It was fascinating to see how these different perspectives evolved and how students reacted upon each others' input. After the case discussion, every student indicated that they found the discussion useful and had gained ideas for engaging in dialogue with pupils in this way. We did check afterwards in a one-on-one conversa-

tion with the student who asked the question about the good intentions, whether his experience was positive as well – we were relieved it was.

Experiences

Sensitive topics came up frequently throughout the course. Student teachers often indicate – also in other settings or contexts than this particular one – that they feel unsure about how to act when exemplary scenarios discussed in this course would happen in their own classroom. They also regularly think that any dilemma they experience is purely due to their inexperience in the profession. Exchange with others is central to the course, so a safe learning environment is crucial. Students must dare to be vulnerable, dare to make mistakes (and the same goes for us as teacher educators), and dare to be constructively critical of others to arrive at alternative courses of action together. A sense of belonging is indispensable to achieve this goal.

As teacher trainers, we continually reflect on how we think the course is progressing and whether we should adapt elements. As each group brings along a completely unique dynamic, this is necessary each year we teach the course. Hence, co-teaching the course is highly valuable, as it enables us to reflect on classroom dynamics and observe each others' role herein.

We contend that the cultural iceberg works well. Participants share what they feel inspired to share, not yet knowing each other. There is often laughter, unexpected insights, and the emergence of 'fun facts'. In this way, we are able to lay the foundation for a 'sense of togetherness' that we built upon in the remaining sessions. When drawing up ground rules together, the students initially tended towards rules for a safe space. It was challenging for us as teacher educators to push back against those ground rules to redirect towards guidelines that would enable a brave space: a space that not only allows for safety, but also for functional discomfort (cf. Henrichs & Van-Rijswijk, this volume). Only then can actual understanding and learning take place. However, this process can be uncomfortable and distressing at times, although the intention is for students to consistently feel safe, heard, and part of the group. As teacher educators, we feel strongly responsible for shaping this learning environment and for how the student teachers feel about the learning environment of their pupils. This creates a powerful setting in which we learn from each other, push boundaries, and reflect on why some situations make us feel uncomfortable. According to the student teachers, the conversation we had at the very beginning of the course contributed to a safe and constructive atmosphere, in which everyone felt prepared to engage in conversation about a potentially sensitive subject (the case discussion) with each other. This is a crucial condition for experiencing a sense of belonging themselves and models how they could work on fostering a sense of belonging experienced by their own pupils in school.

Acknowledgements
The course we describe here was based on a prior course designed by Dr. Brianna Kennedy and Dr. Bjorn Wansink. We would like to acknowledge that their work was an indispensable basis for this course.

References

Arao, B., & Clemens, K. (2013). From safe spaces to brave spaces: A new way to frame dialogue around diversity and social justice. In *The Art of Effective Facilitation. Reflections from Social Justice Educators* (pp. 135–150). Routledge.

Çolak, F. Z., Parra, S. L., & Wansink, B. (2026). "I just get a different feeling in this class": Belonging as affective praxis at a Dutch urban secondary education school. *Journal of Community Psychology*, *54*(1), e70073. https://doi.org/10.1002/jcop.70073

Goodenow, C., & Grady, K. E. (1993). The relationship of school belonging and friends' values to academic motivation among urban adolescent students. *Journal of Experimental Education, 62*(1), 60–71. https://doi.org/10.1080/00220973.1993.9943831

Henrichs, L., & Van Rijswijk, M. (2026). Attending to sense of belonging in teacher education: A twofold necessity. In J. Springob, D. Frison, D. M. Benincasa, G. del Gobbo, & B. Busse (Eds.), *(Re)Imagining teacher education for a future in flux. Perspectives from the erasmus+ teacher academy teff.* Waxmann. https://doi.org/10.31244/9783818851583.16

Hosseini, N., Leijgraaf, M., Gaikhorst, L., & Volman, M. (2024). Practices of social justice-oriented teacher education: A review of the literature. *Frontiers in Education, 9*. https://doi.org/10.3389/feduc.2024.1432617

Lopez, F. (2023). Asset-based pedagogy. In P. A. Shutz & K. R. Muis (Eds.), *Handbook of educational psychology* (4th ed.). Routledge.

Moll, L. C., Amanti, C., Neff, D., & Gonzalez, N. (1992). Funds of knowledge for teaching: Using a qualitative approach to connect homes and classrooms. *Theory Into Practice*, *31*(2), 132–141. https://doi.org/10.1080/00405849209543534

Sensoy, Ö., & DiAngelo, R. (2017). *Is everyone really equal? An introduction to key concepts in social justice education*. Teachers College Press. http://ebookcentral.proquest.com/lib/uunl/detail.action?docID=4988008

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Karen van der Eng & Koen Hoondert

Beyond Pigeonholing: Introducing an Elective Course on Social Justice and Belonging in Teacher Education at Utrecht University

Abstract
A sense of belonging is a crucial condition for meaningful and effective education. Teachers not only need to experience belonging within their professional contexts but also play a key role in cultivating belonging among their pupils. For this reason, belonging should be a core concern of teacher education. However, a sense of belonging is not evenly distributed, both in society and within education systems. In tracked education systems, such as the Dutch system, pupils (and teachers) are separated at an early age into different educational tracks, a process that has a profound impact on their sense of belonging. Teachers who can analyse inequality, design inclusive interventions, and articulate visions of educational justice are better prepared to foster belonging in their classrooms. In this chapter, we examine the relationship between belonging and social justice in teacher education by introducing an elective course within a Dutch postgraduate teacher education programme. In this course, student teachers critically analyse their educational context, design an intervention aimed at promoting inclusion, and articulate a vision of "good education" oriented towards greater justice and belonging. We argue that this course supports belonging through three interconnected mechanisms: critical analysis of inequality, action through inclusive intervention design, and the envisioning of alternative educational futures.

Keywords: Belonging; Social Justice in Teacher Education; Teacher Education; Future in Flux

Introduction

Belonging is more than a pleasant feeling of being accepted; it is closely tied to recognition, dignity, and participation. Research has long demonstrated that belonging is a fundamental human need (Baumeister & Leary, 1995) and that, in educational contexts, it predicts students' motivation, persistence, and well-being (Goodenow & Grady, 1993). As hooks (2003) reminds us, education is fundamentally a practice of building community – a collective space in which recognition and belonging can flourish.

As the *teff* consortium recognises, belonging as both an educational value and lived experience is currently under pressure in many (educational) systems. Within *teff*, the work package on Diversity and Inclusion has addressed belonging through lectures, seminars, and an online learning module, in which belonging functions as a central thread – something to be actively cultivated rather than undermined. *teff*'s work package 5 approached belonging through multiple lenses, including European rights to equal treatment, practices for engaging in challenging conversations, the development of LGBTQ+ friendly schools, culturally responsive teaching, special educational needs, and the role of the activist teacher (*teff* Academy, 2025).

Belonging is not evenly distributed in society or in education. While *teff* primarily addresses the European context, this article focuses on the Dutch educational system. In tracked systems such as the system in the Netherlands, pupils are separated into different educational tracks at a relatively early age (11/12 years old). Research shows that pupils in vocational tracks often experience stigma and internalize deficit-based identities, which negatively affects their sense of belonging (Van de Weerd, 2023). Especially pupils in so-called "lower" tracks struggle to feel that they truly belong within the educational system. This inequality raises pressing questions about social justice within the educational system. Strengthening pupils' sense of belonging should therefore be a central concern of social justice education and, consequently, of teacher education. When teachers themselves experience belonging within a professional community committed to justice, they are more likely to cultivate belonging among their pupils (Allen et al., 2021).

In this article, we introduce the elective course *Voorbij het Hokjesdenken* ("Beyond Pigeonholing"), which is part of a one-year postgraduate teacher education programme at Utrecht University. In this course, student teachers critically analyse injustice within the educational system and design an intervention aimed at promoting social justice within their own educational contexts. Central to this assignment is the development of a personal vision of what constitutes "good education," explicitly taking into account the experiences of pupils in marginalised positions. Student teachers may draw, among other resources, on modules from *teff*'s online learning module on Diversity and Inclusion (*teff* Academy, 2025). Through this process, student teachers come to see themselves not only as professionals operating within existing structures, but also as agents capable of reshaping those structures. In this way, *Beyond Pigeonholing* contributes to the development of future teachers' capacity to foster a stronger sense of belonging among their pupils.

Building on earlier research (Hoondert et al., 2025), this contribution focuses specifically on how the course supports belonging, both for student teachers and, indirectly, for their pupils. We argue that belonging emerges through three interrelated mechanisms: (1) analysing inequality and situating oneself within it, (2) designing interventions that foster inclusion, and (3) envisioning an alternative, more just educational future. In the sections that follow, we provide a more detailed account of the course and its contribution to *belonging*.

The Course: Beyond Pigeonholing

The course focuses on inequalities in the Dutch educational system that are closely connected to early tracking. At approximately age eleven, pupils are stratified into different educational tracks (pre-vocational or pre-academic) based on standardised test results and teacher recommendations. This early selection has far-reaching consequences for pupils' educational trajectories and their sense of belonging. Research consistently shows that early tracking exacerbates inequality, reinforces class divisions, and places considerable pressure on children, parents, and teachers alike (Elffers et al., 2024; Oakes, 2005; Van der Werfhorst & Mijs, 2010).

Most teacher education programmes primarily prepare student teachers to participate in the educational system as it currently exists (Loughran & Hamilton, 2016), thereby inadvertently reproducing its hierarchies. Student teachers are rarely invited to scrutinise the system itself or to question its underlying assumptions (Hosseini et al., 2021). Yet, if a more equitable distribution of belonging is to be achieved, teachers must be able not only to teach within existing structures, but also to critically question and reshape them. This perspective aligns with Cochran-Smith et al. (2016), who argue that equity should be positioned at the centre of teacher education. Doing so creates space for student teachers to contribute to educational contexts in which both they and their pupils can experience a stronger sense of belonging.

In line with Freire's (2014/1970) notion of praxis – a cycle of critical reflection and action – the elective course requires student teachers not only to identify injustice, but also to respond through concrete initiatives. The course is structured around three stages:

1. **Analysis:** Student teachers examine structural inequalities in the Dutch educational system, with a particular focus on early tracking. They connect theory (e.g., critical pedagogy and social justice education) to practice by interviewing colleagues and pupils and by visiting a school.
2. **Action:** Student teachers design an intervention aimed at promoting social justice and inclusion. This intervention may take the form of a lesson, a project, or a (school-level) policy proposal.
3. **Vision:** Student teachers formulate a personal vision of "good education," articulating ideals of equity, justice, and belonging.

In the following sections, we elaborate on each of these stages, focusing on how they function as mechanisms for fostering belonging among student teachers and their pupils.

Analysis: Analysing Inequality and Situating Oneself

The first phase confronts student teachers with the structural dimensions of inequality in Dutch education. Rather than merely studying statistics or policy documents, student teachers are encouraged to reflect on their own positions within the system and to engage with the lived experiences of colleagues and pupils. While this process often evokes discomfort, it can also foster recognition and solidarity. For student teachers from marginalised backgrounds, it can validate their experiences, while for those from more privileged positions, it can reveal previously unnoticed blind spots.

Belonging, in this phase, emerges as a sense of being part of a collective educational story – one shaped by privilege, exclusion, and possibility. By analyzing inequalities and reflecting their own practices and school contexts, student teachers become more attuned to what certain pupils may be missing, feeling, or internalizing. These insights inform their developing professional identities and shape their commitment to fostering belonging in their own classrooms.

Action: Designing Interventions for Inclusion

In the second phase, student teachers move from reflection to action. They design interventions aimed at reducing inequality and fostering inclusion, such as stereotype-challenging lessons, cross-track projects, or proposals to adapt assessment or school policies. This phase aligns with principles of culturally relevant pedagogy (Ladson-Billings, 1995), which emphasise the affirmation of students' identities as a foundation for meaningful learning and belonging.

These interventions strengthen belonging in two ways. First, they support pupils by promoting recognition and inclusion within the classroom or school context. Second, they foster a sense of professional agency among student teachers – the realization that they can actively shape educational practices rather than simply comply with existing structures.

Vision: Envisioning Alternatives and Futures

In the final phase, student teachers articulate their own visions of "good education." This process is guided, among other prompts, by Biesta's question: *What kind of society does education need?* (Biesta, 2022). Engaging with this question often generates friction, as ideals of justice and belonging collide with bureaucratic constraints or entrenched practices. Such friction has educational value (Lozano Parra et al., 2021), as it creates space for critical reflection and hope.

As one student reflected: *"What would my ideal be? Thinking, if everything could be done, what would I do? That was a big part of my development"* (Hoondert et al., 2025). Vision-building connects belonging to possibility. By imagining alternative educational futures, student teachers create conceptual space in which both they

and their pupils can belong more fully – not by ignoring the system, but by actively reshaping it.

Conclusion: Implications for Teacher Education and Pupils

The impact of *Beyond Pigeonholing* extends past the development of student teachers themselves. Teachers who are able to analyse inequality, design inclusive interventions, and articulate visions of educational justice are better equipped to foster belonging among their pupils. Research suggests that even small, well-designed interventions can meaningfully strengthen students' sense of belonging (Walton & Brady, 2020). For pupils, this may be experienced through inclusive language, a more representative curriculum, or explicit recognition of diverse aspirations. *teff*'s online learning modules on Diversity and Inclusion can further support such practices, for example through modules on inclusive language and special educational needs.

Beyond classroom-level changes, fostering belonging may also involve broader initiatives, such as curriculum reform, mixed learning opportunities, and school-wide policy changes. Each of these communicates a powerful message: "You belong here, and your future is not limited by the educational track you were assigned at an early age."

It is not inevitable that Dutch pupils are told – implicitly or explicitly – at the age of eleven who they are and what they can expect from their futures based on the track they enter. The current system risks conveying to pupils in vocational tracks that they do not fully belong within education or society at large. *Beyond Pigeonholing* challenges this narrative by preparing teachers not only to navigate the system, but also to critically question and reshape it. The course fosters belonging through analysing inequality, acting through inclusive interventions, and envisioning more just futures. For student teachers, belonging takes the form of recognition, solidarity, and agency. For pupils, it means encountering teachers who resist pigeonholing and affirm every learner's right to belong. Belonging, we argue, is not a mere soft add-on to diversity and inclusion; it is at the heart of justice in education and must therefore be central to teacher education.

References

Allen, K.-A., Kern, M. L., Vella-Brodrick, D., Waters, L., & Hattie, J. (2021). What schools need to know about fostering school belonging: A meta-analysis. *Educational Psychology Review, 33*(1), 1–34. https://doi.org/10.1007/s10648-019-09523-1

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin, 117*(3), 497–529.

Biesta, G. (2022). *World-centred education: A view for the present*. Routledge.

Cochran-Smith, M., Ell, F., Grudnoff, L., Haigh, M., Hill, M., & Ludlow, L. (2016). Initial teacher education: What does it take to put equity at the center? *Teaching and Teacher Education, 57*, 67–78. https://doi.org/10.1016/j.tate.2016.03.006

Elffers, L., Denessen, E., & Volman, M. (2024). Combining perspectives in multidisciplinary research on inequality in education. *NPJ Science of Learning, 9*(1), Article 5. https://doi.org/10.1038/s41539-024-00215-z

Freire, P. (2014). *Pedagogy of the oppressed* (30th anniversary ed.). Bloomsbury Academic. (Original work published 1970)

Goodenow, C., & Grady, K. E. (1993). The relationship of school belonging and friends' values to academic motivation among urban adolescent students. *Journal of Experimental Education, 62*(1), 60–71.

Hoondert, K., Munsters, M. P. M., Van der Eng, K., Bronkhorst, L. H., & Wansink, B. G. J. (2025). Stand up, speak out: Stimulating dissent in social justice teacher education. *Future in Educational Research*. https://doi.org/10.1002/fer3.70025

hooks, b. (2003). *Teaching community: A pedagogy of hope*. Routledge.

Hosseini, N., Leijgraaf, M., Gaikhorst, L., & Volman, M. (2021). Kansengelijkheid in het onderwijs: Een social justice perspectief voor de lerarenopleiding. *Tijdschrift voor Lerarenopleiders, 42*. https://dare.uva.nl/search?identifier=ef3aa0ea-ce66-433d-92ac-6dd7d7c573e9

Ladson-Billings, G. (1995). But that's just good teaching! The case for culturally relevant pedagogy. *Theory Into Practice, 34*(3), 159–165.

Loughran, J., & Hamilton, M. L. (2016). Developing an understanding of teacher education. In J. Loughran & M. L. Hamilton (Eds.), *International handbook of teacher education* (Vol. 1, pp. 3–22). Springer. https://doi.org/10.1007/978-981-10-0366-0_1

Lozano Parra, S., Bakker, C., & Van Liere, L. (2021). Practicing democracy in the playground: Turning political conflict into educational friction. *Journal of Curriculum Studies, 53*(1), 32–46. https://doi.org/10.1080/00220272.2020.1838615

Oakes, J. (2005). *Keeping track: How schools structure inequality*. Yale University Press.

teff Academy. (2025). *Diversity and inclusion skills in education* [Online course].

Van de Weerd, P. (2023). Being 'the lowest': Models of identity and deficit discourse in vocational education. *Ethnography and Education, 18*(2), 144–158. https://doi.org/10.1080/17457823.2022.2149272

Van der Werfhorst, H. G., & Mijs, J. J. B. (2010). Achievement inequality and the institutional structure of educational systems: A comparative perspective. *Annual Review of Sociology, 36*, 407–428. https://doi.org/10.1146/annurev.soc.012809.102538

Walton, G. M., & Brady, S. T. (2020). The many questions of belonging. In A. J. Elliot (Ed.), *Advances in motivation science* (Vol. 7, pp. 1–51). Elsevier.

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Martine van Rijswijk, Jan van Tartwijk & Marieke van der Schaaf

Stimulating Adaptive Expertise Development in (Student) Teachers

Abstract
In this chapter we explore how to stimulate adaptive expertise in teachers. Adaptive experts are considered people with the ability to adjust their routines when circumstances require it (Bransford et al., 2005; van Tartwijk et al, 2023). This skill is highly relevant, as developments in society such as societal polarization, the rise of generative artificial intelligence, and insecurity caused by geopolitical threats and climate change, are placing new demands on professionals in education. Teachers are expected to implement new content and adjust their teaching methods in relation to these geopolitical developments. In other words, they must adapt their teaching routines. This starts with strengthening or changing their underlying declarative knowledge. This knowledge enables teachers to interpret new or changing classroom situations, anticipate student thinking in such situations, and flexibly adjust their actions to meet evolving pedagogical demands. In this chapter, we highlight two models designed to support the development of such knowledge. These models illustrate how teachers can organize, relate, and refine core concepts for the emergence of adaptive expertise in professional practice.

Keywords: adaptive expertise, adaptive performance, (student) teacher development

Introduction

In this chapter we elaborate on how to stimulate adaptive expertise in developing teachers. Adaptive experts are individuals with the ability to adjust their actions in practice when dynamic circumstances demand it (Bransford et al., 2005, van Tartwijk et al., 2023). This is highly relevant, since developments in society such as polarization in society, the rise of generative artificial intelligence, and insecurity caused by geopolitical threats and climate change, are placing new demands on professionals in education. They are expected to use new content and/or different teaching methods for a changing student population. Implementing new educational content and teaching methods is a challenging task for teachers: they must both be open to new challenges and be able to recognize their own work routines. This is a particularly salient skill, given that societal changes happen in rapid succession and that changes are difficult to predict and grasp as we are faced with a "future in flux." In the Erasmus+

Teacher Academy *teff,* the concept of adaptive expertise was foundational to, amongst others, the work package on well-being and work package on future skills.

To prepare teachers for the dynamics and complexity of the profession, it is important to stimulate the development of adaptive expertise in (student) teachers. Although student teachers are still novices and have not yet developed extensive expertise, cultivating adaptive expertise – and the resulting adaptive performance – is crucial for their future professional practice. Consequently, higher education has already devoted attention to fostering this development (Mylopoulos et al., 2022). In this chapter, we will explore the nature of adaptive expertise and what can be done to stimulate its development.

Adaptive Expertise: Acting on the Unexpected

Adaptive expertise refers to the ability to *recognize* in *new, unexpected, and complex situations* that new ways of acting are needed, as well as the *ability to act* in such situations. Adaptive experts are usually distinguished from routine experts. While routine experts apply well-learned routines in familiar contexts with increasing efficiency and effectiveness, adaptive experts are more adept at adopting new routines when conditions of contexts change (Hatano & Inagaki, 1986; Schwartz, Bransford, & Sears, 2005).

Adaptive expertise is reflected in *adaptive performance*, that is, teachers' flexible and effective response to new, uncertain, or complex educational situations. This can be a new situation for the teacher – such as working with a new test format – or a new situation for the whole world – such as a lockdown – when teachers had to switch to online education at lightning speed. Fundamental to adaptive expertise is *declarative knowledge* (Bohle Carbonel et al., 2014). Declarative knowledge refers to knowing and understanding the domain-independent concepts, principals, ideas, schemas, and theories underlying performance (Chi & Olsson, 2005).

Teachers with strong adaptive expertise can recognize when familiar strategies no longer apply and can creatively develop new approaches based on their domain general knowing and understanding. This interplay of knowledge, reflection, and flexible application lies at the heart of adaptive expertise in teaching and enables teachers to contribute to new problem-solving methods, solutions, or ways of working (van Tartwijk et al. 2023; Fluit et al., 2024). Adaptive experts are agile: they have knowledge and overview above their domain, can prioritize interests and changing circumstances, and adjust existing teaching routines accordingly (Bohle-Carbonell et al., 2014). In *teff*, this resonates with our explorations of the future literacy of teachers.

Characteristics of Adaptive Expertise and Adaptive Performance

A review of various studies into the adaptive expertise and adaptive performance of professionals highlights the types of characteristics that are strongly related. These characteristics were classified by Pelgrim and colleagues (2024) as individual characteristics (for example cognitive flexibility and self-regulatory mechanisms), characteristics of the profession and/or the task (such as collaborative learning and using abstract materials), and characteristics of the work environment/context (for example encouragement and a clear climate for innovation). Hissink and colleagues (2025) presented themes related to adaptive expertise and to adaptive performance, based on their review on operationalizations of the concepts (see table 1).

Table 1: Dimensions and themes related to adaptive expertise and adaptive performance (Hissink et al., 2025, p. 1682)

Dimensions and themes related to adaptive expertise	Dimensions and themes related to adaptive performance
Aspects of a person	Aspects of work or tasks
Epistemology / epistemic orientation	Handling emergencies or crisis situations
Innovativeness of skills	Handling work stress
Domain specificity of skills	Solving problems creatively
Flexibility	Dealing with uncertain and unpredictable work situations
Metacognition	Learning work tasks, technologies and procedures
Goals and beliefs	Demonstrating interpersonal and cultural adaptability
	Demonstrating physical oriented adaptability

In the "ill-structured" work environment such as a school, there is clearly a strong demand for adaptive expertise and adaptive performance of (student) teachers. Ill-structured work and learning environments are characterized by authentic situations and unexpected, complex issues. Teachers are challenged to find non-routine solutions to realistic challenges (Pelgrim et al., 2024).

The Development of Adaptive Expertise

For the development of adaptive expertise, a good balance between efficient professional routines and the willingness to keep improving is essential. On the one hand, teachers need to develop automated routines, which are developed through years of practice and repetition (Hatano & Inagaki, 1986). Routine experts have highly automated the recognition and interpretation of patterns in work situations and the sub-

sequent behavioural response (Feltovich, Prietula, & Ericsson, 2018). This enables these experts to perform their work very efficiently.

A disadvantage of such highly automatized routines is that although the relevant knowledge is present in the professional, it is difficult to recognize and articulate this knowledge in unexpected situations. In addition, relying on automatized routines can hinder further development, leading to stagnation. To prevent a professional from getting stuck in routines, it is important to promote innovation by regularly examining one's own routines. This, however, can also pose a risk. If a professional is confronted with situations or major challenges in the work and learning environment over a long time frame, this can lead to uncertainty and frustration. Support in the development of adaptive expertise should therefore focus on helping to develop both routines, as well as encouraging risk taking and supporting innovation. Figure 1 shows a schematic map of this so-called optimal innovation corridor.

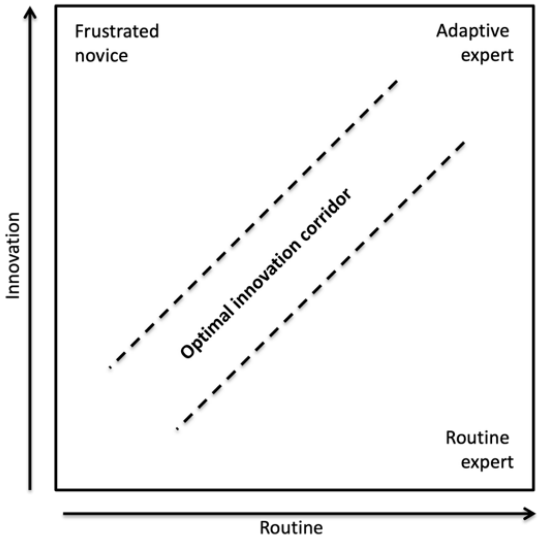


Figure 1: Development of adaptive expertise. (Adapted from Bransford et al., 2005)

Instrumental in this optimal innovation corridor is "deliberate practice:" goal-oriented effort by the learner to increase their own expertise in a domain while working on everyday tasks (Fadde & Klein, 2010).

Declarative Knowledge Development as a Foundation for Adaptive Expertise and Adaptive Performance

Since declarative knowledge is fundamental to adaptive expertise, we propose that teacher education programmes and supervisors include instruments and/or activities that stimulate a deeper understanding of why certain strategies are effective in various situations. This includes, for instance, reflections on the meaning of educa-

tional theories for one's own practice, the influence of earlier experiences on learning as a teacher, and the effect of certain behaviour (Brown & Friesen, 2025). Clarke & Hollingsworth (2002) propose a model that describes the process of professional development of teachers as an iterative movement through four domains. This model can be used to gain more insight into one's development as a teacher and thus enhance a deeper conceptual understanding of what it means to develop professional teacher behaviour, as highlighted in Figure 2.

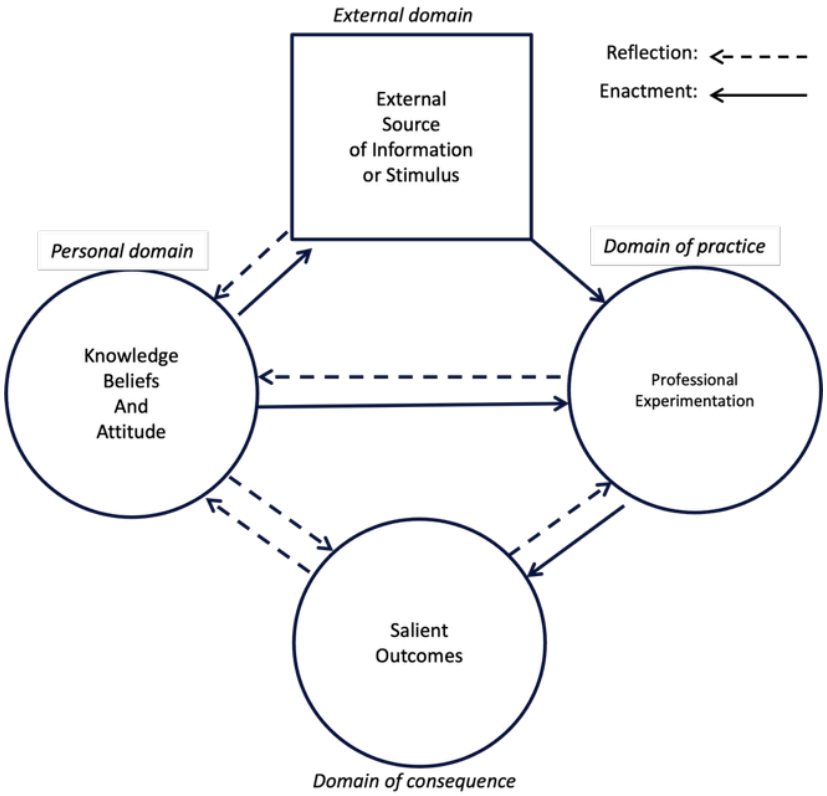


Figure 2: The change environment for professional growth of teachers (Clarke & Hollingsworth, 2002)

Discussing knowledge, values and beliefs (personal domain), experiences as a teacher (domain of practice), the effect of acting as a teacher (domain of consequence), or new sources of information or other external stimuli (external domain), can aid in gaining a better understanding of why certain teaching strategies are effective. It acknowledges the teacher as an autonomous professional who interprets new knowledge and acts considering his/her reflections. Another example is the model of tasks of teachers in higher education as distinguished by Van Dijk and colleagues (2020). This model can be used to support teachers in developing a deeper understanding of their responsibilities and the nature of their tasks (see figure 3).

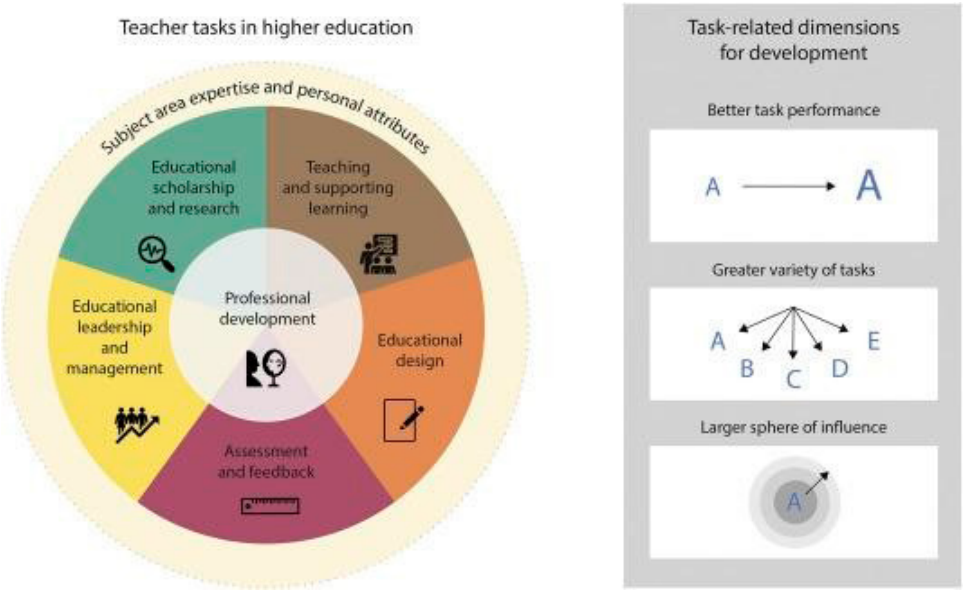


Figure 3: Teacher tasks in higher education (Van Dijk et al., 2020)

By stimulating (student) teachers to reflect on their current tasks and probable tasks in the future, they are encouraged to open their mind to alternative actions they might need to use later in their professional practice. Such reflections directly touch on the question of which routines are useful now, if they will be useful in the future, and where adjustments will be needed.

Final Thoughts: Beneficial Learning Environment

Teacher education that facilitates the development of adaptive expertise and adaptive performance is characterized by articulating conceptual knowledge for teaching, supportive behaviour of supervisors, role model behaviour of educators, support from colleagues, and an open and a positive team learning climate that enables learning and innovation (Fluit et al., 2024). In such a supportive learning environment, (student) teachers are encouraged to reflect on their actions – including their mistakes – and are supported in seeking and integrating feedback, to facilitate their professional development. Table 1 in this chapter can be used to analyse and adjust teacher education programmes to enhance the learning environment. For example, stimulating (student) teachers to think outside the box and to come up with creative alternatives to teaching challenges will strengthen their ability to adapt to changes in the future, adding to their future literacy.

Acknowledgements

We want to acknowledge our colleagues and our fruitful collaboration on adaptive expertise development in the research project Adapt at Work, funded by the NRO.

References

Bohle Carbonell, K., Stalmeijer, R. E., Könings, K. D., Segers, M., & van Merriënboer, J. J. G. (2014). How experts deal with novel situations: A review of adaptive expertise. *Educational Research Review, 12*(1), 14–29. https://doi.org/10.1016/j.edurev.2014.03.001

Bransford, J., Derry, S., Berliner, D. C., Hammerness, K., & Beckett, K. L. (2005). Theories of learning and their roles in teaching. In L. Darling-Hammond, J. Bransford, P. LePage, K. Hammerness, & H. Duffy (Eds.), *Preparing teachers for a changing world: What teachers should learn and be able to do* (pp. 40–88). Jossey-Bass.

Brown, B., & Friesen, S. (2025). Stages of teaching expertise from routine to adaptive: A model for advancing teaching effectiveness. *Studies in Educational Evaluation, 87*, 101530.

Chi, M. T. H., & Ohlsson, S. (2005). Complex declarative learning. In K. J. Holyoak & R. G. Morrison (Eds.), *The Cambridge handbook of thinking and reasoning* (pp. 371–399). Cambridge University Press.

Clarke, D., & Hollingsworth, H. (2002). Elaborating a model of teacher professional growth. *Teaching and Teacher Education, 18*(8), 947–967. https://doi.org/10.1016/S0742-051X(02)00053-7

Ericsson, K. A. (2018). An introduction to the second edition of *The Cambridge Handbook of Expertise and Expert Performance*: Its development, organization, and content. In K. A. Ericsson, R. R. Hoffman, A. Kozbelt, & A. M. Williams (Eds.), *The Cambridge handbook of expertise and expert performance* (2nd ed., pp. 3–20). Cambridge University Press.

Fadde, P. J., & Klein, G. A. (2010). Deliberate performance: Accelerating expertise in natural settings. *Performance Improvement, 49*(9), 5–14. https://doi.org/10.1002/pfi.20175

Feltovich, P. J., Prietula, M. J., & Ericsson, K. A. (2018). Studies of expertise from psychological perspectives: Historical foundations and recurrent themes. In K. A. Ericsson, R. R. Hoffman, A. Kozbelt, & A. M. Williams (Eds.), *The Cambridge handbook of expertise and expert performance* (2nd ed., pp. 59–83). Cambridge University Press.

Hatano, G., & Inagaki, K. (1986). Two courses of expertise. In H. Stevenson, H. Azuma, & K. Hakuta (Eds.), *Child development and education in Japan* (pp. 27–36). Freeman.

Hissink, E., Pelgrim, E., Nieuwenhuis, L., Bus, L., Kuijer-Siebelink, W., & van der Schaaf, M. (2025). Measuring adaptive expertise and adaptive performance in (becoming) healthcare professionals: A scoping review of measurement instruments. *Advances in Health Sciences Education*, 1–27.

Mylopoulos, M. (2020). Preparing future adaptive experts: Why it matters and how it can be done. *Medical Science Educator, 30*(Suppl 1), 11–12. https://doi.org/10.1007/s40670-019-00838-4

Pelgrim, E., Hissink, E., Bus, L., van der Schaaf, M., Nieuwenhuis, L., van Tartwijk, J., & Kuijer-Siebelink, W. (2022). Professionals' adaptive expertise and adaptive performance in educational and workplace settings: An overview of reviews. *Advances in Health Sciences Education, 27*, 1245–1263. https://doi.org/10.1007/s10459-022-10190-y

Rittle-Johnson, B., Schneider, M., & Star, J. R. (2015). Not a one-way street: Bidirectional relations between procedural and conceptual knowledge of mathematics. *Educational Psychology Review, 27*(4), 587–597. https://doi.org/10.1007/s10648-015-9302-x

Schwartz, D. L., Bransford, J. D., & Sears, D. (2005). Efficiency and innovation in transfer. In J. Mestre (Ed.), *Transfer of learning from a modern multidisciplinary perspective* (pp. 1–51). Information Age Publishing.

van Dijk, E. E., van Tartwijk, J., van der Schaaf, M. F., & Kluijtmans, M. (2020). What makes an expert university teacher? A systematic review and synthesis of frameworks for teacher expertise in higher education. *Educational Research Review, 31*, Article 100365. https://doi.org/10.1016/j.edurev.2020.100365

van Tartwijk, J., van Dijk, E. E., Geertsema, J., Kluijtmans, M., & van der Schaaf, M. (2023). Teacher expertise and how it develops during teachers' professional lives. In R. J. Tierney, F. Rizvi, & K. Erkican (Eds.), *International encyclopedia of education* (4th ed., pp. 170–179). Elsevier. https://doi.org/10.1016/B978-0-12-818630-5.04057-4

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Dina Tsagari

Teaching and Assessing Language Learners With Special Educational Needs (SEN)

Abstract
This chapter synthesizes current research on teaching and assessing second/foreign language learners with special educational needs (SEN). It outlines major learner profiles and explains how medical, social, and interactional models of disability shape access to language learning. Key challenges include dyslexia and other specific learning difficulties, cognitive disabilities, sensory and physical impairments, and attention or emotional needs, often intensified for migrant and refugee learners. The chapter examines assessment through the lens of fairness and validity, reviewing the impact of accommodations such as extended time, self-pacing, and read-aloud assistance, as well as alternative approaches like dynamic assessment, portfolios, and emerging digital tools. For pedagogy, Universal Design for Learning, differentiation, multi-sensory techniques, scaffolded tasks, and explicit strategy instruction are highlighted. Collaboration with specialists and families and adequate teacher preparation are essential. The chapter argues that universal design should guide language education so assessment and instruction support learner diversity by default. This topic was discussed in detail in *teff's* work package 5 and prepared for students and teachers alike, including in online seminars and lectures as well as a digital learning module.

Keywords: Special Educational Needs (SEN); Inclusive Language Education; Universal Design for Learning (UDL); Language Assessment and Accommodations; Dyslexia and Learning Difficulties

1. Introduction

Special educational needs (SEN) in language education sit at the nexus of inclusion, equity, and learning. Policy imperatives such as the United Nations Convention on the Rights of Persons with Disabilities (UN, 2008) and the Special Educational Needs and Disabilities Code of Practice (Department for Education & Department of Health and Social Care, 2015) affirm the right to meaningful participation. Yet second language (L2) learning is uniquely demanding, integrating phonological, lexical, grammatical, and sociocultural competencies, which can magnify barriers for learners with Special Learning Difficulties (SpLDs), communication needs, sensory/physical impairments, and socio-emotional conditions. This chapter focuses on a practition-

er-friendly synthesis based on (a) conceptualizing SEN in language learning; (b) key classroom challenges; (c) assessment for fairness and validity; (d) inclusive pedagogy; and (e) sociocultural dimensions and future directions. This chapter directly connects to the aims of the *teff* Academy initiative, which re-imagines teacher education and professional learning for inclusive and equitable language pedagogy across European contexts.

2. Conceptualizing SEN in Language Learning

SEN spans diverse profiles that affect access, processing, and performance in education: specific learning difficulties (e.g., dyslexia), speech-language and communication needs (SLCN), cognitive disabilities, sensory/physical impairments, and socio-emotional and mental health needs (Department for Education & Department of Health, 2015). Disability models shape responses: the medical/deficit view locates difficulty within the learner, the social model attributes disadvantage to environmental barriers, the interactional view recognizes dynamic interplay between person and context (Oliver, 1996; Kormos, 2020). Universal Design for Learning (UDL) operationalizes an interactional stance by embedding flexibility into curriculum, materials, and assessment from the outset (Meyer, Rose, & Gordon, 2014; Tsagari, Nijakowska, & Guz, 2022). Intersectionality further matters: many SEN learners are also multilingual, migrant, or refugee students whose language histories and cultural experiences complicate identification of specific needs and resulting support (Abedi, 2014; Mohamad, Kjørholt, Pesonen, & Tateo, 2024). These intersectional considerations align closely with the *teff* Academy's transnational vision of teacher competence for an education system in flux, one that embraces diversity, mobility, and inclusive design as core values.

3. Key Challenges in Teaching SEN Language Learners

Dyslexia affects phonological processing, decoding, orthographic learning, and working memory, slowing vocabulary growth and compromising accuracy and fluency in an additional language (Helland & Kaasa, 2005; Kormos, 2017; Nijakowska, 2010). Learners with cognitive disabilities are frequently excluded from L2 education despite evidence that simplified input, high-utility vocabulary, visual supports, and functional communication goals enable participation (Shenoy, de Valenzuela, & Pacheco, 2022). Attentional differences and anxiety (e.g., ADHD) affect sustained engagement and task completion (Döpfner & Banaschewski, 2013). Sensory/physical impairments constrain access to print, audio, and oral interaction, requiring alternative formats and mediated interaction (Guzman-Orth, Steinberg, & Albee, 2023). Motivation and affect are highly sensitive to teacher expectations: supportive climates that normalize error and emphasize effort build resilience whereby deficit framings undermine persistence (Csizér, Kormos, & Sarkadi, 2010). Across contexts, teacher prepar-

edness to address SEN in L2 acquisition remains inconsistent (Nijakowska, Tsagari, & Spanoudis, 2018), and structural constraints, e.g. large classes, prescriptive syllabi, and high-stakes exams limit differentiation (e.g., Wolf, Herman, & Dietel, 2010). Such systemic limitations are a focal concern in *teff*'s collaborative work on adaptive pedagogies and assessment reform, which seeks to operationalize flexibility as a future-proof teaching skill.

4. Assessment: Fairness, Validity, and Accessibility

Exclusion is most evident during assessment, where access and performance challenges frequently surface. Standardized language tests prioritize comparability and speed, risking construct-irrelevant variance for learners with processing or access barriers (Abedi, 2014; Wolf, 2020). Evidence indicates that certain accommodations improve access without inflating scores on the target construct: extended time and self-pacing reduce processing load and anxiety; read-aloud assistance supports comprehension for dyslexic learners when reading per se is not the construct of interest (Košak-Babuder, Kormos, Ratajczak, & Pižorn, 2018; Eberharter, Kormos, & Guggenbichler, 2023). Computer-based delivery enables embedded universal tools (e.g., highlighters, magnifiers, line guides), which second language learners with disabilities activate at higher rates in listening/reading domains (Kim, Yumsek, Kemp, Chapman, & Cook, 2023).

Dynamic assessment (DA) provides an alternative paradigm, mediating during assessment to probe learning potential within the zone of proximal development (Poehner, 2008; Lantolf & Poehner, 2010). Portfolios and project-based tasks yield richer, longitudinal evidence but also present scaling challenges. Digital accessibility is advancing rapidly, e.g., automated sign language vocabulary assessment and novice L2 sign repetition tasks, yet questions remain about construct equivalence, machine-human agreement, and learner perceptions of fairness (Holzknecht et al., 2024; Holmström, Schönström, & Ryttervik, 2023). However, researchers advocate for equity-driven validation that treats accommodations as principled design choices rather than exceptions (Taylor & Banerjee, 2023). Within *teff*'s 'Future in Flux' framework, this shift from reactive accommodations to proactive design represents a cornerstone for re-conceptualizing assessment as an instrument of empowerment rather than gatekeeping.

5. Inclusive Pedagogy: Principles and Practices

UDL and differentiation underpin inclusive language teaching. Multiple means of representation (e.g., visuals, captions), action/expression (e.g., oral, written, multimodal outputs), and engagement (e.g., choice, collaboration) broaden access (Meyer et al., 2014; Tomlinson, 2017). Multi-sensory techniques, e.g., tracing, color-coding, and rhythm/movement support learners with dyslexia (Nijakowska, 2010). Explicit strat-

egy instruction (e.g., decoding routines, mnemonics, metacognitive planning) builds autonomy and self-efficacy (Kormos, 2020). Scaffolding through models, sentence frames, visuals, and mediated interaction enables participation for learners with cognitive disabilities or lower literacy (Shenoy et al., 2022).

Teacher learning is pivotal for student success. In the field of second language teaching and assessment, European-funded projects such as the Erasmus+ Teacher Academy *teff* demonstrate that targeted professional development increases teacher confidence and preparedness while normalizing inclusive routines at scale (see also European funded projects such as DysTEFL, SCALED, SPLENDID in Kormos & Smith, 2012; Tsagari, Nijakowska, & Guz, 2022; Karatsiori et al., 2025). Affective conditions matter: cooperative structures, peer mediation, and positive error treatment correlate with stronger motivation and willingness to communicate among learners with SpLDs (Csizér et al., 2010). Collaborative work with special educators, speech-language pathologists, and families reduces misidentification and aligns support (Goodrich, Fitton, Chan, & Davis, 2022). These initiatives converge within the *teff* Academy's overarching goal of building teacher agency in times of flux equipping educators to design inclusive learning ecologies that adapt dynamically to learners' diverse trajectories.

6. Sociocultural Dimensions and Future Directions

SEN intersects with migration and cultural diversity. Refugee and immigrant learners may be faced with interrupted schooling, trauma, and unfamiliar systems alongside SEN, complicating assessment and placement (Mohamad et al., 2024). Family perspectives and cultural attitudes toward disability shape uptake of support; schools must cultivate trust, provide multilingual communication, and co-plan accommodations. Systemically, inclusive intent is undermined when high-stakes examination systems resist flexibility (Wolf et al., 2010). Priorities include expanding research beyond dyslexia to ADHD/autism and emotional-behavioral profiles; conducting longitudinal and cross-linguistic studies; and rigorously evaluating digital/AI tools for accessibility and bias (Holzknecht et al., 2024). Policy should embed universal design into curricula, assessments, and funding while teacher education should mainstream SEN competencies. The *teff* Academy's perspective on 'The Future in Flux' emphasizes precisely this systemic integration where policy, research, and practice co-evolve to sustain inclusivity and resilience amid educational change.

7. Conclusion

Inclusive language education hinges on designing for variability rather than retrofitting exceptions. Evidence supports accommodations, dynamic assessment, and UDL-aligned teaching as a means to enhance fairness and learning without compromising validity. Moving from policy statements to classroom reality requires sys-

tem-level alignment such as assessment reform, coherent teacher education, and resourcing. When assessment and instruction are built for diversity by default, SEN learners and their peers gain access to richer opportunities to learn and to demonstrate what they know. In this sense, this work resonates with the *teff* Academy's vision of a future in flux – one where inclusive language education becomes a living, adaptive system responsive to the complexity of learners and societies.

References

Abedi, J. (2014). English language learners with disabilities: Classification, assessment, and accommodation issues. *Journal of Applied Testing Technology, 10*(2), 1–30. https://jattjournal.net/index.php/atp/article/view/48353

Csizér, K., Kormos, J., & Sarkadi, Á. (2010). The dynamics of language learning attitudes and motivation: Lessons from an interview study of dyslexic language learners. *The Modern Language Journal, 94*(3), 470–487. https://doi.org/10.1111/j.1540-4781.2010.01054.x

Department for Education & Department of Health and Social Care. (2015). *Special educational needs and disability code of practice: 0 to 25 years.* https://www.gov.uk/government/publications/send-code-of-practice-0-to-25

Döpfner, M., & Banaschewski, T. (2013). Attention-deficit/hyperactivity disorder (ADHD). In F. Petermann (Ed.), *Lehrbuch der klinischen Kinderpsychologie* (7th ed., pp. 271–290). Hogrefe.

Eberharter, K., Kormos, J., Guggenbichler, E., Ebner, V. S., Suzuki, S., Moser-Frötscher, D., Konrad, E., & Kremmel, B. (2023). Investigating the impact of self-pacing on the L2 listening performance of young learner candidates with differing L1 literacy skills. *Language Testing, 40*(4), 960–983. https://doi.org/10.1177/02655322221149642

Goodrich, J. M., Fitton, L., Chan, J., & Davis, C. J. (2022). Assessing oral language when screening multilingual children for learning disabilities in reading. *Intervention in School and Clinic, 58*(3), 164–172. https://doi.org/10.1177/1053451222108126

Guzman-Orth, D., Steinberg, J., & Albee, T. (2023). English learners who are blind or visually impaired: A participatory design approach to enhancing fairness and validity for language testing accommodations. *Language Testing, 40*(4), 933–959. https://doi.org/10.1177/02655322231159143

Helland, T., & Kaasa, R. (2005). Dyslexia in English as a second language. *Dyslexia, 11*(1), 41–60. https://doi.org/10.1002/dys.286

Holmström, I., Schönström, K., & Ryttervik, M. (2023). Development of a sign repetition task for novice L2 signers. *Language Assessment Quarterly, 21*(1), 33–59. https://doi.org/10.1080/15434303.2023.2256320

Holzknecht, F., Tornay, S., Battisti, A., Batty, A. O., Tissi, K., Haug, T., & Ebling, S. (2024). Automated sign language vocabulary assessment: Comparing human and machine ratings and studying learner perceptions. *Language Assessment Quarterly, 21*(3), 245–265. https://doi.org/10.1080/15434303.2024.2364877

Karatsiori, M., Liontou, T., Domagała-Zyśk, E., Vogt, K., Košak Babuder, M., & Poredoš, M. (2025). Beyond barriers: Exploring foreign language learning experiences of students with diverse learning needs in four European countries. *Frontiers in Education, 10*, 1520944. https://doi.org/10.3389/feduc.2025.1520944

Kim, A. A., Yumsek, M., Kemp, J. A., Chapman, M., & Cook, H. G. (2023). Universal tools activation in English language proficiency assessments: A comparison of Grades 1–12 English learners with and without disabilities. *Language Testing, 40*(4), 877–903. https://doi.org/10.1177/02655322221149009

Košak-Babuder, M., Kormos, J., Ratajczak, M., & Pižorn, K. (2018). The effect of read-aloud assistance on the text comprehension of dyslexic and non-dyslexic English language learners. *Language Testing, 36*(1), 51–75. https://doi.org/10.1177/0265532218756946

Kormos, J. (2017). The effects of specific learning difficulties on processes of multilingual language development. *Annual Review of Applied Linguistics, 37*, 30–44. https://doi.org/10.1017/S026719051700006X

Kormos, J. (2020). Specific learning difficulties in second language learning and teaching. *Language Teaching, 53*(2), 129–143. https://doi.org/10.1017/S0261444819000442

Kormos, J., & Smith, A. M. (2012). *Teaching languages to students with specific learning difficulties: Theory, research and practice.* Multilingual Matters.

Lantolf, J. P., & Poehner, M. E. (2010). Dynamic assessment in the classroom: Vygotskian praxis for second language development. *Language Teaching Research, 15*(1), 11–33. https://doi.org/10.1177/1362168810383328

Meyer, A., Rose, D. H., & Gordon, D. (2014). *Universal Design for Learning: Theory and Practice.* CAST.

Mohamad, D., Kjørholt, A. T., Pesonen, H. V., & Tateo, L. (2024). Inclusion of Syrian students in need of special support in Norwegian schools: A qualitative study with students and parents. *European Journal of Special Needs Education, 40*(2), 290–305. https://doi.org/10.1080/08856257.2024.2354606

Nijakowska, J. (2010). *Dyslexia in the foreign language classroom.* Multilingual Matters.

Nijakowska, J., Tsagari, D., & Spanoudis, G. (2018). English as a foreign language teacher training needs and perceived preparedness to include dyslexic learners: The case of Greece, Cyprus, and Poland. *Dyslexia, 24*(4), 357–379. https://doi.org/10.1002/dys.1598

Oliver, M. (1996). *Understanding disability: From theory to practice.* Macmillan.

Poehner, M. E. (2008). *Dynamic assessment: A Vygotskian approach to understanding and promoting L2 development.* Springer.

Shenoy, S., de Valenzuela, J. S., & Pacheco, R. (2022). Reimagining language proficiency assessment for English learners with significant cognitive disabilities. *Research and Practice for Persons with Severe Disabilities, 47*(3), 176–183. https://doi.org/10.1177/15407969221119137

Taylor, L., & Banerjee, J. (2023). Accommodations in language testing and assessment: Safeguarding equity, access, and inclusion. *Language Testing, 40*(4), 847–855. https://doi.org/10.1177/02655322231186221

Tomlinson, C. A. (2017). *How to differentiate instruction in academically diverse classrooms* (3rd ed.). ASCD.

Tsagari, D., Nijakowska, J., & Guz, E. (2022). Good practices in inclusive language education and foreign language teacher training – Universal Design in education and increasing accessibility, especially for marginalized groups. https://scaled.uw.edu.pl

Tsagari, D., & Spanoudis, G. (2012). *Assessing L2 students with learning and other disabilities.* Cambridge Scholars Publishing.

United Nations. (2008). *Convention on the Rights of Persons with Disabilities.* https://www.un.org/disabilities/documents/convention/convoptprot-e.pdf

Wolf, M. K. (2020). Assessing young language-minority students: Validation challenges and future research directions. *Language Assessment Quarterly, 17*(5), 559–567. https://doi.org/10.1080/15434303.2020.1826488

Wolf, M. K., Herman, J. L., & Dietel, J. (2010). *Performance assessments for English language learners.* Stanford Center for Opportunity Policy in Education. https://edpolicy.stanford.edu/sites/default/files/publications/performance-assessments-english-language-learners.pdf

F.
Getting Future-Ready:
Fostering Digital Skills in (Future) Teachers

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

David C.D. van Alten, Bård Ketil Engen, Tonje Giaever & Ove Edvard Hatlevik

Designing a European Digital Competence Learning Module for (Future) Teachers

From Content Selection to Framework Development

Abstract
This chapter examines the process of developing the content of a digital learning module designed to promote digital competences among future teachers in Europe. Ongoing processes of technological innovation, digitalisation, and platformisation are reshaping education in ways that demand not only practical digital skills, but also conceptual knowledge and a clear pedagogical vision from teachers. We will discuss different frameworks for conceptualising (future) teachers' digital competences and raise the question of how these can be contextualised within a European digital learning module for future teachers. To answer this question, insights into the conceptual considerations that led to the adoption and adaptation of the DigCompEdu framework are presented in this chapter. By developing a new model as a boundary object, we aim to demonstrate how different educational roles and perspectives both strengthen and complicate the understanding of teachers' digital competences. Furthermore, we seek to illustrate the contextualisation of the framework through a discussion of the selection of learning content in the learning module that was developed.

Keywords: Digital Competence, Digital Learning Module, Boundary Object, Teacher Education, Teacher Professionalization

Introduction

This chapter examines the process of developing the content of a digital learning module designed to promote digital competences among future teachers in Europe. In doing so, we raise the question: What do we mean by *digital competences* for teachers? This broad and generic term is open to diverse understandings, depending on, for example, national, institutional, and disciplinary backgrounds, as well as educational roles. A wide range of related concepts is used in both policy, research, and practice across participating countries. While these concepts share a focus on the impact of technology on the teacher, they differ in scope and emphasis.

Since the turn of the millennium, digital competences have become an important part of formal education. By the mid 2000s, a few countries throughout Europe and

North America had started to incorporate digital competence into school curricula, either as a cross-curricular theme or as a distinct subject. Furthermore, considerable efforts were undertaken to upskill in-service and pre-service teachers, to enable them to meet these new curricula demands and prepare future generations for life in a digital society (Engen & McGarr, 2025). Along with these initiatives, various frameworks for conceptualising and framing a teacher specific digital competence began to emerge. Perhaps the most prominent and influential of these frameworks is the Technological Pedagogical Content Knowledge (TPACK) model (Mishra & Koehler, 2006) which was introduced in 2006. Falloon (2020) subsequently expanded the TPACK framework to encompass two additional sets of integrated competences: personal-ethical and personal-professional. Another influential model is the SAMR model (Substitution, Augmentation, Modification and Redefinition). Like TPACK, SAMR is a taxonomy-based approach to conceptualise the use and evaluation of digital technologies in a K12 context (McDonagh et al., 2021).

Opposed to TPACK and SAMR, DigCompEdu, another influential framework, is structured hierarchically, indicating three levels across twenty-two elementary competences, divided into six areas (McDonagh et al., 2021). DigCompEdu (Redecker, 2017) has had a significant influence on the development of policies for schools and teacher education in many European countries. On one hand, the framework outlines areas for growth, progression, and the development of digital competences for educators across key domains. On the other hand, it could be argued that the level of detail may limit its capacity to adapt to emerging technologies and practices, like the recent availability of artificial intelligence in education.

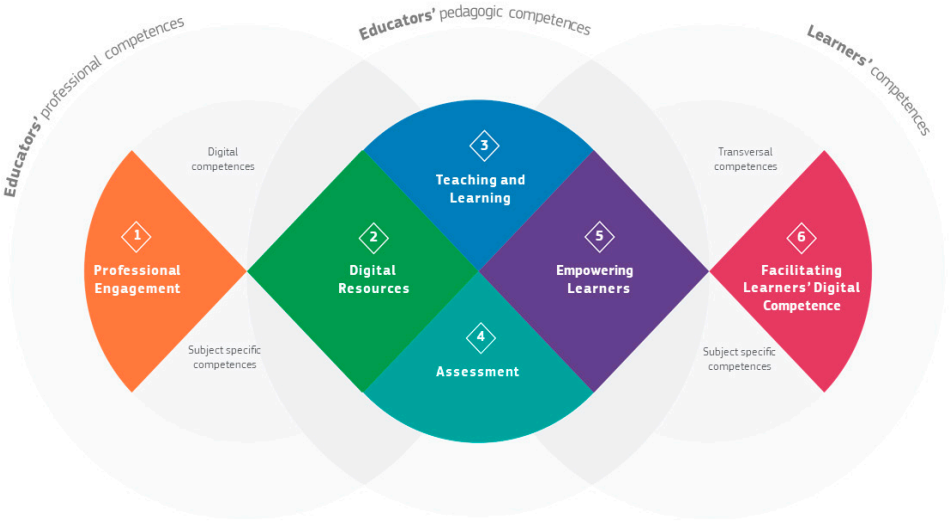


Figure 1: The DigComEdu model (Redecker, 2017, p. 19)

Boundary Object as an Analytical Lens

In our project to develop a digital learning module on digital competences for teachers across Europe, differing interpretations of digital competences and the application of multifaceted frameworks became a key focus. One way to discuss our approach is to view our conceptualisations of digital competences as a 'boundary object' (Bowker & Star, 1999). The concept was first introduced to solve issues around translation that appeared among different professional groups in the development and establishment of a natural history museum in Berkeley, USA. Boundary objects have different meanings in different social contexts, but their structure is common enough to make them recognisable in terms of translation (Bowker & Star, 1999). Boundary objects are therefore sufficiently flexible to accommodate the local needs and constraints of the various parties that use them, while remaining robust enough to preserve a shared identity across different contexts.

In the context of approaching digital competences as a boundary object, several concepts can be relevant. For example, digital skills focus on the instrumental abilities to work with (internet) technology, ICT-tools, and media (cf. van Deursen, Helsper, & Eynon, 2015). Digital literacy can be understood in different ways, influenced by the meaning of the term *literacy* across linguistic and cultural contexts (Spante et al., 2018). As introduced by Gilster (1997), digital literacy encompasses the ability to understand and apply information from a variety of digital sources. In contrast, the literal translation of digital literacy in Dutch is positioned as a cross-curricular domain in primary and secondary education that includes information literacy, media literacy, computational thinking, and basic ICT skills (SLO, 2025). Similarly, in the Norwegian national curriculum, digital skills are considered one of five basic skills, integrated in all subjects at all levels. We employ the term "digital skills," even though it reflects a broader understanding aligned with the concept of digital literacy.

For the development of the digital learning module, we ultimately decided to use the term *digital competences*, as we agreed it was the most appropriate term to capture the broad and multifaceted understandings from the members of the development team. *Digital competences* usually include a wide range of aforementioned aspects such as information management, collaboration, communication, content creation, awareness of ethics, and responsible use of technology (Ferrari, 2012). In addition, as the DigCompEdu framework (Redecker, 2017) is a recognized framework for teachers' digital competence in a European context, we chose to use it as our reference point, particularly in the design of the content of the learning module. In this context, we also considered it a strength that DigCompEdu encompasses a wide range of elements. At the same time, we also recognised that DigCompEdu could not be adopted uncritically, given the diverse educational contexts represented in our project.

The *teff* Model for Digital Competences

In our specific context of developing the digital module, it also became necessary to revise the DigCompEdu.[1] Our *teff* model for *digital competences* introduces several changes compared to the original DigCompEdu model. While the foundational structure of the framework is recognisable, the *teff* version is updated and revised in wording, rearrangement of concepts, and the addition of new elements to better reflect the current educational and digital development. One reason to employ these changes was that DigCompEdu was perceived as having unclear boundaries between its main areas. For example, we had extensive discussions about the actual difference between 'Teaching and Learning' and 'Empowering Learners'; particularly when the purpose of teaching and learning is precisely to empower learners. Another aspect was that we needed a working model more concretely aligned with predefined project goals and deliverables. In relation to the titles of the main areas of DigCompEdu, we found it necessary to revise Area 1 to 'Reflective and Agile Mindset', as 'Professional Engagement' was considered too vague. Furthermore, we made minor adjustments to Areas 3, 4, 5, and 6 of DigCompEdu. Regarding the sub-themes, we also introduced changes that we felt better reflected the lived realities of teachers. Table 1 provides an overview of the changes made.

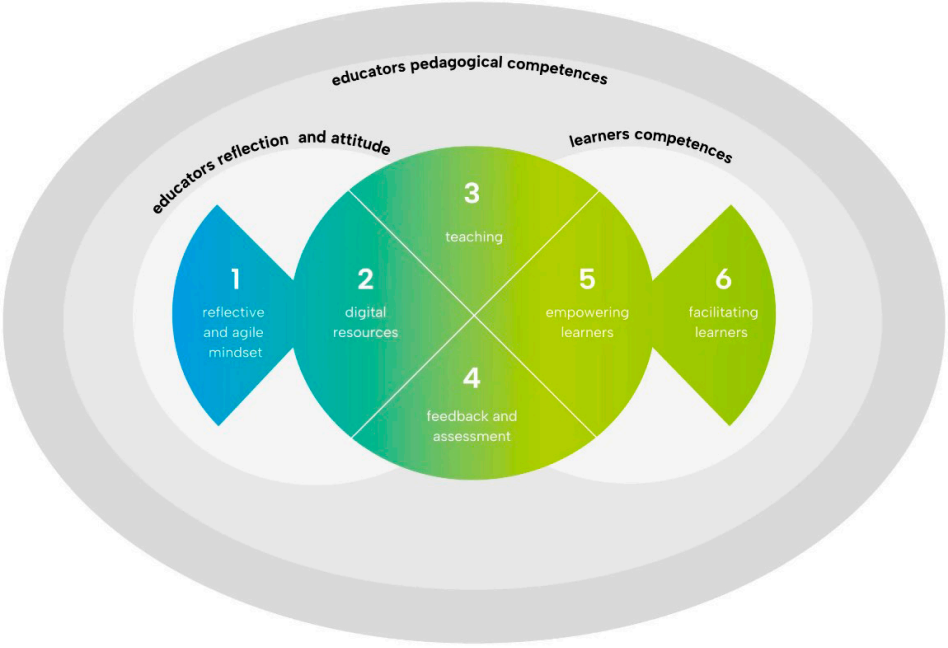


Figure 2: The *teff* model

1 Please refer to Wiesmann et al. (2026) in this volume for more details on the development process of the digital learning module.

Overall, in all six main themes, changes of wording, the content, or the descriptions of the subthemes were made. In three of the main areas there have also been changes in the numbers of subthemes. Main areas 4 and 6 have more subthemes in the *teff* model compared to DigCompEdu, whereas main area 3 has fewer subthemes in *teff* model compared to DigCompEdu. Two out of six main areas have the same title in both models. Two areas were partly changed, and two areas underwent a complete change in the *teff* model compared to DigCompEdu (see table 1).

Table 1: Comparing the DigCompEdu and *teff* model

DigCompEdu – main areas	*teff* model – main areas	DigCompEdu – subthemes	*teff* model – subthemes
1 Professional engagement	1 Reflective and agile mindset (c)	• Organisational communication • Professional collaboration • Reflective practice • Digital CPD	• Reflective practice (o) • Agile mindset and mindful work (c) • School and learning development (c) • Collaboration and communication (p)
2 Digital Resources	2 Digital resources (o)	• Selecting • Creating and modifying • Managing, protecting, sharing	• Evaluating/selecting (p) • Creating/modifying (o) • Implementing/sharing (p)
3 Teaching and learning	3 Teaching (p)	• Teaching • Guidance • Collaborative learning • Self-regulated learning	• Teaching strategies (p) • Classroom management (c) • Classroom climate (c)
4 Assessment	4 Feedback and assessment (p)	• Assessment strategies • Analysing evidence • Feedback & planning	• Visible learning (c) • Assessment strategies (o) • Analysing evidence (o) • Tools and methods (c)
5 Empowering learners	5 Empowering learners (o)	• Differentiation & personalisation • Accessibility & inclusion • Actively engaging learners	• Self-employment (p) • Educational equity (p) • Differentiation (o)
6 Facilitating Learners' Digital Competence	6 Facilitating learners (p)	• Information & media literacy • Communication • Content creation • Responsible use • Problem solving	• Communication and collaboration (p) • Cyber ethics, security and safety (c) • Creativity and problem solving (p) • Digital and data literacy and responsibility (p) • Digital content creation (o) • Critical and complex thinking (c)

Main areas and subthemes of DigCompEdu compared with the *teff* model. c = fully changed, p = partly changed, o = original. (See: https://zfl-lernen.de/online-kurs/teff_digital-competences/)

When comparing the two models, there are also differences that represent a complete conceptual shift, reflecting different pedagogical priorities and interpretations. The first main area of DigCompEdu, "Professional Engagement," focuses on external professional activities, including organisational communication, collaboration, and digital continuous professional development (CPD). In contrast, *teff*'s corresponding area, "Reflective and Agile Mindset," turns inward, focusing on reflective practice, agility, and mindful work. Three of the subthemes of professional engagement are changed (entirely or partly). Another example of a total change is found in the fifth area, "Empowering Learners." Although both frameworks share the same title, their subthemes diverge significantly. DigCompEdu emphasises differentiation, accessibility, inclusion, and active learner engagement, primarily within the classroom context. The *teff* model, however, introduces broader themes such as self-employment and educational equity. All three main areas of Empowering Learners are changed.

There are also areas with a partial change which retain elements from the original framework while introducing new dimensions or reorganising existing ones. In the third area, DigCompEdu's "Teaching and Learning" includes components such as guidance, collaborative learning, and self-regulated learning, which highlight learner autonomy and interaction. *teff*'s corresponding area, simply titled "Teaching", focuses more on teaching strategies, classroom management, and climate. All the subthemes of teaching and learning have changed (entirely or partly). In addition, there are fewer subthemes in the *teff* model compared to DigCompEdu. Similarly, the sixth area, "Facilitating Learners' Digital Competence" in DigCompEdu, emphasises digital literacy, responsible use of technology, and problem solving. *teff*'s version, "Facilitating Learners", expands this scope to include cyber ethics, creativity, and critical thinking.

There are areas in which DigCompEdu and the *teff* model show strong conceptual continuity, indicating a close alignment between the two frameworks. In the second area, "Digital Resources", both models include the processes of selecting, creating, or modifying, and sharing digital resources. The *teff* model adds an additional emphasis on implementation, focusing on the preparation and use of digital materials. Yet, two out of three subthemes of digital resources were changed (entirely or partly). Similarly, in the fourth area, "Assessment" in DigCompEdu and "Feedback and Assessment" in *teff*, there is a clear alignment in terms of assessment strategies, the analysis of evidence, and the role of feedback in planning. *teff* introduces the concept of visible learning, which may reflect a more learner-centred or transparency-focused approach. Two out of three subthemes of "Assessment" are identical. One is changed, and a new area has been added.

In this development process, the *teff* model functioned as a boundary object, a shared reference point that provided coherence across different national and disciplinary perspectives, while still offering flexibility for contextual interpretation and adaptation. It also facilitated dialogue among the developers, with the content of the model serving as a tool for discussing its elements. In this way, it helped to structure the collaboration, the conversations and identify both shared understandings and areas of divergence within the team.

Conclusion

Returning to the aim of this chapter, to discuss perspectives on how we understand *digital competences* for teachers as a conceptual framework for developing a digital learning module, this chapter presents the *teff* model. Within our context, there was a clear need to contextualise the framework, specifically for teachers, as part of a defined project deliverable. In this regard, the *teff* model functioned effectively as a boundary object, bridging the gap between abstract competence frameworks and the practical realities of classroom teaching. Its strength lies in its ability to translate broad concepts of digital competence into actionable guidance tailored to the everyday experiences of teachers in European classrooms. However, this same contextual specificity and level of detail may limit its applicability in other educational or professional settings, where different priorities or conditions prevail.

The very need to revise the DigComEdu framework also raises the question of whether DigComEdu is too vague, or whether it is primarily suited for policy development rather than the practical realities that teachers must navigate daily. The *teff* model is the result of extensive discussions and negotiations about the meaning of digital competence across European schools and teacher education institutions. It can serve as a meaningful boundary object for teachers and teacher educators, enabling shared understanding and collaboration across linguistic and cultural differences. In our context, which involved developing a learning module, it was essential to establish a convergence point that could accommodate diverse understandings of digital competence. The *teff* model is precisely the outcome of such a process, where teacher educators across linguistic and cultural boundaries engage in professional development. As a boundary object, the model facilitates shared meaning while allowing for local interpretation and adaptation.

References

Bowker, G. C., & Star, S. L. (1999). *Sorting things out*. MIT Press.

Engen, B. K., & McGarr, O. (2025). The postdigital divide. *Postdigital Science and Education*. https://doi.org/10.1007/s42438-025-00577-6

Falloon, G. (2020). From digital literacy to digital competence: The teacher digital competency (TDC) framework. *Educational Technology Research and Development, 68*(5), 2449–2472. https://doi.org/10.1007/s11423-020-09767-4

Ferrari, A. (2012). *Digital competence in practice: An analysis of frameworks* (Vol. 10, p. 82116). Publications Office of the European Union.

Gilster, P. (1997). *Digital literacy*. Wiley Computer Pub.

Johannesen, M., Øgrim, L., & Giæver, T. H. (2014). Notion in motion: Teachers' digital competence. *Nordic Journal of Digital Literacy, 4*, 300–312. https://doi.org/10.18261/ISSN1891-943X-2014-04-05

McDonagh, A., Camilleri, P., Engen, B. K., & McGarr, O. (2021). Introducing the PEAT model to frame professional digital competence in teacher education. *Nordic Journal of Comparative and International Education (NJCIE), 5*(4), 5–17. https://doi.org/10.7577/njcie.4226

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017–1054.

Redecker, C. (2017). *European framework for the digital competence of educators* (pp. 1–95). Publications Office of the European Union. https://publications.jrc.ec.europa.eu/repository/handle/JRC107466

SLO. (2025). *Definitieve conceptkerndoelen digitale geletterdheid juli 2025: Inclusief toelichtingsdocument*. SLO. https://open.overheid.nl/documenten/d353545a-402e-4ec0-b2af-4b565d36a948/file

Spante, M., Hashemi, S. S., Lundin, M., & Algers, A. (2018). Digital competence and digital literacy in higher education research: Systematic review of concept use. *Cogent Education, 5*(1), 1519143. https://doi.org/10.1080/2331186X.2018.1519143

Star, S. L., & Griesemer, J. R. (1989). Institutional ecology, 'translations' and boundary objects: Amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907–1939. *Social Studies of Science, 19*(3), 387–420.

van Deursen, A. J. A. M., Helsper, E. J., & Eynon, R. (2015). Development and validation of the Internet Skills Scale (ISS). *Information, Communication & Society, 19*(6), 804–823. https://doi.org/10.1080/1369118X.2015.1078834

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Meggi Wiesmann, Julia Soeffner, Anna Teichmann & María Gutiérrez Vanegas

Designing Digital Learning Modules in a European Project

Insights Into the "Blueprint-Process" of Collaboration, Development and Implementation

Abstract
This article provides insights into the development process of digital learning modules (DLMs) for teachers as part of the Erasmus+ Teacher Academy *teff*. The first DLM within *teff* was created as part of the Work Package 3 (WP 3) "Digital Competences". In this work package, the didactic-methodological, technical and organisational framework of a DLM were defined. This article provides insights into the development process including designing the structure and content of the DLMs, the use of quality assurance measures to ensure the modules meet the needs of the target group, as well as the collaboration between the European partners. Through iterative processes including structured teamwork and the exchange of feedback, the quality of the DLMs was continuously improved. This chapter presents a description of the development of the DLM in WP3, followed by a presentation of the framework developed. This framework was subsequently used as a foundation for the development of further DLMs (on diversity and inclusion, well-being, sustainability) which were implemented as part of the larger *teff* project.

Keywords: Digital learning modules, collaboration, H5P, blueprint-process, teamwork

1. Introduction

The *teff* work package 3 "Digital Competences" was the first WP to develop a digital learning module (DLM) as a deliverable. Here, the module was conceived as a reference for subsequent DLMs and a procedure was developed to prepare diverse topics and complex contents for various target groups. Overall, *teff* managed to design four DLMs in the work packages on sustainability (WP4), diversity & inclusion (WP5) and well-being skills (WP6). These work packages, however, went well beyond this initial goal. The results are:

- four English-language online courses with basic information and various navigation options for the integrated DLMs;

- a total of 20 English-language DLMs, including transfer tasks and learning assessments;
- translations of the online courses and DLMs into several languages (German, Spanish and one module in French);
- instructions, templates and handouts for the development of further DLMs.

This chapter focuses on the development of a transferable 'blueprint process' for the development of further DLMs.

2. Developing a Common Understanding of Collaborative Cooperation and the Creation of OER DLMs

To ensure the lasting impact of the *teff* Teacher Academy, the project proposal specified DLMs as essential deliverables. DLMs enable the long-term utilisation of the training programmes by learners, beyond learning windows limited to the project period or specific instances such as on-site training. The DLMs were developed as Open Educational Resources (OER). The principles of accessibility and collaboration are the driving forces for developing these DLMs as OER. The DLMs were published with a Creative Commons (CC) licence.[1]

2.1 Project Management and Coordination in a European Network

To ensure the successful development of the DLMs, the work in WP3 focused on a set of fundamental documents that define the standards and workflows within the *teff* Academy. These documents serve as comprehensive guidelines that outline the protocols for collaboration, quality assurance and content creation. The decision to develop an online course consisting of six DLMs (which could potentially cover all areas of the *teff Framework for Digital Competencies,* and could also be expanded in the future) raised many organisational questions and tasks. The course had to be developed within the European network of all members of WP3 spanning six institutions in five countries (Germany, Netherlands, Norway, Spain, Sweden). In addition, cohesion amongst the six DLMs was imperative. Therefore, central questions concerning the general structure, main definitions, and the objectives of the DLMs had to be addressed as a first step. To efficiently monitor the different responsibilities, work stages and timeline, the WP3 worked with a detailed milestone plan. Different members of the WP3 were specifically tasked with creating the concept, the storyboard and developing the DLMs. This enabled a parallel development of the six

1 Creative Commons (CC) is a non-profit organisation that offers assistance to authors in releasing legally protected content in the form of ready-made licence agreements. There is a choice between very open and less open licences. The CC By-SA 4.0 licence was chosen for this project. This licence allows third parties to distribute, remix, modify and build upon a work, as long as appropriate copyright and rights information is provided and the new works are published under the same conditions.

unique modules. This approach also had the advantage that the partners were able to block time slots for quality assurance.

2.2 Developing the Guidelines and Templates

Guidelines and templates for both the design of DLMs and the development process were necessary for establishing a common understanding and enabling a smoother implementation for all partners involved. These guidelines were developed collaboratively and subsequently used as a joint document to ensure that all DLMs were of the same high quality and consistent design. Additionally, they were included in the *Comprehensive Guidelines Booklet "Designing teff Learning Activities."*

The guidelines start with an overview of the general structure of DLMs to ensure that everyone implements the same terms. The core of the booklet consists of two checklists. The first covers some general points of DLM design, such as adherence to *teff* quality standards and the *teff* learning activity design process. Additionally, it offers a set of guiding questions covering a range of principles underlying the design of DLMs – for example, clarifying responsibilities within the working group, defining a target group, ensuring accessibility and sustainability of the DLM, including a review process in the design phase and awareness of proper licensing as OER. The second checklist focuses on learning design standards: It includes major elements that make a DLM attractive to learners, such as a clear and transparent structure, user-friendly navigation, correct and comprehensive content, applicability of the content, interactivity and variation in content-presentation and assessment and conditions for receiving a certificate/confirmation of participation. These standards are based on the ARCS Motivational Design Model (Keller, 1987) and Mayer's Principles (Mayer, 2014). The ARCS-model states that four conditions should be followed to motivate learners to continue with a course: Keeping the learner's attention (A) by mixing methods and media, explaining the practical relevance (R) of the content, strengthening the learner's confidence (C) by providing clear learning objectives as well as their satisfaction (S) by showing possibilities of how to transfer the content into practice.

Finally, the guidelines include templates of the most important working documents already mentioned above:

- the concept to establish the broad structure, learning goal, duration, etc. of the DLM and to collect feedback from all members from the respective group;
- the storyboard for the detailed content and structure of the DLM, including links, pictures, design, and interactive elements;
- the milestone plan to get an overview of tasks, timeline, and responsibilities;
- icons to mark specific elements in the DLMs (such as literature or reflective tasks);
- and the recommended structure of focus group interviews for quality assurance.

Principles of accessibility were applied to ensure that the learning modules can be used by the broadest audience possible. Graphic principles, such as high contrast on

text-based boxes and accessible use of images were also implemented when creating the learning modules. The systems utilized offer metadata options for entering alternative text for images, tables, and buttons, so that the content can also be accessed by people with visual impairments using special programmes or devices (screen readers). Subtitles in videos were also used when possible or instructions were provided on how to display them.

3. The Development-Process

3.1 Setting Up and Selecting the Technical Infrastructure

After the project kick-off, a survey was conducted among all work package participants to identify content priorities, available resources, and technical infrastructures. The results of the survey indicated that the infrastructure used at the University of Cologne was most suitable for developing the DLMs. The DLMs integrated into these subpages were implemented using the open-source tool H5P, which is integrated as a plugin in WordPress but can also be edited externally in other systems. H5P offers several compelling advantages for this project:

- it is an open-source tool that embodies the same philosophy of accessibility and collaboration that defines OER itself; the technical infrastructure supporting their educational content is as freely accessible and modifiable as the content itself;
- implementing an open-source tool also prevents vendor lock-in, ensuring that educational resources remain accessible regardless of commercial decisions or subscription changes;
- H5P offers different content types with numerous functions to integrate interactive elements such as quizzes and image hotspots;
- the reuse and embed function allows for easy downloading, editing, and integration into other systems (eliminating the need for user management);
- it is quick to learn and easy to use;
- the platform supports language conversion for end users regarding button labels and interface elements.

The used "Portfolio" content type developed by the University of Cologne in another funded project enables the creation of DLMs with multiple subpages, allowing various interactive contents to be structured together in a user-friendly manner without requiring extensive training. The structure of the individual pages using placeholders is user-friendly and can be implemented without much training. This combination of flexibility, interoperability, and user-friendliness made H5P the ideal choice for developing reusable, accessible DLMs that could be shared across all project partners, easily translated into several languages and integrated into their respective systems.

3.2 Development of the DLM "Digital Resources" as Prototype

As outlined in the article 'Development of a European learning module on digital competences for teachers using the DigCompEdu framework as a boundary object', WP3 developed its own framework of "Digital competences for teachers" based on the DigCompEdu (Redecker, 2017). This framework became the structure of the *teff* online course on digital competences. The online course comprises six DLMs: core modules on digital resources, teaching, feedback and assessment, and empowering learners, framed by modules on reflective and agile mindset and on facilitating learners' digital competence. The DLM "digital resources" was established as the first DLM within the course as well as the first DLM within *teff*. While designing the DLM, questions on collaboration, feedback structures, review possibilities, assessment and learning design arose. The structuring documents and guidelines described above were the result of finding solutions to these questions throughout the design process.

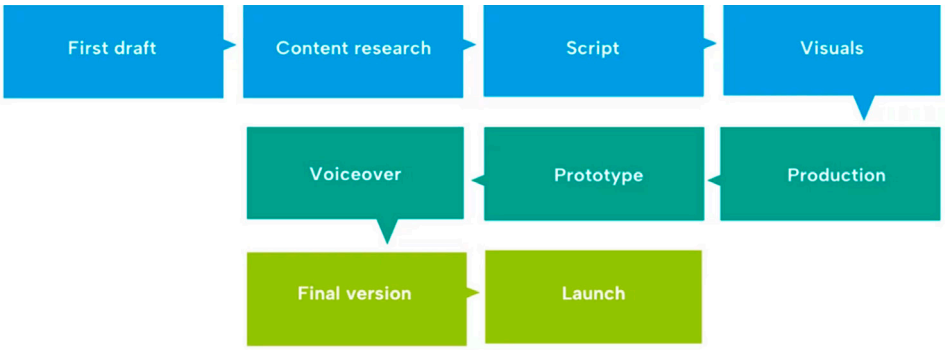


Figure 1: Design process of the DLMs

Figure 1 illustrates the design process of the DLMs. The script / storyboard revealed itself as the most important document: It is used for both specifying content and interactive elements and images used in the DLM as well as the central document to collect the feedback of all members of WP3. The more detailed the storyboard, the easier the production of the DLM in H5P. Once created, the prototype on digital resources served as a template for all other modules, ensuring continuity within the structure of the modules:

- a title page with the title, a suitable image, the processing time, as well as notes for a possible interruption of the DLM and for the licence,
- a welcome page with a brief description and learning objectives,
- content chapters with questions for content editing or review,
- learning success control (confirmation of participation after 80 % correct answers) and transfer tasks and,
- a final page with a review of the learning objectives and a reference to the online course

To motivate learners to share their respective experiences with topics discussed in the module, reflective questions were added and linked to EduMaps, a digital whiteboard. This was to enable learners to share their thoughts, tool recommendations and good-practices, thereby creating a cross-phased and cross-border peer-learning community. Unfortunately, as of now, these features are not yet used. Research suggests that such limited engagement is common in asynchronous courses, often due to practical and emotional barriers. For example, Doyle & Nieuwoudt (2021, p. 166) report that "the majority of participants reported a lack of time," and some noted they "were not confident in the activities and thus did not post a message." These factors likely contribute to why learners in our module have not yet made active use of the collaborative space.

3.3 Quality Assurance Measures

The quality assurance consisted of three steps:

- checking functionality, spelling and integrated contents and specifications from the guidelines by the developing partner,
- inspection by the other partners of the work package including description of the changes and possible additions (including screenshots and examples in an Excel sheet),
- focus groups consisting of students, student trainees and teachers from different countries.

After the development of the module, the first quality assurance was performed by the developing partner before the other involved partners gave feedback and suggestions. As a final step, we decided to test the modules directly on our target demographic through testing in focus groups. Focus groups are moderated group interviews and form an important measure for the further development and qualitative improvement of the DLMs. The method originated in the field of public relations and marketing. Focus groups bring together people with a specific background or knowledge relevant to the topic at hand. For the development of DLMs, it is essential to form focus groups comprising the *teff* target group: this includes students, student trainees and teachers. Through probing the opinions of members of the focus groups, researchers can gain relevant insight for the improvement of the DLM. Focus groups can be conducted in person on-site or in a moderated form online (e.g. in Zoom). The composition of the group follows the principle of being "small enough for everyone to have an opportunity to share insights and yet large enough to provide diversity of perceptions" (Krueger & Casey, 2000, p. 10). Maguire (2003) advocates a size of four to six people, as this small group size allows all participants in the focus group to contribute personally to the discussion. In the context of *teff*, the meetings were organised and moderated by one of the *teff* members and took place via Zoom. Around ninety minutes to two hours were scheduled for testing the learning modules and collecting feedback. We began with an introduction and a short briefing on

the project, the DLMs and the platform. We utilized a digital whiteboard for collecting feedback, missing or unclear information and ideas for improvement. The participants (mostly student teachers from Belgium, Finland, Germany, the Netherlands, Norway, and Spain) went through one of the modules and collected positive aspects, suggestions for improvement and finally discussed these thoughts with some of the other participants. For a deeper look into the structure and content of the modules, we developed some guiding questions for the participants, which were used in the later part of the meeting. In the end, we summarised the main aspects and recommendations for our further work. The proposed changes resulting from the focus group were communicated by the site responsible for the focus group to the production sites via recorded video and written text and the changes were subsequently implemented by the production sites. The other project partners were also informed about the relevant changes made.

4. Translation Process

After the translation of the initial storyboards into Spanish and German, the technical implementation of the multilingual DLMs was initiated. The structure of the original English online course was first duplicated, including the main landing page, six individual module landing pages, and the H5P portfolios to be embedded within each module. The translated text blocks were then inserted into the respective H5P portfolios. Care was taken to maintain a consistent structure and design across all language versions to ensure an equal user experience irrespective of the selected language. In addition to the main content, all interface elements within the H5P portfolios, such as navigation buttons, progress indicators, and labels, also had to be translated.

Subsequently, the visual materials were adapted using Canva. Graphics were either modified or replaced to align with the translated content, and language-specific adjustments were made where necessary. When external resources were linked within the modules, official Spanish or German versions were used, when available. If no such versions existed, a note was added to inform users that the resource was only available in English. Through this process, a multilingual version of each module was made accessible without the need for major changes to the existing infrastructure. The use of H5P portfolios facilitated this flexibility by allowing easy content replacement, visual editing, and language adaptation within a standardised interactive framework. This approach not only ensured linguistic inclusivity but also supported the scalability of the modules across different European contexts.

5. Outlook on the Technical Production of Further Modules

The experiences gained during the development of the first DLMs have laid a strong foundation for the subsequent courses on sustainability education, diversity and inclusion, and (future) teacher well-being. Building on established structures, tem-

plates, and guidelines, the production processes for these modules were refined and better coordinated. To strengthen collaboration and workflow transparency, digital project management tools (e.g. MeisterTask) were introduced, allowing clearer task allocation, deadlines, and progress tracking. The H5P template developed during the initial phase has proven to be a key tool for European cooperation in digital education. Its reuse and embed functions, intuitive structure, and compatibility with various learning platforms (e.g. EinstiegH5P, ILIAS or Moodle) enable straightforward integration and exchange between institutions. Since H5P content can be reused without user management, it supports flexibility, openness, and accessibility across languages and systems.

Nevertheless, some challenges remain. The *teff* Teacher Academy offers the chance to share experiences among peers from different European countries, however reflective tasks and digital tools for interaction and exchange of materials and experiences (such as the use of EduMaps) have not been used by the learners so far. Another challenge was collecting materials and examples from different countries, which can be very time-consuming and does not guarantee an equal number of contributions from each country. The creation of a glossary and detailed style guide, including standardised terminology, gender-neutral language, and formatting rules was essential for ensuring quality and inclusivity but also required considerable effort during quality assurance.

In addition to these efforts a language-related challenge emerged: the WordPress tool plugin used for module development was available only in German, which made it more difficult for partners from other countries to contribute effectively and placed additional workload on the hosting institution responsible for managing the tool. The implementation of comprehensive tables of contents and linked navigation improved coherence across modules, while translations were carried out after incorporating focus group feedback to ensure that multilingual versions reflected the revised content. Sustained engagement from all partners remains vital. While established structures facilitate coordination, encouraging more active collaboration during content creation, rather than mainly during review, continues to be an important goal. By maintaining shared standards and continuously refining technical and organisational procedures, the project has established a scalable and sustainable framework for future module development. This ensures that the DLMs remain high in quality, accessible, and relevant for teachers and teaching students across Europe.

References

Doyle, J., & Nieuwoudt, J. (2021). Is lurking working? The role of non-assessed discussion boards in an online enabling program literacies subject. *Student Engagement in Higher Education Journal, 3*(2), 158–175.

Keller, J. M. (1987). Development and use of the ARCS model of instructional design. *Journal of Instructional Development, 10*, 2–10.

Krueger, R., & Casey, M. (2020). *Focus groups: A practical guide for applied research* (5th ed.). SAGE.

Maguire, M. (2003). *The use of focus groups for user requirements analysis.* CRC Press.
Mayer, R. E. (2014). *The Cambridge handbook of multimedia learning* (2nd ed.). Cambridge University Press.
Organisation for Economic Co-operation and Development. (2019). *Working and learning together: Rethinking human resource policies for schools.* https://vdoc.pub/download/working-and-learning-together-719vsv7pett0
Redecker, C. (2017). *European framework for the digital competence of educators: DigCompEdu.* https://joint-research-centre.ec.europa.eu/digcompedu_en
Tuomi, I. (2013). Open educational resources and the transformation of education. *European Journal of Education, 48*(1), 58–78. https://doi.org/10.1111/ejed.12019

G.
Envisioning Education Tomorrow: Fostering Futures Thinking

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Iina Hyyppä, Ilona Södervik, Heidi Krzywacki, Xinlan Zhang, Tapio Rasa & Antti Laherto

Challenge Your Futures Thinking

An Introductory Activity on Futures Thinking for Teachers

Abstract
While the nature of education is inherently future-oriented, educational practices discussing the future and the way it is perceived remain undervalued. As a part of the Erasmus+ Teacher Academy *"Teacher Education for a Future in Flux" (teff)* we developed an educational activity for pre-service and in-service teachers designed to encourage them and their students to explore and expand their perceptions of the future. The activity includes an educational tool focused on different frameworks of futures studies and futures thinking, accompanied by reflective tasks for analysing future visions and finding agency in achieving a desired future. The activity and tool have been implemented at various European teacher education institutions and also serve as the basis for ongoing research on teachers' futures thinking skills.

Keywords: futures thinking; futures education; learning material; pre-service teachers; in-service teachers

Introduction

While *future* is a catchword in many discourses centering on education, *future-oriented education* (Laherto & Rasa, 2022) should not only focus on fostering competencies that students are likely to need, but also on developing the capability to envision and critically reflect on the future itself. Such capabilities, commonly referred to as *futures literacy* (Miller, 2018), involve imagining various alternative futures and understanding how images of the future influence present actions and decisions, and vice versa: how present-day actions and decisions affect potential futures. The activity presented in this chapter draws on this meaning of *futures thinking*, informed by the fields of Futures Studies and Futures Education (e.g. Lombardo & Cornish, 2010).

The 'Challenge your futures thinking' tool (Appendix) was developed by teacher educators and educational researchers at the University of Helsinki, Finland, as a part of the Erasmus+ Teacher Academy "Teacher Education for a Future in Flux" (*teff*). It acts as an educational resource on futures thinking. The material introduces various frameworks of futures thinking developed in the field of Futures Studies, explores

individuals' hopeful future visions, and encourages reflection and the elaboration of one's own futures thinking.

'Challenge your futures thinking' can be employed in various ways – from implementing the tool as a means of self-reflection on personal perceptions of the future, to challenging views between peers, to hosting lessons with students to encourage them to imagine desired futures and elaborate their futures thinking. The tool aims to bring to light the often-subconscious conceptions we hold of the future and to create space for discussion on these conceptions. While the tool itself is not conceptualised for any specific audience, it was developed primarily for educators and teacher students and has already been employed in pre-service and in-service teacher education across various European universities.

Implementation in *teff*

Within *teff*, the tool was implemented as part of a broader activity on futures thinking, where pre-service and in-service teachers engaged in writing short essays and answering a multiple-choice questionnaire as pre-assignments. Participants were encouraged to reflect on their conceptions of the future of the teaching profession through two writing tasks, after which they received the 'Challenge your futures thinking' tool as a learning material, accompanied by a brief lecture on futures studies and futures thinking.

The first assignment, a so-called *futures visioning activity*, aimed at evoking narratives of a desired future and encouraging participants to consider alternative, wishful futures. The assignment consisted of a short essay response:

1. *'It is the year 2050 and you work as a teacher. Write a short story on your workday in your desired future. You may discuss, for example, working methods and environments, pedagogical solutions, pupils and students, interaction, potential conflicts, and the role of school in society.'*

The second assignment, a *backcasting task*, invited participants to consider the steps required to reach their envisioned future and to understand the relationship between that future vision and the present day. The assignment was to write a short essay response to the following prompt:

2 *'Now imagine yourself in your aforementioned desired future. Look back towards the present day and briefly describe the developments and changes that have occurred on the way to this future. Also consider what or who has influenced the changes.'*

After the writing assignments, the participants were asked to respond to the Teacher's Futures Consciousness questionnaire consisting of Likert-scale questions (Zhang et al., 2026). Finally, the following 'Challenge your futures thinking' tool was pre-

sented as a reflective mechanism and learning opportunity. This activity, made up of the above assignments and the tool, has been hosted across European teacher education institutions by *teff* partners in Finland, Germany, Belgium, Italy, and Sweden, and has been the ground for ongoing research on pre-service and in-service teachers' futures thinking (Hyyppä et al., 2025, 2026; Zhang et al., 2026). In 2026, the results will be used in a *teff* report informing policymaking on teacher education in Europe.

The 'Challenge your futures thinking' tool is presented in the Appendix.

References

Hyyppä, I., Södervik, I., Krzywacki, H., & Laherto, A. (2025). Visioning schooling in 2050: Analyzing pre-service teachers' futures consciousness. In A. Rajala, A. Cortez, R. Hofmann, A. Jornet, H. Lotz-Sisitka, & L. Markauskaite (Eds.), *Proceedings of the 19th International Conference of the Learning Sciences – ICLS 2025* (pp. 2095–2099). ISLS International Society of the Learning Sciences.

Hyyppä, I., Södervik, I., Krzywacki, H., & Laherto, A. (2026). *Desired futures of schooling – Unravelling pre-service teachers' futures consciousness* [Manuscript in preparation].

Laherto, A. & Rasa, T. (2022). Facilitating transformative science education through futures thinking. *On the Horizon, 30*(2), 96-103.

Lombardo, T. & Cornish, E. (2010). Wisdom facing forward: What it means to have heightened future consciousness. *The Futurist, 44*(5), 34-42.

Miller, R. (Ed.). (2018). *Transforming the future: Anticipation in the 21st century.* UNESCO; Routledge.

Zhang, X., Laherto, A., Hyyppä, I. M., Krzywacki, H., Tikkanen, L., & Södervik, I. (2026). *Contextualization and validation of the futures consciousness scale in teacher education* [Manuscript in preparation].

Appendix:
'Challenge Your Futures Thinking' Reflective Tool and Learning Material

What Do We Know About the Future?

The past, present, and future: broadly speaking, time can simply be divided into these three frames. Historical narratives, future predictions, and visions are subjective. The academic field of Futures studies was established in the 1960's to develop our ways of thinking about the future by employing the following principles.

Three guiding principles of Futures Studies (Amara, 1981)

1. The future is **not predictable**, as there is no singular future, but rather countless possibilities
2. The future is **not predetermined**
3. The future **can be influenced** through present choices and actions

Applying the above mindset, we cannot know what will happen in the future, but we can aim to influence future events through our own current choices and actions. While futures are intrinsically open and unpredictable, they can nevertheless be anticipated and envisioned. In order to make appropriate choices for the future we must be able to consider, on the one hand, the consequences of our present-day actions and, on the other hand, accept the fundamental uncertainties of the future. Futures thinking requires precision, systematicity, and critical thinking, while remaining open-minded and accepting inherent uncertainties.

How Can We Think About the Future?

Already in 1978, Henchey presented a prevalent model that can aid in thinking about the futures in plural.

Categorisation of Futures (Henchey, 1978)

- **Possible futures:** all futures that are not absolutely impossible
- **Plausible futures:** all futures that could happen
- **Probable futures:** all futures that are likely to happen
- **Preferable futures:** all futures that are desirable

Many concrete visualisations of the framework have been constructed, one of which is the following futures cone (adapted from Voros, 2003; 2017).

The Futures Cone

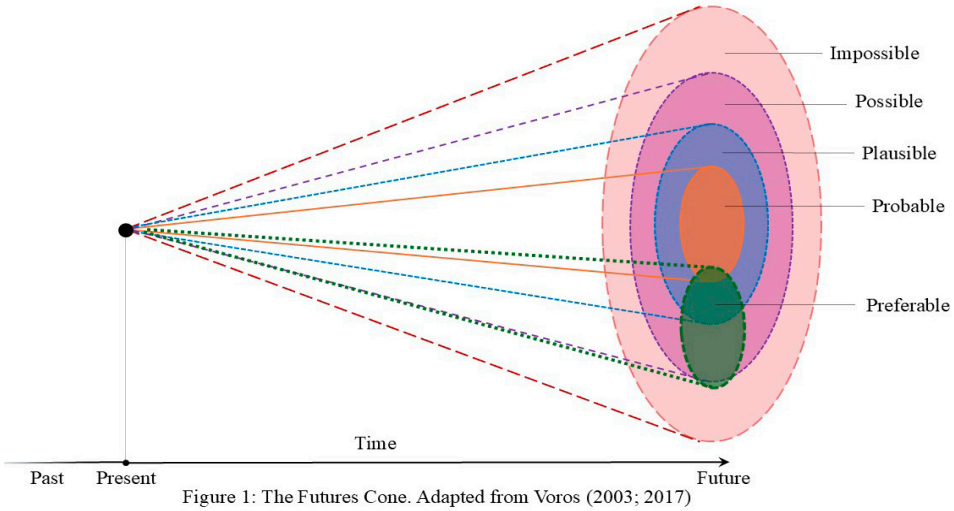


Figure 1: The Futures Cone. Adapted from Voros (2003; 2017)

The further into the future one looks, the broader the range of perceived possible futures becomes. In the Voros (2017) model, one can also imagine preposterous futures that are perceived as impossible. Among all possible futures, one can identify different plausible and preferable futures. If the model is visualized three-dimensionally, one can also understand that as the timespan between the present and the future grows, the proportion of probable futures that we perceive diminishes relative to the others. The further one looks ahead into the future, the more increasingly likely it is that events beyond our capacity to expect or predict will occur. It is important to note that desired futures can be located anywhere in this model.

Futures Visioning

Pause for a moment and think about how you view the future. Write down or think about a vision of the future.

- In which category of futures (Henchey, 1978) would you situate your future vision? Ponder the reasons why.
- If you were to vision a preferable future, how likely do you reckon it would be? Where on the Futures Cone (Voros, 2003; 2017) would you place it?

Take a look at the following table and continue pondering the above questions. The table describes different **ways of thinking about the future**, which can be used as tools in creating various future visions.

	Futures	Foundations	Thinking methods	Thinking techniques
1	**Probable**	Continuities Orientations & trends	Logical Scientific	Historical analogies Extrapolation
2	**Possible/ Plausible**	Discontinuities Surprises	Speculative Imaginative	Scenarios Simulation
3	**Preferable**	Choices Futures images	Goal-oriented Empowering	Visioning Planning

Table (1) adapted from materials developed by Teach the Future (www.teachthefuture.org).

- **Probable futures** (1) can be developed through extrapolation, that is by following the past and current trends in a logical manner and predicting where they will take us in the future. On the other hand, thinking about probable futures can take the form of hopelessness, or seeing a negative future as inevitable.
- **Possible and plausible futures** (2) can be devised through a "what if" way of thinking, that is by speculating and imagining what *could* happen if the future deviates from our present-day assumptions.
- **Preferable futures** (3) employ an entirely different thinking mechanism. Instead of starting at the present-day like in probable, possible, and plausible futures, this way of thinking jumps straight into the future and creates the world through subjective wishes, values, and aims. One can then look backwards from this preferable future towards the present-day and consider how that future was achieved (this technique is referred to as *backcasting*).

These three ways of thinking differ in terms of their perceived opportunities to influence the future. The closer a vision is to a preferable future, the more agency it requires.

How Can We Understand Our Own Futures Thinking?

As the future exists merely within our thoughts, it is crucial that we recognize and challenge the ways we think about the future. We also need to be able to analyse the values and conceptions that impact our futures thinking. The following model of futures consciousness can be used as a tool for (self-)reflection.

The Five Dimensions of Futures Consciousness (Ahvenharju et al., 2021)

Figure 2: The 5 Dimensions of Futures Consciousness. Adapted from Ahvenharju et al. (2021)

Reflect on Your Own Futures Thinking

Consider your earlier future vision or try to conceive an alternative future. Use the questions below to reflect on your futures thinking and futures visions individually or with a group. Have an open dialogue and remember the pluralistic nature of futures, as there are no rights and wrongs in visioning what the future could be!

- Reflect on your future vision using the Futures Cone (Voros, 2003; 2017).
  Do you consider your future visions to be possible, plausible, or probable? Why?
- Reflect on the thinking techniques that you used in creating your future vision.
  Which futures thinking techniques from Table 1 did you use?
- **Reflect on the five dimensions of Futures Consciousness (Ahvenharju et al., 2021).** Answer the questions below each dimension in the model.
  Which dimensions of futures consciousness stand out in your thinking?
  Which dimensions could you aim to further incorporate into your thinking?

A Final Challenge for the End:

- How could you use the above explained models to broaden your thinking of your own future and the futures of society, school, and the teacher's profession?

References

Ahvenharju, S., Lalot, F., Minkkinen, M., & Quiamzade, A. (2021). Individual futures consciousness: Psychology behind the five-dimensional Futures Consciousness scale. *Futures, 128*, 102708. https://doi.org/10.1016/j.futures.2021.102708

Amara, R. (1981). The Futures Field: Searching for definitions and boundaries. *The Futurist, 15*(1), 25–29.

Henchey, N. (1978). Making sense of future studies. *Alternatives, 7*(2), 24–27. http://www.jstor.org/stable/45030200

Teach the Future. (n.d.). *Prepare students for tomorrow, Teach the Future today – Teaching tools.* https://teachthefuture.org

Voros, J. (2003). A generic foresight process framework. *Foresight, 5*(3), 10–21. https://doi.org/10.1108/14636680310698379

Voros, J. (2017). Big history and anticipation: Using Big History as a framework for global foresight. In R. Poli (Ed.), *Handbook of anticipation: Theoretical and applied aspects of the use of future in decision making* (Chapter 95, 40 pp.). Springer International. https://doi.org/10.1007/978-3-319-31737-3_95-1

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Roman Bartosch & Wiebke Dannecker

Assembling Future Skills Together: The *teff* Future Fiction Makerspace

Abstract
The contribution outlines key aspects of the debate on future skills and futures literacy and underlines the importance of collaborative and participatory research in arts-based education. It introduces the concept and format of the *teff* Future Fiction Makerspace, organised and conducted at the University of Cologne and together with more than 70 European colleagues. The objective of the Future Fiction Makerspace – the creation and dissemination of a 'Future Fiction Tool-Kit' – are described and explained, and the methodology and key findings are outlined.

Keywords: future skills, futures literacy, collaboration, participatory research, living labs

1. Introduction

It is a truism that all education is a future-oriented endeavour. While teaching future generations must necessarily be orientated towards their anticipated or manifest needs, trenchant critiques have challenged the supposedly inert or conservative influence of, for example, literary and cultural canons on curricula and teaching practices (Whitehead, 1967; Drew, 2025). Under the pressure of ever-accelerating crises – from ecological to digital ones – and in the context of rapid social and technological change and uncertainty, both the future orientation of education and critiques of its former stasis must be reflected and addressed.

It is against the backdrop of these developments and discussions that 'future skills' are receiving significant attention. While these skills may reiterate a surprising conservative concern when they remain merely technologically focussed, a global community of researchers in the field of futures literacy (Sippl, Brandhofer & Rauscher, 2023; Dannecker, 2025) have made convincing cases for a more encompassing notion of education and its potentials. This is where the environmental humanities come in – and this is where the *teff* Future Fiction Makerspace comes in as well.

The Future Fiction Makerspace was designed with the understanding that future skills and futures literacy depend on – and thrive through – collaborative practices that cultivate attention to the visionary and empowering affordances of art. It was organised and conducted by a team of seven researchers across all career levels, sup-

ported by two research assistants, and later joined by three established scholars in the Cologne team. Four BA- and Master-level students contributed through their own research projects in the Makerspace under the supervision of the leading team. Additionally, around 70 researchers and practitioners from the European *teff* community participated.

2. Learning to Envision Futures

In line with research in future-thinking as well as the well-being crises associated with the perception of a loss of future opportunity and quality of life (Bartosch & Fuchs, 2024), we acknowledge – and explicitly build on – the conviction that any meaningful set of future skills and futures literacy thrives on the ability of learners and teachers to mobilise their imagination to see that the future is, in many respects, radically open.

At the same time, the future is not subject to individual decision-making, and bringing about desirable and sustainable change requires ongoing and cooperative collaboration. The Future Fiction Makerspace sought to translate these theoretical insights into meaningful educational and scholarly practice by, firstly, paying acute attention to the affordances and potentials of the arts, most notably literary fiction, poetry writing, performances and plays, and curatorial practices. Secondly, it aimed at participatory research processes that included not only the expertise of participants but kept open the spectrum and scope of its own research results.

The Future Fiction Makerspace was built on three 'keynote inspirations' – impulses from experts on their research as well as on open questions they are pursuing in their professional lives – designed to spark interest in, and focus attention on, the creative potentials of futures literacy research. These inspirations addressed potentials and best educational practices concerning intergenerational drama performances, work in living labs on children's and young adult fiction, as well as multilingual classes on poetry adaptations. These inspirations framed collaborative work in six futures labs: a 'cli-fi lab' working with speculative literary fiction, a 'poetry lab' introducing participants to creative writing, a 'theatre lab' experimenting with performance and play, an 'exhibition lab' aimed to engage learners in curatorial practice and futures thinking, a 'futures fiction lab' mobilising children's literature for literacy acquisition, and, finally, an 'adaptation lab' engaging rewriting and multimodal practices for futures literacy. Besides convivial conversations and fruitful critical debates, the open format of these components included discussions of the nature of the output and results the group deemed helpful for future (and futuring) practices.

3. Preliminary Results

The group published an academic article (Dannecker et al., 2025) and are currently working on three academic monographs, one concerned with developing a practice-oriented check list for literary fiction for young learners into a fully-fledged

"Future Fiction Companion;" one assembling artistic, scholarly and pedagogical essays and practice guidelines in a curated collection meant to inspire experimentation with artistic agencies (including multispecies song-writing and creative writing); and one that addresses and evaluates design principles to drama-based activities in inclusive education. Further academic work was conducted in BA and Master's theses. The two BA theses are 'No Future in the Early English Classroom? A Review and Analysis of Teaching Materials and the Pedagogical Potentials of Futures Literacy in Primary School Education' and 'Climate Change Literature – Teaching William Sutcliffe's *The Summer We Turned Green*'. The two Master's theses are: 'Fostering Futures Literacy in Primary English Teaching through Storytelling' and 'Education for Sustainable Development – Follow-up Communication in Heterogeneous Learning Groups.' This work highlights the productive nature of our collaboration across career and expertise levels and seeks to inspire other scholarly and scientific colleagues while it also establishes student and postgraduate supervision as an important stepping stone in the qualification of future change-makers. The importance of such holistic and dedicated academic engagement notwithstanding, the group acknowledges – and has been supported in this by the international community of collaborators – that an exclusive focus on academic publishing protocols is not sufficient if wider audiences are meant to be reached and practical value for teaching practices is sought.

This is why a second, and ongoing outlet of the project is the creation of Future Fiction Briefs. While the academic publications provide the conceptual and empirical background, these four-page practice papers function as tools for the transliteration of research findings into hands-on, inspirational as well as organisational aides for practitioners in formal and non-formal educational settings. They are published online and open access in the "MESH Leaf" series, a series of policy and practice publications promoted and distributed in the research communities of the MESH research hub (see mesh.uni-koeln.de/) and *teff* community, the policy-making leg of the UNESCO/MOST BRIDGES Hub for Planetary Well-being (https://bridges-hub.cologne/) and local and international collaborators in schools and arts-based educational contexts (see fig. 1). Taken together, they constitute the 'futures literacy tool kit;' a living resource that will be added to, revised, and complemented by a range of activities within the core group and beyond.

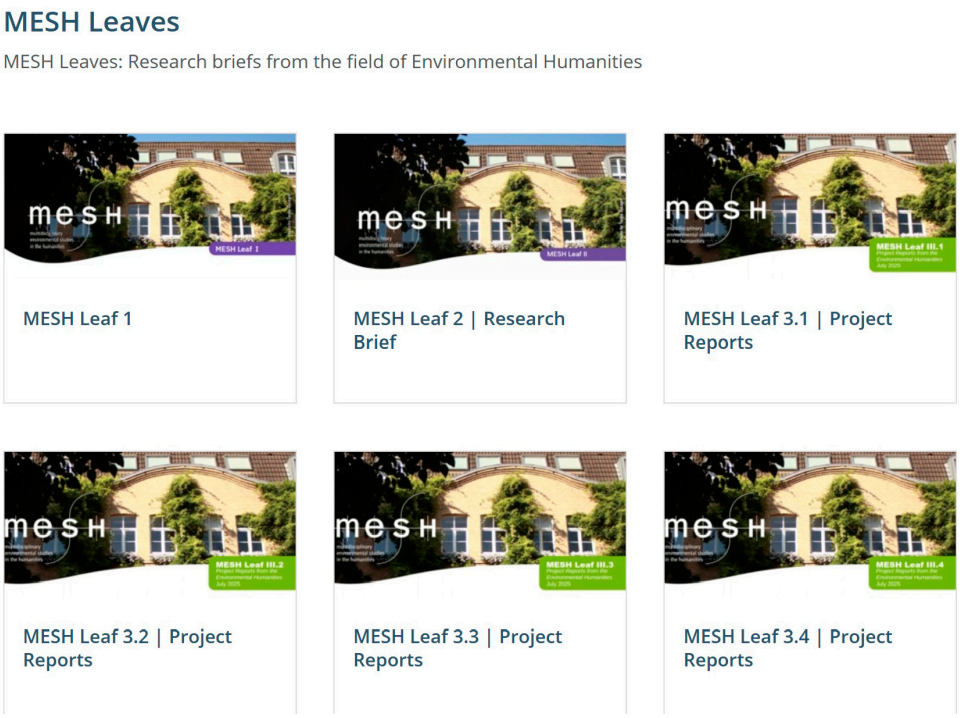


Figure 1: The "MESH Leaf" series as an online repository for policy and practice briefs.

4. Outlook: Future(s) Activities

In future work, the tool kit serves as the foundation of training modules developed by the University of Cologne team and its European colleagues. These modules can be used as stand-alone offers for continuing education as well as integral components of the emerging micro-credential programmes for futures literacy and public environmental humanities in Cologne and the European University for Well-being. To support these endeavours, we organised a second iteration of the *teff* Future Fiction Makerspace – "Future Fiction Makerspace II: Back to the Future" – that serves two main purposes. Firstly, it initiates exchange with our international partners to assess feasibility and practicality of the developed tools and adjusts them according to the experiences and expertise of the European community. Secondly, it brings in new keynote inspirations from experts that agreed to advance our work, with respect not only to the potentials of the arts and arts-based practices, but with an eye of design principles and institutional opportunities for integrating future skills and futures literacy in formal educational practices. Another workshop and set of publications and activities are planned already and beyond the initial frame of the Erasmus+ Teacher Academy *teff* funding and timeline.

Acknowledgements
We thank the European *teff* team and community and all participants of the Future Fiction Makerspace. Special thanks to our keynote inspirations, Julia Hoydis, Carmen Sippl, and Per Esben Svelstad, and our fantastic research team, Leonie Carell, Celestine Caruso, Sina Derichsweiler, Natalie Dederichs, Sina Derichsweiler and Tanya Gautam as well as our research assistants, Grace Ali and Sophie Spieß.

References

Bartosch, R., & Fuchs, S. (2024). The worst is yet to come: Theoretical and empirical findings on mental health in a climate-changed world. In C. Ludwig et al. (Eds.), *Mental health in English language education* (pp. 61–73). Narr Francke Attempto.

Dannecker, W., Bartosch, R., Derichsweiler, S., Dederichs, N., Carell, L., & Gautam, T. (2025). Zukünfte imaginieren, erzählen und reflektieren: Der Future Fiction Makerspace als Reallabor einer zukunftsfähigen Lehrkräftebildung. *Kölner Online Journal für Lehrerinnenbildung*, *9*(9), 120–137.

Dannecker, W. (2025). Vom Leben auf dem Meer erzählen – Zukunftsvorstellungen reflektieren: Zur Bedeutung von Zukunftserzählungen für die Aneignung von Futures Literacy am Beispiel der Jugendroman-Trilogie *Ocean City*. *R&E-Source, 4*, 30–47. https://journal.ph-noe.ac.at/index.php/resource/article/view/1490/1479

Drew, J. (2025). *Animals in literary education: Towards multispecies empathy*. Palgrave Macmillan.

Sippl, C., Brandhofer, G., & Rauscher, E. (Eds.). (2023). *Futures literacy: Zukunft lernen und lehren*. Studienverlag.

Whitehead, A. N. (1967). *The aims of education*. Free Press.

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Dagmar M. Benincasa & Lotte Geunis

The *teff Educathon*: Innovation, Engagement and Co-creation for Key Issues in Education

Abstract
This chapter reflects on the *teff Educathon*, a tried and tested co-creation method that brings together people from all corners of the field of education – pupils, teachers, trainee teachers, lecturers, policy-makers – to address a shared education challenge. The paper critically considers the first editions of the *teff Educathons*, outlining the rationale behind their original design and detailing their implementation and results. Looking ahead, the chapter then provides three use cases for future Educathons, suggesting their applicability and relevance can be widened further. In doing so, the authors aim to inspire the continued organisation of Educathons across Europe and beyond.

Keywords: Educathon, co-creation, student voice, European projects, Design Thinking

1. Introduction

This chapter offers a forward-looking take on the *teff Educathon*, a co-creation methodology that helps pupils, teachers, trainee teachers, teacher trainers and others develop creative solutions to education challenges. The *teff Educathon* was designed by the Erasmus+ Teaching Academy for a Future in Flux (*teff*), an EU-funded partnership (2023–2026) coordinated by the University of Cologne, Germany. The prefix *"edu-"* signals the deliberate emphasis on education and learning, while the suffix "*-thon*" – as in formats such as *Ideathons* and *Hackathons* – evokes the intensity and momentum of a marathon. Accordingly, an *Educathon* can be understood as a condensed learning experience in which participants engage in a short, high-energy phase of collaborative work focused on a shared challenge. Achieving the intended outcome requires participants to pool their individual strengths and cooperate in formulating one or more viable solutions (Benincasa et al., 2025).

The following subchapters outline the overall structure and adaptable features of a *teff Educathon*, and subsequently explore its effects on participants and on the format more broadly, drawing on recurrent feedback and outlining future developments.

2. *teff Educathons* in Practice

2.1 What makes a *teff Educathon*

Each *teff Educathon* revolves around one pre-determined topic. Even though a *teff Educathon* could, in principle, be focused on any educational subject, it is important that each participant can – in one form or another – relate to the topic, regardless of their background, current status (e.g. as a pupil or as a teacher) or even age. Furthermore, past *teff Educathons* have been conducted on topics suitable for an internationally mixed group of participants, i.e. "teacher shortage in Europe," "teacher well-being across the globe," or "the attractiveness of the teaching profession in Europe." Whatever the topic, the event must offer a common ground from which all participants can set off into different directions, be it by making sure to invite only participants with similar pre-knowledge or -experience or by incorporating the process of knowledge acquisition into the topic selection.

All *teff Educathons* follow the principle of agility, which aims at maximum flexibility and supports iterative processes, albeit within a pre-set structure. *teff Educathons* "intentionally allow participants to stray from – presumably straight or fixed – paths, inviting participants to roam more freely. […] The road is longer, with a few more detours – but the destination is worth it" (Benincasa et al., 2025). With regard to its structure, the *teff Educathon* adopts the agile method of *Design Thinking*: a method which, among many other overlapping principles with *Educathons*, also addresses real-world challenges, stresses the importance of multi-perspectivity and aims at equipping participants with problem-solving skills, while at the same time fostering creativity and innovation (Cross, 2023; Simschek, 2020). Considering that, according to Ehlers (2020), "*Design Thinking* competence" could even be considered a *future skill,* this method also contributes to the underlying future-orientation of *teff Educathons.*

In true *Design Thinking* spirit, throughout the event hosts and facilitators make sure to emphasize that "'every thought counts.' It is the unapologetic embrace of all ideas, no matter how different or disruptive, that enables innovation. Importantly, it is also part of what makes an Educathon such a meaningful experience for participants, above and beyond the ultimate results it produces" (Benincasa et al., 2025).

In practice, a *teff Educathon* always covers three phases, with all participants being part of a team of (ideally) 3–5 people:

Phase I: Why?

In this exploration phase, participants take a deep-dive into the topic by exploring the underlying problem, defining challenges that come with it, and phrasing (research) questions which can be asked in order to tackle the pre-defined challenges. The definition of challenges and questions is facilitated through Think-Pair-Share, supported by a Placemat which can be found in the *teff Educathon* Toolkit (see below). The length and depth of this phase depends highly on the context. If the participants are already acquainted with the topic (e.g. as part of a semester-long course), less time

will be needed to explore the topic. If, on the other hand, participants are confronted with a rather unfamiliar topic (for example at the start of a multi-day workshop), diving into the topic will require more time and more background material (i.e. informative videos, texts, etc.). It is important, at this very early point, to hear from as many perspectives as possible, either by facilitating communication across participants from different status groups or by providing 'outside voices' e.g. in the form of videos or testimonials. Each team leaves phase I with one fixed question (retrieved from what they see as the key challenge) they are going to concentrate on for the rest of the *teff Educathon*.

Phase II: What?

Phase II, the ideation phase, asks the teams to generate ideas for solutions / answers regarding the question they defined in phase I. Here, the emphasis lies on quantity before quality: Participants are encouraged to come up with as many ideas as possible, regardless of their feasibility, in order to unleash their creative powers. Participants are introduced to different brainstorming rules and techniques to help them do so. At the end of the phase, each team decides on one idea they would like to pursue in phase III.

Phase III: How?

In the third phase, the teams turn their idea into a 90 second-pitch; an accompanying handout with tips for content and structure of a pitch helps the teams structure their short presentation. The *teff Educathon* ends with the presentation of the pitches. In most cases, a jury chooses a winning pitch – not based on its feasibility, but on the *innovation* of the idea presented – and discusses some aspects of the pitches with the participants afterwards. At the end of the event, participants are invited to give feedback on the *teff Educathon* itself.

Even though one characteristic of an *Educathon* is a fixed timeframe, each phase can be modified in length. Because of the flexibility of the format, *teff Educathons* have thus far been conducted from anywhere between 6 hours and 1 ½ days (with the pitches being presented on the second day).

2.2 Flexible Modalities: Online, On-Site, or Hybrid

The *teff Educathon* can be – and successfully has been – realized as an online, on-site, or hybrid event. The flexibility of the format is one aspect that makes the *teff Educathon* so future-oriented: it is possible to achieve the same quality of results in any of the settings.

The very first *teff Educathon* was a hybrid edition that took place in March 2024 and enjoyed the participation of six European countries and 70 participants in total. Here, *teff*'s cross-phased approach allowed for a particularly diverse audience: teacher

educators, in-service teachers, student and trainee teachers, and even pupils all joined the *teff Educathon* to work collaboratively on the topic of teacher shortage, a long-standing challenge in education across Europe. Facilitation at the different sites was supported by a detailed playbook sent out in advance, while "checkpoints" on Zoom ensured guidance and instructions from the host in Cologne (cf. Benincasa, 2025). The resulting pitches mirrored the diversity of the group, with some pitches focusing on concrete ideas to facilitate teachers' daily work and others addressing systemic change at government level.

The *teff Educathon* has also proven useful for multi-day events such as *Summer Schools* or *Blended Intensive Progammes*[1](BIP) In the 2025 BIP „Well-being of future teachers and education professionals" at Universittà di Firenze, Italy, a *teff Educathon*, this time focusing on the attractiveness of the teaching profession in Europe, was conducted with a group of 33 student teachers and educators from 10 European countries. Having worked on the overarching topic of teacher and student well-being for several days already, participants enjoyed applying their acquired knowledge and experience into concrete ideas and solutions for a pressing issue.

2.3 Feedback and Next Steps

Feedback has been collected in all *teff Educathons* conducted so far via digital forms and/or oral discussions. Overall, the feedback from both facilitators and participants has been extremely positive. After the very first *teff Educathon*, facilitators said they appreciated the *Playbook* they received in advance, which fuelled the idea of a *Toolkit* (see below) from the early beginning. They also reported having felt comfortable in their role and planned on using elements of the *teff Educathon* in their own teaching.

Overall, organization of the event has always been praised by both facilitators and participants. However, reactions towards the rather strict structure of the event – while allowing high flexibility within the set three phases – have been mixed, with some participants enjoying the high expectations placed upon them and others feeling unsure at first, not knowing every detail of what will await them during the event. Some participants belonging to the latter group, however, reported that even though they were worried at first, they enjoyed the fast-paced learning environment and were able to become more relaxed once they had internalized that the intention of the *Educathon* is not to find one perfect solution, but to generate many innovative solutions stemming from the minds of its participants.

> Setting high expectations without revealing the full structure of the day motivates participants to do well, but – importantly – it allows them to stay sharp and focus on each step. In doing so, participants can properly consider the issue of [the topic] in all its facets. A more flexible or rushed

1 BIPs are short, intensive and innovative learning formats in which groups of higher education institutions offer students and staff a mix of short-term physical mobility and collaborative online components – often challenge-based and transdisciplinary – that provide added value beyond regular courses and aim to make international learning more flexible and accessible for all (European Commission, 2025).

> approach would likely see them cover a few surface level ideas, or move towards answers without fully engaging with the questions. In other words, while the unknown may be a little unsettling, it serves a purpose: it focuses the mind (Benincasa, 2025, p. 310).

The marathon nature of the *teff Educathon* directly asks their participants to deliver, many of them valued the restricted timeframe in that it forced them to "get to the point" and not get lost in long discussions. The same applied to the – very short – timeframe of the pitch (90 seconds): Narrowing an idea down to its core asked for thorough investigation and analysis of a team's idea, which allowed for true collaboration and cooperation within the teams. The majority of participants were planning on using elements of the *teff Educathon* in their own (future) teaching, with some of them describing the event as being "truly inspiring" and "finally something innovative in [their] studies." Some participants reported after a *teff Educathon* that they felt "more inspired by the fact that we can come together and create tools and solutions that genuinely could help," and that "sharing experiences with each other helped [them] to get a bigger picture on the role of a teacher."

In future *teff Educathons*, further focus will be put on the group composition, as some participants voiced that they would have appreciated more diverse teams, especially those who ended up working with peers and colleagues from their home country or with the same background. Even though diversity within the teams is not a requirement per se, participants understood the potential of cultural diversity, especially during the ideation phase. As one participant stated after a *teff Educathon* on the attractiveness of the teaching profession in Europe, "overall, we are all facing similar challenges," while another's takeaway from their *teff Educathon* was "how much aligned our idea and the topics that concern us are, even though we're from different countries."

Furthermore, the issue of how to integrate generative AI into the format requires careful consideration. Ideally, the solution should not involve prohibiting the use of tools such as ChatGPT, as these tools can, for instance, enhance the quality of pitch presentations – particularly for participants with limited writing experience. Instead, attention might be directed toward the development of effective prompts. The generation of visual material based on ideas produced by the teams could likewise offer unexpected added value for the presentation of pitches. However, the use of generative AI – especially in phase I and II of the *teff Educathon* – remains problematic, as these phases rely heavily on the participants' own creativity and, at the current stage, do not seem to benefit meaningfully from such technological support.

Elementary handouts and materials, such as the aforementioned *Placemat* employed in phase I, have been published on the *teff* website from the beginning. Having received a lot of feedback from facilitators and participants alike, a *teff Educathon Toolkit* will now be developed and published in spring 2026. It will contain all relevant handouts, a Playbook for facilitators, and other material to help teachers and educators conduct their own *teff* Educathon.

The use of the *Toolkit* will be piloted as part of a *teff Educathon* being held during the *BIP* „Many Voices, One Classroom: Insights into Diversity in Education Today" in March 2026. Further use of the Toolkit is guaranteed by the newly-founded Erasmus+ *Teacher Academy for Media Literacy*'s (*TAMeLi*) intention to organize at least one hybrid Educathon during the project lifetime.

3. Forward Thinking: Possible Use Cases Across Education

Reflecting on the results to date, the *teff Educathon* has proven to be an agile and relatively light-touch methodology that achieves disproportionate impact in three key areas. First, with regard to output, the *teff Educathon* enables the development of a set of innovative ideas and solutions through shared creativity. Second, the *teff Educathon* can restore a sense of agency and ownership of key issues among those in (the field of) education. Challenges in education are most deeply felt by those experiencing them on a day to day basis. By encouraging participants to engage with these issues in a creative and constructive way, the *Educathon* enables a deeper and positive (re)engagement, not only individually but collectively. Finally, with regard to impact, the *teff Educathon* is remarkably effective in lifting the barriers that typically separate pupils, teachers, lecturers and education stakeholders. Together, these strengths allow for a truly transformative experience that benefits all those involved. In light of these findings, the *teff* community is committed to making this methodology a feature of teacher training wherever possible. To that end, this final section will offer three different use cases of the *teff Educathon*, each anchored in one of its key strengths.

The Original: Shaping Solutions Through Shared Creativity

The primary focus of the original *Educathon* is the chosen topic and the search for creative and innovative solutions. What are the core ideas and issues in education? What challenges demand new ideas, out-of-the-box thinking, collective input? The typical approach here is to take rather large, abstract issues – teacher shortage, student well-being, the use of smartphones – and co-create a wide range of solutions. For this type of *Educathon*, it is important to have cross-phased participation (pupils, (trainee) teachers, lecturers): this will significantly enhance the quality and depth of the co-creation and the resulting solutions. In terms of practical design and implementation, there is significant flexibility. These *Educathons* can be designed for in-person, hybrid, or online implementation; they can be organised across different schools, countries and even regions (time zones permitting); and can be run in parallel or consecutively, for example in different provinces or countries over the course of a school year.

Empowerment in Education: Awareness and Skills Building

The second use case puts the audience at the centre, focusing on awareness and skills building. The main adaptation is that this type of *Educathon* is designed in function of a particular group ('phase') and its needs. In this approach, the co-creation ele-

ments allow participants to take ownership of an issue or subject, while its cross-phased aspects lend additional legitimacy and depth. For example, a school could organise a *teff Educathon* with a focus on the well-being of pupils. In this case, the participation of teacher trainers or lecturers would help inform and guide initial discussions, while the participation of teachers and administrators would help shape experience-driven solutions. Alternatively, as a skills-building example, teacher trainees could focus on the effective use of education technology. Here too, trainee teachers would strengthen their understanding of the issue by working with lecturers and teachers, while fine-tuning their own ideas and vision as the co-creation process unfolds.

Education Policy: Beyond the School Gates

A third and final use case is education policy, whereby the *teff Educathon* moves beyond the school gates but retains its education-focused elements. Education has an enormous societal impact and, in turn, enjoys great societal interest. Teachers, trainee teachers and especially pupils typically have few opportunities to engage directly with those who decide what their education looks like – at local level (city, council), but in particular at state or country level (Benincasa, 2025). There is much to be gained by bringing together those who decide on education policy on the one hand, and those who implement and experience it on the other. The *teff Educathon* creates a level playing field that allows every participant to channel their concerns, ideas, and suggestions into a shared search for solutions. Beyond the results itself, such an exercise can help build the foundation for a more regular dialogue, with a firm focus on what matters most: what happens in our classrooms.

3. Conclusion

This paper has provided an overview of the rationale, design, implementation and results of *teff Educathons*. It has focused in particular on their agility, illustrating how these Educathons can be shaped to meet the needs of a particular subject or audience. It has also focused on their impact, stressing the various ways in which results and outcomes exceeded expectations. The chapter concluded with suggested additional use cases for the future. With the support of the upcoming toolkit, the authors hope that educators across Europe will embrace this methodology in their search for engagement, innovation and co-creation in education.

More information on the *teff* Educathon – including materials for download – are available at https://www.teff-academy.eu/what-we-do/educathon.

Acknowledgements
The authors wish to thank the *teff* consortium, in particular the partner institutions that participated in, or supported, the *teff Educathons*. Special thanks go to the *teff Educathon* participants – their commitment, inspiration and good cheer encouraged the continued development of this methodology as one of the stand-out *teff* results.

References

Benincasa, D. M., Geunis, L., Holz, O., & Springob, J. (2025). Why not ask them? The Educathon: Tackling challenges in education with and for students. In V. Chio, L. Geunis, O. Holz, N. Oruc Ertürk, J. Ratkowska-Pasikowska, & F. Shelton (Eds.), *Research and evidence-based perspectives in education* (pp. 301–311). Waxmann.

Cross, N. (2023). *Design thinking: Understanding how designers think and work*. Bloomsbury Visual Art.

Ehlers, U.-D. (2020). Future skills für die Welt von morgen. In U.-D. Ehlers (Ed.), *Future skills: Zukunft der Hochschulbildung – Future higher education* (pp. 57–100). Springer VS. https://doi.org/10.1007/978-3-658-29297-3_5

European Commission. (2025). *Erasmus+ programme guide*. https://erasmus-plus.ec.europa.eu/sites/default/files/2025-11/programme-guide-2026_en.pdf

Simschek, R. (2020). *Agilität? Frag doch einfach! Klare Antworten aus erster Hand*. UVK / Narr Francke Attempto.

H.
Beyond *teff*:
Strengthening Teacher Education Through Erasmus+ Teacher Academies

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Marie Vanderbeke, Joana Kadir, Henning Feldmann & Björn Rothstein

Building Communities of Practice in (International) Cross-Phase Teacher Education

Lessons Learned From the ERASMUS+ Teacher Academy TESTEd and Their Application in the Project digiLL_COM

Abstract
Schools across Europe are trying to adapt to societal and technological transformations, such as the digital condition (Stalder, 2016) and artificial intelligence, as well as sustainability. There is unanimous agreement that continuous professional development (CPD) is crucial for high-quality, up-to-date teaching and job satisfaction, as well as teacher retention, across all educational levels (e.g. OECD, 2024; European Council, 2020). At the same time, student teachers are calling for a greater focus on practical elements in their studies and closer links with schools. Cross-phase teacher education could provide in-service teachers with evidence-based CPD organised at universities, while also enabling student teachers and researchers to collaborate with in-service teachers and incorporate their knowledge and expertise into their studies or work. However, actual teacher participation in CPD is often challenging, despite teachers expressing a high perceived need for training in cross-cutting issues (OECD, 2019). This contribution, therefore, addresses the challenges of cross-phase education within the TESTEd project, as well as the lessons learned from it. Furthermore, it will provide insights into how the ongoing project 'digiLL_Com' has integrated these insights and continues to develop a cross-phase community of practice.

Keywords: Cross-phase teacher education, Communities of Practice, ERASMUS+ Teacher Academy, Internationalisation of teacher education

1. Introduction

Schools across Europe face highly complex and far-reaching changes: From climate adaptations to learning with artificial intelligence, teachers must prepare students for rapid societal change.

Equipping school systems for the digital and green transition and enabling teachers to reduce educational inequalities by supporting diverse students is also at the heart of the European Commission's establishment of the European Education Area (European Commission, 2020). To achieve this, the EU promotes not only basic skills

but also interdisciplinary competencies, drawing on its focus on lifelong learning and competence frameworks that address cross-cutting issues such as competencies for democratic culture, green skills, and digital competencies.

The integration of cross-cutting issues in the classroom is, however, often difficult due to their broad, interdisciplinary nature and unclear boundaries (e.g. European Commission, 2021; OECD, 2024). With (student) teachers focusing mostly on their subject-areas – in initial teacher education (European Commission and Directorate-General for Education, Youth, Sport and Culture, 2021) and in CPD offers (European Commission, 2021) – siloed disciplinary structures as well as full schedules and curricula complicate the effective integration of interdisciplinary, cross-cutting issues. With in-service teachers spending less than 3 % of their time on CPD (ibid.), initial teacher education (ITE) takes on greater significance in preparing future teachers for their role to teach these highly relevant cross-cutting issues. Nevertheless, as societal transformations such as digitalisation continue to accelerate, the short period of ITE cannot adequately prepare student teachers for all possible future teaching demands. Cross-phase teacher education could, therefore, address common challenges and questions regarding teacher professionalisation (Kaufmann, Denninger, & Reinert, 2024; cf. European Council, 2020).

Cross-phase teacher training could support teachers' lifelong learning processes and engage teachers and trainers across the continuum of teacher education in collaborative learning opportunities. These opportunities could allow them to connect their subject and pedagogical competencies with cross-cutting issues and foster a mindset that is open to interdisciplinary work and future continuous professionalisation (Springob et al., 2023). The following sections will explore this concept, specifically providing insights into the ERASMUS+ Teacher Academy "Towards a European Syllabus in Teacher Education" (TESTEd), its attempt to build a Community of Practice (CoP) across all phases of teacher education, the accompanying challenges, and lessons learned.

2. Cross-Phase Teacher Education in the TESTEd Teacher Academy

Cross-phase teacher education can be defined as "the professional, methodical and above all structurally anchored exchange between all three phases of teacher education" (Springob et al., 2023, p. 483). It is therefore an attempt to engage teachers in a shared professionalisation process and to facilitate a knowledge transfer between the phases. Springob et al. (2023) understand cross-phase teacher training as a "closely networked approach" that is characterised by goal-oriented collaboration, mutual benefit, equal communication, and repeated joint offers focusing on cross-cutting issues (ibid., p. 483).

Furthermore, cross-phase teacher training could be a means to bridge the perceived divide between theory and practice – academia and schools (e.g. OECD, 2024). By providing a shared space for teacher training, it creates opportunities to trans-

late evidence into classroom practices and to engage in more application-oriented research, with teachers and school leaders as agenda setters (cf. Stecher et al., 2024).[1]

Opportunities for interdisciplinary collaboration remain scarce – fewer than one-third of secondary teachers have participated in CPD programmes involving teacher networks (European Commission, 2021). As a result, many (student) teachers miss out on opportunities for professional exchange that could have fostered innovation and interdisciplinary learning. Moreover, when opportunities exist, they are often limited to isolated, short-term initiatives (Bauer & Fabel-Lamla, 2020).

The ERASMUS+ Teacher Academy TESTEd was guided by the aim of establishing such a shared space and fostering long-term, sustainable networks with stakeholders from all stages of teacher education. TESTEd provided learning opportunities on how to integrate cross-cutting issues in classrooms and schools across Europe, as well as a platform for collaboration and the exchange of good practices. TESTEd activities ranged from networking events, e.g. CityLabs, roundtable discussions and a hybrid closing conference, to student teacher research mobility, makerspaces, virtual lectures and CPD courses, as well as the publication of Open Educational Resources (OER)[2] for further learning. The project's goal was to form a CoP (Lave & Wenger, 1991) between teacher trainers (ITE and CPD), school leaders, in-service teachers, student teachers, governmental agencies, and education administrators that interacted regularly and worked on joint solutions to challenges in teacher education. The project followed the mindset that international cooperation across the continuum of teacher education can lead to important advancements through the transfer of good practices from one education institute to another, or from one person to another. TESTEd emphasised openness to different experiences and expertise to foster interdisciplinary dialogue.

2.1 Challenges of Cross-Phase Teacher Education

With the aim of an open, international, and interdisciplinary collaboration across all phases of teacher education, TESTEd provided valuable insights into the challenges of cross-phase collaboration in teacher education.

One major difficulty was reaching in-service teachers and ensuring their sustained engagement in activities that involved both pre-service and in-service participants. While cross-phase learning environments aim to foster mutual understanding and professional exchange between student teachers, teacher educators, and in-service teachers, our experiences revealed an asymmetry in how participants at different stages in teacher education engage with these opportunities. While student teachers readily participated in TESTEd activities and praised learning opportunities as highly beneficial in formative evaluations, in-service teachers were more difficult to attract.

1 These ideas are further explored in the TESTEd policy paper: https://doi.org/10.13154/294-12014

2 TESTEd-OER are available online here: https://tested-network.eu/publications/

A possible interpretation of this challenge might be Springob et al. findings (2023, p. 478), which show that in-service teachers tend to value the exchange with student teachers significantly less than vice versa. This imbalance complicates the establishment of equal relationships and calls for a more careful design of interaction formats that acknowledge and address differing motivations and expectations.

Structural and organisational factors also posed challenges: Tight school schedules, full curricula in ITE, institutional constraints, and varying perceptions of professional needs made cross-phase collaboration difficult. Furthermore, while in-service teachers often focussed on immediate, practice-oriented benefits and the concrete exchange of classroom practices and materials, pre-service teachers and university teacher trainers offered theoretical and research-based perspectives. Balancing these perspectives requires sensitivity to each group's needs and creating spaces that value both practical and academic knowledge equally. This also requires interdisciplinary and international collaboration as well as cross-phase collaboration to be recognised as professional development.

Furthermore, interdisciplinary and international cooperation is complex and demanding, as teachers must navigate different disciplinary and cultural patterns of thought and terminology, as well as varying organisational logics. To address these challenges, teachers need support in developing the skills necessary to cooperate effectively in international and interdisciplinary groups. However, only few countries have provisions to include forming cooperation and teamwork competencies in teacher training (European Commission, 2021). In Germany, cooperation and teamwork are part of teacher competence frameworks; however, these skills are often not integrated into the curricula of ITE and CPD programmes and its promotion in schools remains limited (Bauer & Fabel-Lamla, 2020). Therefore, the ability to cooperate with teachers across boards and teacher education phases needs to be fostered early on in teacher education to prepare (future) teachers for continuous professional growth throughout their careers.

2.2 Lessons Learned from the TESTEd Project[3]

Several lessons have emerged from the TESTEd project's efforts to establish and sustain this cross-phase teacher education CoP.

One central insight concerns the importance of understanding institutional logics and related benefits. This insight is consistent with research from Niemann et al. (2023), that also addressed an understanding of different institutional operating principles as a central condition for success in cross-phase CoPs. Teacher CoPs must tailor tasks to participants' expertise and needs to ensure tangible benefits. In the TESTEd makerspace, participants designed classroom activities as OER that integrate cross-cutting

3 A more in-depth analysis of structural changes that would support the integration of cross-cutting issues across all phases of teacher education as well as school development can be found in the TESTEd policy paper published here: https://doi.org/10.13154/294-12014

issues. Activities allowed student teachers to integrate their evidence-based knowledge on the cross-cutting issues at hand while in-service teachers provided practical insights and feedback on the activities based on their experience and expertise. Through this, fruitful dialogues between student teachers and in-service teachers were created that led to tangible outcomes.

A further key lesson relates to the design of learning offers within such communities. To attract in-service teachers, activities must reflect their professional realities: This includes scheduling decisions, the relevance of the activities to everyday classroom practice, and a clear contribution to their competence development. This would also remove in-service teachers from the role of mentor to student teacher mentees (see also Springob et al., 2023). Niemann et al. (2023) refer to adequate resources, incentive structures for teachers, and flexibility in the organisation of professional development as crucial for functioning CoPs in teacher education. However, making in-service teachers the sole focus of attention can unintentionally undermine the idea of learning on equal terms among all participants. Furthermore, the focus on in-service teachers runs the risk of student teachers not feeling addressed.

The experience in the TESTEd project also highlights the pivotal role of school leadership and educational administration in the process. Even though CPD is a professional duty in almost all European countries, teachers report high barriers to participation – specifically, scheduling conflicts and a lack of allocated time for CPD training often result in low participation in CPD (European Commission, 2021). Collaboration, thus, cannot be sustained if it remains limited to the commitment of individual teachers. Instead, it needs school leadership, government agencies and administration to legitimise the work in the CoP as an integral element of professional practice. Furthermore, the recognition and accreditation of CPD must be secured. This is especially relevant in international contexts as it ensures the participation of teachers from countries where an accreditation is a pre-requisite for their attendance. TESTEd worked with international teacher trainers across all phases of teacher education to ensure that the CPD recognition was possible.

Finally, the experience of different projects underlines the significance of third spaces as institutionalised settings for international exchange and interdisciplinary collaboration (OECD, 2024).[4] Such spaces provide continuity and allow participants from all phases of teacher education to meet on equal footing. When these third spaces are embedded within the structures of schools, universities, and educational administrations, they serve as sustainable anchors for CoPs and help bridge the often-fragmented phases of teacher professional learning. TESTEd, co-funded by the EU, successfully created such a space, though its continuation now depends on further funding and institutional commitment. The following section will, therefore, showcase how insights from TESTEd are adapted in the project digiLL_COM.

4 The OECD suggests third spaces as fixed physical spaces that provide clear infrastructure and systematic processes for communication and exchange to (a) allow all partners to remain on equal footing and (b) foster transparency in collaboration (2024, p. 91).

3. Integrating the Lessons Learned – Insights Into Community-Building in the Project digiLL_COM

OER have long been regarded as a quintessential expression of openness in education. They not only provide freely accessible materials but also embody a mindset of openness – one that encourages collaboration, participation, and the co-construction of knowledge (BMBF, 2022). The challenge, therefore, lies in developing CoP that support both the use and creation of OER, and that connect teacher educators, student teachers, and in-service teachers across institutional and professional boundaries.

The project "digiLL_COM – Community für die Lehrkräftebildung"[5] builds directly on this premise. Emerging from the established digiLL university network, an alliance of twelve institutions of initial teacher education in Germany, the project aims to consolidate digiLL's position as a key partner and community hub for OER in teacher education. Thereby, digiLL_COM creates a sustainable CoP across the three phases of teacher education – (1) ITE educators, (2) student teachers, and (3) in-service teachers.

Although it is based at a university, the project targets in-service teachers and therefore depends on government support. Their involvement not only legitimises participation by in-service teachers but also signals the systemic relevance of the project. digiLL_COM actively pursues close cooperation with the school administration to this end. This alignment with administrative structures reinforces the perception of digiLL_COM as a credible and impactful initiative.

The project addresses all three phases separately as well as collectively, thereby paying attention to the different institutional logics in which the target groups operate. Furthermore, the project conducted a needs analysis for each target group and developed its formats and content to engage the respective target group in "purposeful activities and meaningful discussions" (Wenger & Wenger-Trayner, 2015). Across all phases, target-specific material is developed to address the production and use of OER in each phase of (teacher) education.

To facilitate encounters between ITE teachers, students, and in-service teachers on equal footing, the project actively creates and maintains third spaces through regular community meetings, online platforms for collaboration, and workshops. Most notably, the three target groups are invited to participate in the bi-annual, in-person OER Maker Spaces. Maker Spaces focus on the collaborative production of OER across all phases of teacher education, encouraging the exchange of experiences and ideas in a space outside of the regular institutional confines. The shared experience of OER creation and the exchange of knowledge facilitate the development of shared practice (Wenger & Wenger-Trayner, 2015), creating a CoP.

---

5 digiLL_COM is funded as part of the OE_COM funding line of the Bundesministerium für Bildung, Familie, Senioren, Frauen und Jugend. The project is coordinated by the Ruhr University Bochum, University of Cologne and University Duisburg Essen.

4. Conclusion

The experiences from TESTEd and the digiLL_COM project underline that CoPs in cross-phase teacher education represent a promising approach to fostering teacher professionalisation. However, the findings also demonstrate that such collaboration does not emerge naturally. Structural barriers, differing institutional logics, and variations in motivation across professional stages all present challenges to establishing lasting cooperation. Sustainable collaboration depends on deliberate design choices – ensuring relevance for in-service teachers, institutional support from school leadership and administrations, and the creation of "third spaces" where participants can meet on equal footing. Projects like TESTEd and digiLL_COM show that when these conditions are met, cross-phase communities of practice can become powerful engines for professional growth, innovation, and the co-construction of knowledge. Ultimately, the success of cross-phase teacher education hinges on embedding such approaches within the broader structures of teacher education and educational policy. Only when collaboration across all phases is recognised, supported, and resourced as an integral part of teacher professionalisation can it truly be realised.

Acknowledgements
The ERASMUS+ Teacher Academy "Towards a European Syllabus in Teacher Education" (TESTEd) was co-funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the EACEA. Neither the European Union nor the granting authority can be held responsible for them.

References

Bauer, P., & Fabel-Lamla, M. (2020). (Multi-)professionelle Kooperation in der Lehrerinnen- und Lehrerbildung. In C. Cramer, J. König, M. Rothland, & S. Blömeke (Eds.), *Handbuch Lehrerinnen- und Lehrerbildung* (pp. 91–97). Klinkhardt. https://doi.org/10.35468/hblb2020-010

Bundesministerium für Bildung und Forschung. (2022). *OER-Strategie – Freie Bildungsmaterialien für die Entwicklung digitaler Bildung*. https://www.bmbf.de/SharedDocs/Publikationen/de/bmbf/3/691288_OER-Strategie.pdf

Council of the European Union. (2020). *Council conclusions on European teachers and trainers for the future (2020/C 193/04). Official Journal of the European Union, C 193*, 11–19. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020XG0609(02)

Council of the European Union. (2021). *Council resolution on a strategic framework for European cooperation in education and training towards the European Education Area and beyond (2021–2030) (2021/C 66/01). Official Journal of the European Union, C 66*, 1–21. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021G0226(01)

European Commission, Directorate-General for Education, Youth, Sport and Culture. (2021). *Education for environmental sustainability: Policies and approaches in Euro-*

pean Union Member States – Final report. Publications Office of the European Union. https://data.europa.eu/doi/10.2766/391

European Commission, European Education and Culture Executive Agency, Birch, P., Motiejūnaitė-Schulmeister, A., & De Coster, I. (2021). *Teachers in Europe: Careers, development and well-being – Eurydice report.* Publications Office of the European Union. https://data.europa.eu/doi/10.2797/997402

Kaufmann, B., Denninger, A., & Reinert, M. (2024). Einleitung. In B. Kaufmann, A. Denninger, M. Reinert, & L. Steinfeld (Eds.), *Möglichkeiten und Herausforderungen der phasen- und disziplinübergreifenden Zusammenarbeit in der Lehrkräftebildung* (pp. 9–19). Waxmann.

Niemann, J., Drossel, K., Eickelmann, B., Raneck-Kuhlmann, A., & Buhl, H. M. (2023). Gelingensbedingungen der phasenübergreifenden Zusammenarbeit in der Lehrkräftebildung zur Entwicklung digitalisierungsbezogener Ressourcen in Communities of Practice. *HLZ – Herausforderung Lehrerinnenbildung*, *6*(2), 113–128. https://doi.org/10.11576/hlz-6218

OECD. (2019). *TALIS 2018 results (Volume I): Teachers and school leaders as lifelong learners.* OECD Publishing. https://doi.org/10.1787/1d0bc92a-en

OECD. (2024). *Education policy outlook 2024: Reshaping teaching into a thriving profession from ABCs to AI.* OECD Publishing. https://doi.org/10.1787/dd5140e4-en

Springob, J., Benincasa, D., & Berninger, I. (2023). Bridging boundaries: Defining and discussing the potentials of a cross-phase approach for a future-oriented teacher education. In *Digital transformation in education: Perception, action and prospect. Proceedings of the 3rd International Conference on Innovation in Learning Instruction and Teacher Education (ILITE 3)* (pp. 472–488). University of Education Publishers.

Stalder, F. (2016). *Kultur der Digitalität*. Suhrkamp.

Stecher, L., von Aufschnaiter, C., Braun, E., Hinzke, J.-H., & Wissinger, J. (2024). Innere und äußere, disziplinen- und institutionenübergreifende Zusammenarbeit in der Lehrkräftebildung. In B. Kaufmann, A. Denninger, M. Reinert, & L. Steinfeld (Eds.), *Möglichkeiten und Herausforderungen der phasen- und disziplinübergreifenden Zusammenarbeit in der Lehrkräftebildung* (pp. 227–237). Waxmann.

Wenger, E., & Wenger-Trayner, B. (2015). *Communities of practice: A brief introduction.* http://wenger-trayner.com/introduction-to-communities-of-practice/

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Rachel Bowden, Elena Revyakina, Neusa Branco, Bento Cavadas, Susana Colaço, Maria Eracleous, Conor Galvin, Pavlina Hadjitheodoulou Loizidou, Marie Kniest, Elisabete Linhares, Nikos Palavitsinis, Efi Paparistodemou, Maria Pitzioli & Christina Stavrou

Value Creation Through Transdisciplinary Teacher Education for Sustainable Development: Learning From Teacher Academy Project – Teaching Sustainability (TAP-TS)

Abstract

This chapter presents key insights from a study of the perceived value created for the partners of the Teacher Academy Project-Teaching Sustainability (*TAP-TS*) by the project, an Erasmus+ initiative aimed at fostering competence in Teaching Sustainability among European educators. The Wenger-Trayner et al. (2023) values creation framework is applied to examine narrative accounts from 11 partner institutions across seven countries, and through thematic analysis the immediate, potential, applied, and realised value generated by this project are identified. Findings indicate that *TAP-TS* generated profound value for the partner institutions, with the co-creation of learning resources and pedagogical approaches, and the systematic inclusion of generative reflective practice acting as primary drivers of change. Immediate value emerged in supportive social learning environments; potential value accumulated through co-creation and participatory approaches; applied value materialized in new teaching and learning practices and institutional innovations; and realized value appeared in long-term transformation of professional identities and practices. Across all value cycles, reflection acted as the impetus for professional growth. Overall, the chapter concludes that transdisciplinary collaboration – when supported by reflective processes and clear output expectations – is a powerful model for achieving transformative learning in teacher professional development, particularly in addressing the challenges and opportunities of teaching for sustainability, sustainable development, and a just transition.

Keywords: Sustainability, Erasmus+ Teacher Academies, Value-creation, Transdisciplinary

Introduction

Education for Sustainable Development (ESD) is a Sustainable Development Goal that underpins the achievement of all 17 goals (UNESCO, 2020). Teachers are central to educational reforms and teacher education is imperative for preparing and supporting teachers to practise ESD (Fischer et al., 2022). At the same time, the transformation of teacher education and schools for ESD is urgently required, because many existing practices and mindsets are part of the problem (UNESCO, 2021). Sustainable development (SD) is an inherently transdisciplinary concept, where ecological, social and economic systems and interests are both integrated and conflicting (Mittelstraß, 2003). Transdisciplinarity is central to ESD, both as a prerequisite for exploring SD, and as a potential driver for educational innovation and transformation (ibid.). Transdisciplinarity refers to processes which occur between, across, and beyond traditional academic and social boundaries (Kondratjuk, 2023). Transdisciplinarity can be an important driver for educational transformation – both in fostering educators' transformative learning and in reshaping educational practices, including formats, structures, and processes (Mittelstraß, 2003; ibid.).

Erasmus+ Teacher Academies aim to drive innovation in teacher education policy and practice across Europe by bringing together educators from diverse national contexts, institutional settings, disciplines, and career stages to focus on overarching education priorities (European Commission, 2021). Teacher Academy Project-*Teaching Sustainability* (*TAP-TS*) exemplified this transdisciplinary ambition, with a consortium of 11 teacher education partner institutions (including schools, institutes of higher education, a government agency, a civil society organisation, and digital learning and quality assurance experts) from seven European countries (Austria, Belgium, Cyprus, Germany, Ireland, Portugal, and Sweden), and with expertise across the natural sciences, technology, business, sociolinguistics, and digital and media education. *TAP-TS* aimed to strengthen the ESD competencies of primary and secondary school student teachers, teachers and teacher educators through the co-development of learning and teaching resources during online, hybrid and face-to-face professional learning events. Ultimately, the project published seven open-access 'learning and teaching packages' (LTPs), that explore ESD in relation to digitality, entrepreneurship, STEAM, multilingual education, decoloniality, critical media literacy, and whole-institution approaches, and that are linked to the European Commission's sustainability competence framework (Bianchi et al., 2022).

This chapter considers the value created by *TAP-TS* for project partners through a thematic analysis of their value creation stories (Wenger-Trayner et al., 2023). It begins with a brief review of ESD teacher education studies, followed by a description of the Wenger-Trayner et al. (2023) values creation framework and our process of data collection and analysis. Next, findings are presented using the Wenger-Trayner et al. (2023) analytical categories. Finally, the discussion and conclusions relate the findings to transdisciplinarity and educational transformation, and the ESD teacher education literature.

ESD Teacher Education

In many countries, ESD is still not a compulsory component of teacher education (Springob et al., 2023), although it is often a requirement for schools. More work is needed to further embed ESD in teacher education and more empirical research is needed to inform this work (Evans et al., 2017). In 2005, UNESCO published "Guidelines and recommendations for reorienting teacher education to address sustainability" (UNESCO, 2005), which included a summary of challenges and opportunities for ESD in teacher education. The report noted a general lack of understanding of the concept of sustainability as well as the inadequacy of institutional cultures to support "the creativity, innovation and risk-taking necessary to support transformative efforts to reorient education to address sustainability" (2005, p. 31). More positively, the report suggested that international networks "allow faculty members to scrutinize curriculums[sic], programs, practices, and policies of their institutions and the surrounding society and make small or sweeping changes" (2005, p. 29).

These findings are largely confirmed by a more recent review into sustainability teacher education for primary and secondary teachers by Mulà and Tilbury (2025), who present eight "catalytic entry points" for sustainability education, which lead to a "ripple change effect" across teacher education systems (p. 1492). The authors find that, while an increasing number of resources for ESD are available online, there is a need to connect these to professional development opportunities in order for teachers to use the resources in their work in schools (Mulà & Tilbury, 2025). This resonates with Tilbury and Galvin (2022), who recommend that teacher education enable teachers to explore ESD in ways which are meaningful to them, in recognition of their diverse experiences, motivations and commitment levels. The tension between the transdisciplinary nature of ESD and the strong disciplinary focus of teacher education and schools is addressed in several studies. For example, Evans et al. (2017) note that teacher education is too often centred on learning how to integrate sustainability in single subjects rather than using interdisciplinary approaches and addressing it as a whole-school experience. Ødegaard et al. (2022), report that student teachers find transdisciplinary teacher education inauthentic, given the disciplinary reality of schools.

Methodology and Methods

Measuring the impact of what we value in education is notoriously difficult, which drives a tendency to prioritize what is easily measured. In relation to ESD, Brockwell and colleagues (2022) propose a focus on value creation from the perspectives of the people involved, rather than externally defined indicators. In this study, we apply the Wenger-Trayner et al. (2023) value creation framework, to explore the value created through participation in *TAP-TS* for the 11 teacher education partners. Three months after the end of the project, project partners created 'value creation stories', describing their experience of *TAP-TS* activities, what they gained and accomplished as a result,

and the wider impact. The full stories were shared among partners during an online workshop, and the value created was discussed using the categories below, proposed by Wenger-Trayner et al. (2023, p. 213):

- "Immediate value: Engaging with colleagues produces value in and of itself, such as enjoying the company of like-minded people, doing something exciting, or feeling that you can be truthful about the challenges you face.
- Potential value: This engagement generates new insights, resources, ideas, methods, a shared identity, or social connections, which have the potential to improve practice.
- Applied value: Adopting or adapting these new insights, shared identity, resources, and connections to make changes in practice has inherent learning value; it is the test of their relevance and requires clever tweaks to adapt to the new context.
- Realized value: The value of social learning is realized to the extent that changes in practice start to make a difference toward what matters to members and stakeholders."

Following this, a thematic analysis (Braun & Clark, 2006) was used to review the full stories and identify key themes in relation to each category of value creation. These are presented in the findings section below.

Findings

Immediate Value: Learning From and Within a Transdisciplinary Community

Immediate value emerged strongly through participation in *TAP-TS*, repeatedly described as collaborative, enriching, and emotionally supportive. Learning occurred through interaction and shared practice: "I had the opportunity to interact intensively with many people … I was able to learn from a lot of different people and teams… whilst we collaborated on shared tasks." This cross-institutional engagement fostered belonging and collective purpose. Safe relational spaces were essential. Participants described the environment as "very appreciative, open, and supportive," particularly for those "with less prior knowledge" or lower English confidence. Structured opportunities for collaboration, co-design, and dialogue – especially summer schools and Active Learning Events – were highlighted as impactful: "Working face-to-face, sharing experiences, and designing materials together made the learning deep, personal, and lasting." Exposure to diverse perspectives, including serious games, whole-school approaches, inquiry learning, and varied national contexts, enriched understanding. Teachers and student teachers contributed authentic classroom perspectives that challenged assumptions:

"Students were unafraid to ask challenging questions, and teachers pushed us to think practically … They kept us in mind of other priorities in schools." Reflection was central to realizing this value, helping reframe tensions around expertise and improving learning experiences. One teacher described feeling "really uncomfortable to be positioned as an expert" until reflective conversations reframed contributions as

"work in progress for others to engage with." Reflection provided emotional support, shared meaning-making, and acted as "an important daily practice."

Potential Value: Co-Creation, Community Identity Formation, and Future Possibilities

Potential value included accruing resources, ideas, professional connections, and new development pathways. Participants reported increased confidence and expanded pedagogical repertoires: "Through *TAP-TS*, I gained a great deal of confidence … as well as new motivation," and "I significantly deepened my knowledge in areas such as green citizenship, sustainable entrepreneurship, and climate crisis resilience." Partner diversity was seen as a major asset: "The different nature of the partners was one of the greatest potentials of this project," and "Managing different perspectives enriched all of us." Working across multilingual and multidisciplinary contexts strengthened transdisciplinary thinking and highlighted the contextual nature of sustainability education. The project enhanced visibility through publications, conferences, and networking, including "joining the European community of teacher educators and school teachers." Reflection again served as a catalyst, guiding the design and implementation of Learning & Teaching Packages (LTPs), enabling "communications around reflective practice" and shaping an institutional model centered on collaboration, experimentation, and continuous improvement.

Applied Value: Shift in Practice, Perspectives, and Valuing Project Outputs

Applied value appeared in concrete changes to teaching practice, course design, and institutional processes. Awareness of sustainability and ESD grew across institutions: "Participating student teachers are continuing to use LTP materials and to recommend them to others," indicating reach beyond the project. A central area of applied value was the adaptation and use of LTPs. These materials were integrated into classroom and university settings: "Everything I learned had consequences in my teaching practice … This has had a clear impact on student teachers' learning." Materials became institutional resources: "We adapted the *TAP-TS* materials into engaging, scaffolded, and student-centered lessons" Applied value also emerged through cross-institutional collaboration, mobility experiences, and experimentation with learning event formats. Reflective feedback supported ongoing adaptation: "After every activity, we revisited and reshaped what we were doing." LTP development and enhancements to the *TAP-TS* Moodle platform further extended impact, promoting accessibility and scalability. As one partner noted, "This allowed us to look at Moodle as an open platform where content is exchanged easily and freely."

Realized Value: Transformation, Identity Shift, and Legacy

Realized value appeared in long-term transformations in identity, pedagogy, institutional culture, and community engagement. "*TAP-TS* did more than provide knowledge – it transformed how I teach, how my students learn, and how our institution contributes to a sustainable future." Student teachers "became really engaged and empowered, launching their own small projects." The *TAP-TS* community itself rep-

resented a lasting legacy, with ongoing partnerships and "a strong sense of belonging to an engaged community." Institutional structures such as "a hub for sustainability education" demonstrate embedded outcomes. Reflection, now internalized as a guiding professional stance, underpinned these transformations. As participants emphasized, "reflection was reframed not as a tool but as a guiding principle that informs practice," and its enduring impact lies in "how we embedded reflection – as an ongoing process."

Concluding Discussion

These value creation stories demonstrate how participation in a transdisciplinary European community of practice enabled the *TAP-TS* community members to generate value across all Wenger–Trayner value-creation cycles, including transformative learning and the transformation of educational practices. The co-development of Learning and Teaching Packages (LTPs) required participants to negotiate perspectives across international, national, and local contexts and to consider diverse role identities. In doing so, it reinforced mutual learning and emphasized that knowledge co-created with teachers as key actors of the events is more meaningful and impactful than resources designed for them (Mulà & Tilbury, 2025; Tilbury & Galvin, 2022).

These findings also align with theories of transformative learning, which position reflection and dialogue as catalysts for profound shifts in beliefs, identities, and professional practice (Mezirow, 2009). Participants repeatedly described reflection, not as a technique, but as an embedded stance that shaped how they learned, acted, and institutionalized change. This supports research showing that reflective practice is a key driver of realized value in professional communities (Wenger-Trayner et al., 2023). Interestingly, the project's strong output-orientation – such as the requirement to produce LTPs, and mobility and learning events of different formats – ultimately acted as a productive driver of transdisciplinary exchange. The need to create practice-oriented outputs pushed engagement beyond theoretical discussion towards application, adaptation, and contextualization.

By bringing together diverse perspectives, the project generated higher levels of value, extending from immediate learning to institutional transformation, such as the development of new sustainability hubs and the integration of sustainability into the curriculum. This suggests that output-oriented structures, when combined with trust-based collaboration, technical support, and reflective practice, may strengthen transdisciplinary innovation rather than undermine it.

Overall, the study demonstrates that transdisciplinary co-creation processes, supported by structured reflection, can contribute to the transformation of teacher education by shifting pedagogical identities and institutional cultures. *TAP-TS* illustrates how transformative learning and collaboration reshape educators' understanding of their roles as change agents. In this way, the project contributes to broader debates on reimagining education as a collaborative, participatory, and future-oriented endeavour essential to addressing sustainability challenges.

References

Bianchi, G., Pisiotis, U., & Cabrera Giraldez, M. (2022). *GreenComp – The European sustainability competence framework*. Publications Office of the European Union. https://doi.org/10.2760/13286

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Brockwell, A. J., Mochizuki, Y., & Sprague, T. (2022). Designing indicators and assessment tools for SDG Target 4.7: A critique of the current approach and a proposal for an "Inside-Out" strategy. *Compare: A Journal of Comparative and International Education, 54*(5), 731–749. https://doi.org/10.1080/03057925.2022.2129957

Evans, N. S., Stevenson, R. B., Lasen, M., Ferreira, J.-A., & Davis, J. (2017). Approaches to embedding sustainability in teacher education: A synthesis of the literature. *Teaching and Teacher Education, 63*, 405–417. https://doi.org/10.1016/j.tate.2017.01.013

European Commission. (2021). *Erasmus+ Teacher Academies*. Publications Office of the European Union. https://data.europa.eu/doi/10.2766/43

Fischer, D., King, J., Rieckmann, M., Barth, M., Büssing, A., Hemmer, I., & Lindau-Bank, D. (2022). Teacher education for sustainable development: A review of an emerging research field. *Journal of Teacher Education, 73*(5), 509–524. https://doi.org/10.1177/00224871221105784

Kondratjuk, M., Epp, A., Gabriel, S., Gasterstädt, J., Hinrichsen, M., Koevel, A., Rüger, S., Terstegen, S., Wanka, A., & Zschach, M. (Eds.). (2023). *Transdisziplinarität in der Bildungsforschung: Perspektiven und Herausforderungen theoretischer, method(olog)ischer und empirischer Grenzgänge*. Springer VS. https://link.springer.com/book/10.1007/978-3-658-41139-8

Mezirow, J. (2009). An overview on transformative learning. In K. Illeris (Ed.), *Contemporary theories of learning: Learning theorists – in their own words* (pp. 90–105). Routledge.

Mulà, I., & Tilbury, D. (2025). Teacher education for sustainable development: Catalysing change across the professional landscapes in Europe. *Environmental Education Research, 31*(7), 1481–1508. https://doi.org/10.1080/13504622.2025.2475143

Ødegaard, M., Paulsrud, P., Horverak, O., & Frøyland, M. (2022). Making sense of frustration and complexity when introducing sustainability in teacher education. *Nordic Journal of Education, 15*(3), 1–23. https://doi.org/10.5617/adno.8184

Springob, J., Elster, D., & Bock, K. (2023). Sustainability in teacher education around the world: First insights in national legal guidelines as well as good practice examples and initial approaches from universities in Argentina, Austria, Canada, Estonia, Germany, Mexico, Namibia, Sweden, the USA and Vietnam. *ZfL Discussion Papers, 2023*(9). https://doi.org/10.13140/RG.2.2.22099.45609

Tilbury, D., & Galvin, C. (2022). *A whole school approach to learning for environmental sustainability (EU WG Learning for Sustainability Input Paper)*. DG EAC.

United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development (A/RES/70/1)*. https://sustainabledevelopment.un.org/post2015/transformingourworld/publication

UNESCO. (2005). *Guidelines and recommendations for reorienting teacher education to address sustainability*. http://unesdoc.unesco.org/images/0014/001433/143370e.pdf

UNESCO. (2020). *Education for sustainable development: A roadmap*. UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000374802

Wenger-Trayner, E., Wenger-Trayner, B., Reid, P., & Bruderlein, C. (2023). *Communities of practice within and across organizations: A guidebook*. Social Learning Lab.

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Floor Kamphorst, Oliver Straser, Katja Maaß & Anna Blattmann

ICSE Academy – Professional Development for STEM Teachers in the 21st Century

Abstract
International large-scale assessments such as PISA and TIMSS continue to show stagnating performance in STEM education, while teacher shortages and high attrition rates underline the increasing pressures on the profession. At the same time, teachers are expected to address complex societal challenges, including digitalization, sustainability, diversity and inclusion, and interdisciplinarity to meet the needs of future learners. These demands highlight the necessity for innovative approaches to initial and continuous teacher education in Europe. The ICSE Academy was designed as a European initiative to develop and implement innovative professional development formats that actively engage teachers in addressing these challenges. Central elements included an international workshop series, a summer school, a job-shadowing program for teacher educators, and the international conference Educating the Educators (5th edition). All formats were grounded in problem-based, collaborative learning principles, aiming to move beyond transmissive approaches. Evaluation data indicate that participants, while entering with a comparatively high self-concept of teaching competences, reported significant increases in their perceived content knowledge and pedagogical content knowledge. Moreover, innovative mobility-oriented formats, such as online workshops and summer schools, were particularly well received, with high levels of expressed willingness for future participation. These findings suggest that international, interactive, and research-informed professional development can contribute to strengthening teacher competencies and may provide a pathway towards enhancing the attractiveness and sustainability for the future of the teaching profession in Europe.

Keywords: STEM Education, Professional Development, digitalisation, diversity, interdisciplinarity

1. Introduction

In the face of a convergence of technological, ecological, and societal transformations, scientific literacy and mathematical competence are indispensable for informed citizenship and sustainable innovation. Living in an era of digital transformation, climate emergency, and widespread misinformation, societies depend on citizens who can reason quantitatively, evaluate evidence, and apply scientific thinking to real-world

problems. However, the most recent international monitoring studies show that more than one-fifth of European 15-year-olds are unable to complete basic tasks in mathematics and science (OECD, 2023; Mullis et al., 2020). Research consistently shows that teacher quality is the most decisive in-school factor for student achievement, explaining up to three-quarters of the variance in learning outcomes (Council of the European Union, 2019; Rivkin et al., 2005). Consequently, building and maintaining a highly qualified STEM teacher workforce is a central educational and societal challenge for the 21st century.

The transformation of European societies poses four intertwined challenges that define the future landscape of STEM education. To start, digital technologies have reshaped the conditions for teaching and learning. The European Commission's Digital Education Action Plan (COM, 2020) explicitly calls for enhancing teachers' confidence and competences in digital pedagogy. Teacher education, therefore, needs to combine technological know-how with reflective practice regarding data use, artificial intelligence, and digital well-being.

Furthermore, complex global issues such as climate change and public health cannot be addressed within disciplinary silos. STEM education must therefore shift from isolated subject instruction toward integrated, inquiry-based, and project-based learning. The OECD (2019) and recent European initiatives have emphasised that interdisciplinary approaches help students connect scientific, mathematical, and technological concepts to authentic societal contexts. As a result, teacher training needs to prepare for working interdisciplinary. Third, significant gender gaps and socio-economic disparities persist in STEM participation (Eurydice, 2021), despite political commitments to equity. Teachers require strategies to create inclusive, gender-sensitive, and culturally responsive learning environments. Projects such as MaSDiV and IncluSMe have shown that targeted Professional Development (PD) can enhance teachers' capacity to address diversity and to foster participation of underrepresented groups in STEM.

Finally, STEM teaching is expected to contribute to learners' capacity to act on sustainability challenges. This implies engaging students with socio-scientific issues (SSI) that connect science, technology, and ethical decision-making. Teachers need skills to integrate SSI's meaningfully into their lessons and to help students understand the role of STEM knowledge in achieving the Sustainable Development Goals.

These interrelated challenges imply profound shifts in the role of teachers and in the expectations placed on them. Teachers must be able to design interdisciplinary learning opportunities, orchestrate collaborative inquiry processes, address diversity in classrooms, and leverage digital tools responsibly. To achieve this educational improvement, high-quality teacher education needs to move beyond transmissive, lecture-based approaches and toward co-creative, evidence-based PD that links theory, practice, and reflection. Both Initial Teacher Education (ITE) and Continuous Professional Development (CPD) must become spaces for collaborative experimentation and lifelong growth.

Despite the growing demands on teachers, Europe faces a declining supply of qualified STEM educators. Roughly half of the EU Member States currently experience or anticipate a shortage of well-trained STEM teachers (Eurydice, 2021). The

reasons are multifaceted: limited career prospects, high workload, insufficient recognition, and restricted access to meaningful PD. Low attractiveness of the teaching profession is both a cause and a consequence of these systemic weaknesses. Studies by the OECD (2020) reveal that teachers' job satisfaction and retention increase substantially when they participate regularly in collaborative PD. However, such opportunities remain rare. Teachers still report limited engagement in structural peer collaboration or feedback practices. Without systemic support for teacher learning, attrition rates will continue to rise, particularly in STEM subjects where alternative career options are abundant.

Addressing these intertwined challenges requires a fundamental renewal of Europe's teacher education systems. Both ITE and CPD must become more flexible, collaborative, and internationally connected. The Eurydice (2021) report *Teachers in Europe* stress the need for evidence-based PD models that transcend national boundaries as well as enable mobility and exchange among teacher educators, researchers, and practitioners. Future-oriented teacher education must therefore foster PD communities, integrate mobility as a pedagogical principle, and link local innovation with European collaboration. These are key directions for systemic modernisation.

These challenges define the context in which innovative approaches to teacher PD have become indispensable. To address these challenges and Europe's growing need for highly qualified, innovative, and mobile STEM teachers, ICSE Academy (2022–2025) was established under the Erasmus+ Teacher Academies framework ICSE Academy aimed to demonstrate how European cooperation can act as a catalyst for preparing STEM teacher education for the future. The Academy was meant to strengthen the quality, accessibility, and European dimension of STEM teacher education by designing, implementing, and evaluating innovative PD formats that bridge the gap between research, policy, and practice. Here we present the Academy's intervention model, research methodology for evaluation, main results, and a concluding discussion on sustainability and policy implications.

2. The ICSE Academy: A European Intervention Model

ICSE Academy's overarching vision is to create sustainable structures for collaboration, mobility, and research-informed PD among teacher educators, schools, and policy actors.

The Academy's strategic orientation follows three interconnected missions:

1. Setting up a sustainable European partnership that unites providers of ITE, CPD, policy makers, and schools in collaboration and mutual learning.
2. Developing, testing, and validating innovative PD formats that are effective, accessible, and transferable across national contexts.
3. Informing educational policy and strengthening systemic impact by providing evidence on effective models of STEM teacher education and establishing mechanisms for dissemination and sustainability.

These missions are guided by a needs – feasibility alignment, ensuring that all activities emerge from both bottom-up inputs (teachers' expressed needs and experiences) and top-down policy requirements. This way, the Academy operationalises one of the central ambitions of the European Education Area: to make teacher education future-oriented through collaborative, evidence-based, and internationally connected PD. The partnership, coordinated by the International Centre for STEM Education (ICSE), established a triadic collaboration among higher education institutions, associated educational policy actors, and model schools across Europe. Conceptually, the Academy operates as a Community of Practice (Wenger et al., 2002).

The ICSE Academy's PD approach was structured around three core activity formats: job-shadowing, the interdisciplinary European workshop series, and the collaborative European summer schools, complemented by the Educating the Educators 5 (EtE5) conference as a dissemination and policy interface. Each format addressed specific gaps in European STEM teacher education identified in policy analyses: fragmentation between institutions, limited mobility and exchange, and lack of evidence-based, practice-oriented PD opportunities. Together, these activities formed a coherent system of PD grounded in collaboration, mobility, and a distinct European dimension.

The job-shadowing program fostered mutual PD among STEM ITE and CPD providers within the ICSE Academy consortium. Teacher educators from the partner institutions visited each other's courses, either on-site or online, to observe how colleagues design and facilitate STEM-related seminars and workshops. The core idea was to make existing good practice in teacher education visible and open to discussion, and to translate these insights into concrete innovations in one's own institutional context. Each job-shadowing activity followed a similar structure. First, the visiting educator observed one or more sessions of a colleague's course or workshop. Then, hosts and visitors jointly reflected on pedagogical choices, use of materials, and ways of engaging (pre- and in-service) teachers in a structured debriefing conversation. As a final step, the visiting educator adapted selected elements and implemented them in their own setting.

The European workshop series represented the Academy's principal format for virtual mobility and collaborative PD. It was implemented twice during the project period, each cycle extending over 13 weeks, with weekly sessions of 1 hour 45 minutes plus a short break. Pre- and in-service STEM teachers participated from all partner countries, fostering a transnational community of practice that combined theoretical insight with classroom-oriented reflection. Each workshop cycle was organised around four thematic clusters that addressed pressing challenges in STEM education across Europe: sustainability issues in STEM, diversity and inclusion in STEM, STEM in the digital era, and innovative assessment in STEM education. These clusters were implemented sequentially and facilitated by different partner universities, allowing participants to experience varied teaching traditions, institutional contexts, and national perspectives. Sessions followed a highly interactive format, combining short impulses by experts with collaborative activities and open discussion. The overall focus remained on practice and exchange: participants were encouraged to

apply new ideas to their own teaching contexts and to share experiences and classroom examples with colleagues from other countries. Participants could request a micro-credential certificate recognising their engagement and workload, aligned with the European Commission's framework for short learning experiences. The workshop series thus functioned both as a professional-learning environment and as a mechanism for formal recognition of CPD. Participants reported that the format increased their confidence in addressing current STEM challenges, stimulated innovation in their classroom practice, and strengthened their sense of belonging to a wider European STEM-education community.

The Academy's summer schools provided immersive European learning environments combining physical mobility, collaborative pedagogy, and hands-on engagement with real-world STEM issues. Two editions were held in Utrecht (Netherlands, 2023) and Prague (Czech Republic, 2024). Each gathered pre- and in-service teachers from across Europe, representing diverse educational systems and professional backgrounds. The summer schools focused on four thematic areas reflecting central challenges for future-oriented STEM education: sustainability, diversity, digitalisation, and interdisciplinarity. Methodologically, they emphasised experiential and problem-based learning. Participants collaborated on authentic, practice-oriented tasks, explored locally relevant examples of STEM education, and developed concrete teaching scenarios. Through a combination of workshops, and reflective discussions, teachers engaged in co-creation processes that strengthened their ability to integrate European priorities, such as sustainable development and digital literacy, into their professional practice. Participants could opt to receive a micro-credential, acknowledging their active involvement and workload. Beyond just learning of content, the summer schools fostered intercultural understanding and a shared sense of European professional identity.

3. Methodology: Research and Evaluation Design

The ICSE Academy was accompanied by a thorough research and evaluation design to generate robust evidence on effective PD models in European STEM teacher education. The research concept was grounded in a mixed-methods approach, combining quantitative and qualitative methodologies to explore participants' professional growth, institutional change, and systemic impact. A baseline study was conducted to assess the status quo of teacher PD across partner countries. This initial analysis provided a conceptual and empirical foundation for the design of the Academy's PD formats, particularly the workshop series and the summer schools. For these two formats, pre- and post-questionnaires were implemented examining changes in teachers' self-assessments, attitudes, and needs. This design allowed for the measurement of learning gains and the assessment of the impact of participation on teachers' confidence, collaboration, and pedagogical innovation.

The job-shadowing program was explored through a qualitative case-study approach. For each shadowing activity, three participants were interviewed, using a

semi-structured interview, evaluating the impact of the activity. All participants completed reflection bundles. These bundles focused on observed pedagogical practices, reflection processes, and transfer into the home context, while also documenting their learning experiences, perceived challenges, and transfer outcomes. The resulting evidence contributed to the continuous improvement of the Academy's activities and to the wider European discourse on effective, scalable, and sustainable teacher educator PD.

4. Results

Across its three-year implementation period, ICSE Academy engaged more than 390 participants in its PD activities: 60 in the job-shadowing program, approximately 140 in the two cycles of the Interdisciplinary European workshop series, 90 in the Collaborative European summer schools, and over 100 at the Educating the Educators 5 (EtE5) conference. Together, these activities provided a comprehensive testbed for innovative, cross-border models of teacher education and yielded a consistent set of findings.

Pre- and post-questionnaires conducted in both workshop series and summer schools revealed significant shifts in several dimensions of teacher learning. Participants showed strong and statistically significant improvements in their self-assessed professional knowledge and in their awareness of their own PD needs. Interestingly, this growth in perceived professional knowledge was accompanied by a parallel increase in participants' recognition of areas still requiring development. The formats thus functioned as reflective catalysts, encouraging teachers to see PD as an ongoing process rather than a finite outcome.

Moreover, participants reported a marked rise in their willingness to engage in future international professional exchange activities. This is particularly noteworthy given that 63.7 % of teachers had never before participated in international exchange formats. After participating in the Academy's programs, 84 % expressed a positive attitude toward such initiatives and stated that they would take part again. Feedback data indicate that the summer schools and workshop series were perceived as highly motivating and practically relevant. Participants highlighted the benefits of hands-on collaboration, interdisciplinary teamwork, and intercultural exchange. However, several respondents suggested that shorter or modular versions of the workshop series would enhance accessibility in the future.

The job-shadowing program was particularly well-received among teacher educators in higher-education institutions. Participants described it as a form of on-the-job PD that allowed them to observe, adapt, and integrate effective teaching practices from colleagues across Europe. Many of the shadowed workshops and methods were partially or fully incorporated into the hosts' own university courses, indicating tangible transfer effects. Qualitative case studies showed that in-person shadowing was perceived as significantly more effective than online observation, mainly due to the richer informal dialogue. Overall, the program contributed to sustainable institutional

learning by fostering a culture of openness and peer-based quality enhancement in teacher education.

5. Overall Reflection and Sustainability

Taken together, the results suggest that the ICSE Academy successfully strengthened both individual teacher competences and institutional capacity for innovation in STEM education. The findings demonstrate that international collaboration can stimulate reflective professional growth and increase teachers' motivation to engage in further learning. At the same time, the project revealed structural barriers, such as limited time resources, that need to be addressed to make long-term participation feasible at scale.

To ensure the project's long-term impact, dissemination and sustainability were core priorities from the outset. The project's dissemination concept combined academic communication (such as the EtE 5 conference), practitioner outreach, and policy dialogue. A central mechanism for long-term continuation was the integration of two key formats – the workshop series and job-shadowing – into the European School Education Platform (cf. Benincasa et al. in this volume), allowing teachers to continue collaborating. These measures were complemented by policy briefs aimed at policymakers and the establishment of National Policy Committees. Crucially, several partner institutions have already integrated adapted versions of the Academy's formats into their regular PD programs, ensuring the project's continuity. ICSE Academy thus contributed to both new insights into effective STEM teacher PD and enduring mechanisms that enable educators across Europe to remain connected, exchange practice, and engage in lifelong professional growth.

References

COM (2020). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on achieving the European Education Area by 2025*. European Commission.

Council of the European Union. (2022). Council recommendation on a European approach to micro-credentials for lifelong learning and employability (2022/C 243/02). *Official Journal of the European Union, C 243*, 1–8.

European Commission. (2021). *Erasmus+ Teacher Academies: Fostering excellence in teacher education through European partnerships*. European Education and Culture Executive Agency.

Eurydice. (2021). *Teachers in Europe: Careers, development and well-being*. Publications Office of the European Union.

Mullis, I. V. S., Martin, M. O., Foy, P., Kelly, D. L., & Fishbein, B. (2020, December). *TIMSS 2019 international results in mathematics and science*. TIMSS & PIRLS International Study Center. https://timssandpirls.bc.edu/timss2019/international-results/

OECD. (2019). *TALIS 2018 results (Vol. I): Teachers and school leaders as lifelong learners*. OECD Publishing. https://doi.org/10.1787/1d0bc92a-en

OECD. (2020). *TALIS 2018 results (Vol. II): Teachers and school leaders as valued professionals*. OECD Publishing. https://doi.org/10.1787/19cf08df-en

OECD. (2023). *PISA 2022 results (Volume I): The state of learning and equity in education*. OECD Publishing. https://doi.org/10.1787/53f23881-en

Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica, 73*(2), 417–458. https://doi.org/10.1111/j.1468-0262.2005.00584.x

Wenger, E., McDermott, R., & Snyder, W. (2002). *Cultivating communities of practice: A guide to managing knowledge*. Harvard Business School Press.

Jan Springob, Daniela Frison, Dagmar M. Benincasa,
Giovanna del Gobbo, Beatrix Busse (Eds.)
(Re-)Imagining Teacher Education for a Future in Flux
Perspectives from the Erasmus+ Teacher Academy *teff*

Isolde Malmberg & Karla Stolle

Music-Related Sustainability Competence

The Arts Subjects Between Social Impact and L'art Pour L'art

Abstract
Sustainability is increasingly recognised as a key competence in European education, yet its role in the arts, especially music, remains only loosely defined. Drawing on findings from the three-year Erasmus+ co-funded TEAM project (Teacher Education Academy Music), this chapter examines how sustainability is understood and implemented in music education and music teacher education across Europe. Based on survey data from thirty-one countries and the development of European learning outcomes, we show how Education for Sustainable Development (ESD) appears in policy documents, curricula, and classroom practices. Interpretations vary widely, spanning cultural heritage preservation, ecological responsibility, and everyday eco-practices. Emerging competency frameworks reveal a persistent tension between narrow ecological definitions of sustainability and broader approaches linked to inclusion, global citizenship, and collaborative artistic practice. We argue that music education sits between two longstanding orientations – social impact/activism and l'art pour l'art – and that these perspectives can productively complement one another within ESD. Highlighting music's aesthetic, relational, and imaginative potential, the chapter offers a conceptual basis for strengthening sustainability education in schools and music teacher education.

Keywords: music education; music teacher education; sustainability education; art subject; Education for Sustainable Development (ESD)

1. Introduction

In times of global crisis, education systems bear the responsibility of preparing learners for sustainable futures. The *OECD Trends Shaping Education 2025* identifies "learning in an AI-driven world" (OECD, 2025, p. 13) and "Education on a fragile planet" (ibid., p. 14) as current challenges, calling for creativity, collaboration, and ethical judgement. As the report stresses,

> "the planetary crises of climate change, biodiversity loss and pollution intersect with education in various ways: education and training systems are both vulnerable to the impacts of socio-ecological emergencies, and crucial in shaping behaviours, collective action and skills that can support sustainable societies and greening economies." (OECD, 2025, p. 14)

While education in a broader sense is called to contribute to shaping sustainable futures, the arts subjects hold particular transformative potential. As Niederhauser et al. (2023) note, contemporary debates on sustainability attribute a crucial role to the arts in fostering reflection, imagination, openness, and societal transformation. This transformative potential lies in the arts' capacity to connect emotion, cognition, and ethical awareness through aesthetic experience, creating spaces where learners can engage critically and imaginatively with complex socio-ecological issues (Bolden et al., 2021; Vella & Pavlou, 2022). As Malmberg (2023) further argues, music as an aesthetic and relational discipline, provides conditions for learning that are inherently connected to sustainability: awareness, empathy, creativity, and reflection. This understanding aligns with broader theoretical conceptions of music. König (2019, p. 8) describes music as "a social sphere […] in which the values of the present are negotiated in an exemplary way and translated into sonic utopias." Such a view underscores both the aesthetic autonomy as well as music's societal meaning.

Based on surveys and analysis within the three year's Erasmus+ co-funded project TEAM[1], in this chapter we will explore Education for Sustainable Development (ESD) in general school music education (ME) and in music teacher education (MTE) as a field situated between two long-standing conceptions of art and education. On the one hand, the concept of (artistic) activism, which emphasises the social, ethical, and transformative potential of music, and on the other, the ideal of *l'art pour l'art*, which values artistic creation as an autonomous space of aesthetic experience. Both perspectives have shaped how music education has been theorised and practised across Europe.

2. Sustainable (Green) Education in Music Education

Following the growing attention to sustainability education, music education faces the question of how this broad and multifaceted concept can be meaningfully related to subject-specific practices. In contrast to disciplines traditionally associated with environmental or socio-ecological learning, (future) music teachers must actively interpret how sustainability connects to artistic, cultural, and pedagogical aims and how it can be embedded in the music lessons in school.

Sustainability in music education can be examined across three interconnected levels: subject-didactic developments, teacher education concepts, and school curricula/classroom practice. The following sections explore how these dynamics currently unfold in European contexts: Section 2.1 analyses how national experts frame sustainability within ME using data from the TEAM WP8 survey, while section 2.2 turns to MTE by examining how ESD is reflected in the European-wide TEAM learning outcomes for MTE. Together, we aim to show how ESD is beginning to take shape across

1 *TEAM – Teacher Education Academy Music. Future-Making, Mobility and Network in Europe* https://teacher-academy-music.eu/ is funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

institutional layers of music education, even if the term itself remains only partly defined.

2.1 European Experts Framing Sustainability in ME

The *TEAM* project work package 8's task *Mapping Music Education in Europe* was designed as a large-scale comparative survey. Its purpose was to create a coherent overview of school music education in Europe in order to identify both shared tendencies and national particularities. The study was conducted as an expert-based questionnaire survey between December 2024 and March 2025. National experts, including the EAS[2] National coordinators from thirty-one European countries[3], completed a structured questionnaire comprising seven thematic sections: governance, school structure, music in schools, curriculum, teacher profiles, current trends, anticipated future developments and selected examples of practice. The questionnaire included primarily open-ended questions and invited respondents to describe not only formal frameworks but also contextual realities and current debates.

For this article, the dataset serves as the empirical basis. Rather than conducting a re-analysis, our focus lies on a targeted thematic reading of the WP8 material to trace where and in what ways sustainability is mentioned or implied within the questionnaires. This analysis shows that the term sustainability is mentioned in different sections of the questionnaires. In some countries, it appears in the political framework as part of national education strategies; in others, it is mentioned within curriculum descriptions, current trends, or future developments. ESD is therefore not treated as a single, clearly defined concept, but can be found across political, curricular, and pedagogical dimensions. Depending on its placement, the term is associated with themes such as environmental education, cultural heritage, digitalisation, or teacher well-being. These differences suggest that sustainability in music education operates as a transversal principle, connecting diverse educational concerns. The following will give insights through two selected lenses: (A) cultural sustainability education and (B) ecological sustainability education. This allows for a differentiated understanding of how the experts frame sustainability and link it to diverse pedagogical concepts and practices in their countries.

2 The European Association for Music in Schools (EAS, see https://eas-music.org/) is an international network founded in 1990 to promote cooperation, research, and professional exchange in the field of school music education across Europe. The EAS National coordinators are appointed representatives who serve as liaisons between the EAS board and the National music education communities.

3 A total of 31 experts participated in the WP8 survey, representing a broad geographical and educational diversity across Europe. Information was gathered from the following countries: AT, BE, BG, BA, HR, CY, CZ, EE, FI, DE, EL, HU, IE, IT, LV, LT, LU, ME, NL, NO, PL, PT, RS, SI, SK, ES, SE, CH, TR, UK (EN, SCT, WAL) (country abbreviations follows the ISO 3166-1 alpha-2 standard).

(A) Cultural Sustainability: Between Awareness of Tradition and Renewal

National experts frequently describe ME as key for preserving and transforming cultural identity. Many experts connect the term sustainability to traditions, emphasising how musical heritage can support continuity while allowing creative renewal. Examples from the Baltic region are particularly telling. The Estonian expert notes:

> "Students learn to understand the meaning of music in social communication, including song celebrations[4] and other national events. They learn to understand the significance of music in society as a symbolic power that unites communities, studying national anthems and songs with cultural significance. This includes understanding the diversity of ethnic communities in Estonia and the importance of ethical and legal use of music" (E_EE).

Similarly, the Lithuanian report explicitly links sustainability to heritage preservation: "Music education incorporates sustainability by promoting awareness of traditional Lithuanian music as a cultural heritage that must be preserved" (E_LT).

The Lithuanian experts immediately associate the term sustainability with the preservation of musical heritage, which suggests that in ME sustainability is often interpreted implicitly through cultural continuity and the safeguarding of tradition. As the following example shows, this culturally grounded understanding appears even in cases where sustainability is not explicitly mentioned in the curriculum: "While the curriculum does not explicitly mention sustainability, through the study and preservation of musical heritage, students develop an awareness of the importance of safeguarding intangible cultural heritage for future generations" (E_HR).

(B) Ecological (Green) Sustainability: Between Policies and Implementation

Alongside these culturally oriented interpretations, a second strand of responses highlights a more policy-driven and ecological understanding of sustainability. Here, sustainability is articulated through environmental education, cross-curricular frameworks, and national strategies. These perspectives broaden the picture by showing that sustainability is also addressed at systemic and curricular levels. In the Slovak curriculum, the notion of sustainability is embedded as part of the cross-cutting theme *Environmental Education* at ISCED level 1[5], stating that "The goal is to acquire knowledge, skills, attitudes, and habits that contribute to the protection and improvement of the environment, which are essential for a sustainable life on Earth" (E_SK).

---

4 The Estonian *Laulupidu* (Song Celebration) is a nationwide choral festival first held in 1869 in Tartu during the Estonian national awakening. Since 1950, it has taken place every five years in Tallinn, alternating with youth festivals, involving up to 30,000 singers and audiences of over 100,000. Recognised by UNESCO as Intangible Cultural Heritage (2008), it represents a living form of cultural sustainability, linking school music, community participation, and national identity, see https://laulupidu.ee.

5 *ISCED* (International Standard Classification of Education) is a framework developed by UNESCO for internationally comparable descriptions of education systems. ISCED level 1 corresponds to primary education. When sustainability is defined as a cross-curricular theme at this level, it applies to all subjects, including music, which shares responsibility for fostering environmental and ethical awareness through artistic experience.

A similar approach can be seen in Luxembourg, where the concept of *Bildung fir nohalteg Entwécklung* (education for sustainable development) is formally anchored within the national education system and coordinated between the Ministry of Education and the Ministry of the Environment, Climate and Biodiversity (E_LU). The same emphasis on ecological awareness appears in Sweden, where the national curriculum identifies sustainability as a transversal educational goal. The curricula for compulsory (2022) and upper secondary schools (2025) place sustainability alongside digital competence and factual knowledge as key cross-curricular priorities, linking ME to broader educational aims (E_SE). A similar approach can be seen in Norway, where sustainability is seen as a key cross-curricular topic: "Sustainability is a cross-curricular theme, encouraging students to engage with environmental challenges and adopt responsible practices" (E_NO).

In the Polish context, sustainability also appears explicitly among the "directions of state educational policy" (E_PL) which are announced every year, where sustainability is framed through pro-ecological behaviours and environmental responsibility. Whilst the mentioned countries frame sustainability mainly through curricular and policy initiatives, some respondents describe concrete classroom-level actions. In Bulgaria, for example, sustainability is reported to appear in everyday teaching practice: "Some schools encourage the use of recycled materials for musical instruments, promoting eco-friendly practices in music education. Digital resources are increasingly replacing printed materials, reducing paper usage in music theory instruction" (E_BG).

Together, these findings show that ESD in European music education currently operates on several levels: as a political commitment, a (cross-)curricular goal, and a set of practical actions in schools. This inconsistent picture suggests that while sustainability has entered educational discourse, its concrete realisation still depends largely on local initiative and teacher engagement. Returning to our initial question of societal versus *l'art pour l'art* ESD ME, the answer remains elusive. Sustainability appears in the data largely in broad terms, and we find hardly any related conceptual statements from the experts addressing whether these approaches emphasise primarily functional or artistic-aesthetic music educational practices.

2.2 European-wide Learning Outcomes for MTE

Work Package 6 *Learning Outcomes* in the TEAM project developed a set of descriptors (*TEAM learning outcomes*) to describe competencies that should be acquired upon completion of music teacher education programs across Europe. A pilot survey has been conducted with 18 experts from 14 countries to identify so-called emerging themes in the music classroom. Emerging themes referred to topics and content that were new or likely to become important in music education in the near future (De Baets et al., 2025).

The discussion of the analysed dataset illustrates the challenge posed by the parallel existence of both narrow and broad conceptions of sustainability. The code "sus-

tainability" was assigned to only three countries in this dataset, likely because it was defined in this study in a narrower sense, focusing on ecological sustainability. We posit that as the statements were coded inductively, the code sustainability had only shown in three countries. However, in many other emerging themes, we find aspects of a broader concept of sustainability, like global (artistic) citizenships, diversity and inclusion, collaboration, or musical cultures (ibid., p. 87). The members of WP6 are currently publishing the *TEAM* learning outcomes. However, they have recognized the problem of unclear terminology and objectives and are currently working with school music teachers in many countries through workshops, discussions, and the clarification of concepts and concrete implementation ideas.

3. Discussion

If we summarize the processes of implementing ESD in ME and MTE, as well as the multiple levels and definitions through which ESD is introduced across countries, we observe that ESD has so far been conceptualized very broadly and implemented and secondly in highly diverse ways. We can also observe that sustainability, as both a narrow and a broad concept, still leads to uncertainties in its conceptual discussion. Furthermore, the fact that ESD is a broad concept – as already evident in the large discussion about the breadth or focus of the SDGs (UNESCO, 2016 & 2017) – also places ME and MTE at risk of obscurity, which one may call "sustainability-washing." If much of what is currently offered in ME is suddenly framed as serving ESD, it becomes unclear which specific music-educational and policy interventions genuinely help to prepare young people for the future.

At the same time, prospective music teachers specifically are expressing their urgent need for clarity and effective concepts for music lessons in schools. As Malmberg's and Gall's recent empirical study shows, music teacher novices across Europe express a high interest in sustainability education, yet lack conceptual understanding of how it relates to their subject music (Malmberg & Gall, 2025). A clarifying and comprehensive subject-didactic discourse is therefore more urgently needed than ever.

Music education can be linked to both activism and ecological sustainability education, addressing how social impact on the one hand and artistic individuality and intrinsic value (art for art's sake) on the other interact. The emerging art genre of *data sonification* serves as an example (Roeder, 2018; Sheik, 2019). Here, environmental data is transformed into music (the music pieces' genres range from contemporary electronic music to dance-floor and techno). The point at which data sonification (i.e., the purposeful, auditory representation of environmental damage) ends and at which art begins can provide a basis for clarifying discussions among young learners. In times of ecological, social, and cultural transition, the challenge is not to choose between activism and art, but to understand how they can coexist productively. ESD, we argue, can offer a connecting framework. Such a framework acknowledges music's intrinsic aesthetic value while recognizing its capacity to foster empathy, awareness,

and imaginative engagement with what surrounds us all, and what we want to preserve.

Acknowledgements
This article was developed within the Erasmus+ co-funded project *Teacher Education Academy for Music – Future-Making, Mobility and Networking in Europe (TEAM)* (2023–2026), coordinated by the University of Music and Performing Arts Vienna (mdw) in cooperation with the European Association for Music in Schools (EAS). We thank all colleagues and partners involved, especially those contributing to Work Packages 6 and 8, whose work informed this publication.

Work Package 8 (Mapping Music Education in Europe), conducted by Rūta Girdzijauskienė, Lorraine O'Connell, and Karla Louisa Stolle, benefited from the valuable input of national experts and EAS National Coordinators. Work Package 6 (Learning Outcomes), carried out by Thomas De Baets, Ann-Sophie De Praitere, and Isolde Malmberg with associated partner Marina Gall, provided key insights through the development of European-wide TEAM Learning Outcomes.

Authors' contributions: IM and KS contributed equally.
Competing interests: No conflicts of interest declared.
Funding: Supported by EACEA – Erasmus+ Teacher Academies (Grant 101103634).
Ethics: All necessary ethical approvals were obtained.

References

Bolden, B., Jeanneret, N., & Kukkonen, T. (Eds.). (2021). *Visions of sustainability for arts education: Value, challenge and potential*. Springer. https://doi.org/10.1007/978-981-16-6174-7

Clausen, E., Mascher, E., & Vogels, R. (2017). *Musik*. In Engagement Global (Eds.), *Orientierungsrahmen globale Entwicklung: Teilausgabe Musik*. https://www.eineweltsong.de/fileadmin/downloads/Dokumente/05_or-ge_musik_bf.pdf

De Baets, T., De Praitere, A.-S., Gall, M., & Malmberg, I. (2025). Future-proof learning outcomes for classroom music teacher education: A European-wide exploration. *Culture, Education, and Future, 3*(1), 82–99. https://doi.org/10.70116/2980274182

Estonian Song and Dance Celebration Foundation. (n.d./2023). *The Estonian Song Celebration (Laulupidu) – History and tradition*. Eesti Laulu – ja Tantsupeo Sihtasutus. https://laulupidu.ee

Eusterbrock, L. (2024). *Musikalische Bildung für nachhaltige Entwicklung? Klimawandel und Nachhaltigkeit in der Musikpädagogik* [Video]. YouTube. https://www.youtube.com/watch?v=J85PE9K9d7Y

König, B. (2019). Monteverdi und der Klimawandel: Wie die Musik auf eine globale Herausforderung reagieren könnte. *Neue Musikzeitung (NMZ), 68*(9).

Malmberg, I. (2023). Towards a sustainable music education: What contribution should music education make to the crises and urgent questions of our time to innovate for the future? An essay. In M. Petrović (Ed.), *Music pedagogy in the context of present and future changes* (pp. 11–21). Faculty of Music Belgrade.

Malmberg, I., & Gall, M. (2025). Sustainable Development Goals and music education: Trainee music teachers' perspectives. In B. Freitag-Hild, S. Goertz, I. Malmberg, & L. P. Juang (Eds.), *Educating teachers for sustainable development and global citizenship: Internationalizing teacher education in the context of the UN Sustainable Development Goals* (pp. 163–182). Universitätsverlag Potsdam. https://doi.org/10.25932/publishup-67987

Niederhauser, J., Vez, C., Jörg, A., Bertschy, F., Künzli David, C., & Pfründer, G. (2023). The power of artistic practices in ESD. *Environmental Education Research, 30*(4), 580–590. https://doi.org/10.1080/13504622.2023.2227362

OECD. (2025). *Trends shaping education 2025*. OECD Publishing. https://doi.org/10.1787/ee6587fd-en

Roeder, T. (2018). Sonifikation: Vermittlungsansätze zwischen Klang und Information. *Zeitschrift für digitale Geisteswissenschaften*, *3*(2018). https://doi.org/10.17175/2018_002

Sheik, K. (2019). This is what climate change sounds like. *The New York Times*. https://www.nytimes.com/2019/10/24/arts/music/climate-change-music-sound.html

UNESCO. (2016). *17 Sustainable Development Goals*. https://en.unesco.org/sustainabledevelopmentgoals

UNESCO. (2017). *Education for Sustainable Development Goals: Learning objectives*. https://unesdoc.unesco.org/ark:/48223/pf0000247444_eng

United Nations. (2021). *SDGs and music: Agents of change in action*. https://unric.org/en/sdgs-and-music-agents-of-change-in-action/

Vella, R., & Pavlou, V. (Eds.). (2022). *Art, sustainability and learning communities*. Intellect Books.

Authors

ADMIRAAL, Wilfried is a psychologist and full professor at the Centre for the Study of Professions of Oslo Metropolitan University in Norway. His research interests are in the social and emotional aspects of the teaching profession. Current projects relate to the attrition of early-career and late-career teachers and schools as a safe and democratic learning and teaching environment.
Contact: wilfried@oslomet.no

BARTOSCH, Roman is Professor of Anglophone Literatures and Cultures and the Anglophone World and Director of the Interdisciplinary Research Centre for Teaching in the Humanities at the University of Cologne.
Contact: roman.bartosch@uni-koeln.de

BENINCASA, Dagmar Marie has been *teff*'s project coordinator. A secondary school language teacher and university lecturer in teacher education, she currently works at the Centre for Teacher Education (CfTE) at Universität zu Köln. Her main areas of interest include (teacher) well-being, cross-phase collaboration, and the development of (digital) future-oriented learning opportunities for initial and continuous teacher education.
Contact: d.benincasa@uni-koeln.de

BLATTMANN, Anna is a project manager and teacher educator at International Center for STEM Education (ICSE).
Contact: anna.blattmann@ph-freiburg.de

BOSCH, Anna is a teacher educator of the Graduate School of Teaching at Utrecht University. Her main focus is on workplace learning and strengthening the connection between educational theory and professional practice. She is particularly interested in how learning unfolds in real work contexts and how academic insights can meaningfully inform everyday professional development. She was a participant of the work package on well-being.
Contact: a.h.bosch@uu.nl

BOWDEN, Rachel is an educational researcher, teacher educator, and project manager with experience across education systems in Germany, Rwanda, and Malaysia. She holds an MSc in Education for Sustainability and a PhD in Applied Linguistics. She is currently researching ESD in rural schools and informal education settings in Germany.
Contact: rachel.bowden@hszg.de

BRANCO, Neusa holds a PhD in Education and is a professor of initial teacher education at the Polytechnic University of Santarém – Higher School of Education, Portugal. Her research focuses on algebra teaching and learning, mathematics didactics, science-mathematics connections, and digital technology integration.
Contact: neusa.branco@ese.ipsantarem.pt

BRESGES, André has been Professor of Physics Education at the University of Cologne since 2007. His research and work focus on teacher training, the use of digital media in physics education, and technology-supported learning. Other topics include inclusion, the digitization of schools, and the development of innovative teaching and learning formats in physics.
Contact: andre.bresges@uni-koeln.de

BUSSE, Beatrix is Chief Development Officer of *teff*, Vice-Rector for Studies and Teaching, and professor of diachronic English linguistics at the University of Cologne, as well as the Chief Development Officer of the *European University for Well-Being* (*EUniWell*). Her scholarly interests include corpus and transfer linguistics, stylistics, and language (discursive place-making) in urban spaces.
Contact: beatrix.busse@uni-koeln.de

CAVADAS, Bento is a science education teacher at the Polytechnic University of Santarém/School of Education, Portugal, and an author of natural science textbooks. His research interests include science education, teacher education, science textbooks, and integration of science and mathematics.
Contact: bento.cavadas@ese.ipsantarem.pt

CERTINI, Rossella is a PhD researcher in "Theory and History of educational processes." Her main research concerns educational theories, school and methodological innovations, autobiography, processes of inclusion in the school and society. She works at the Department of Education, Languages, Interculturality, Literature and Psychology at the University of Florence. She is Erasmus Delegate of her University
Contact: rossella.certini@unifi.it

COLAÇO, Susana holds a PhD in Mathematics and is a professor of initial and in-service teacher education at the Polytechnic University of Santarém – School of Education, Portugal. Her work focuses on mathematics education, ICT, STEM, teacher professional development, digital literacy, inclusion, and citizenship.
Contact: susana.colaco@ese.ipsantarem.pt

DANNECKER, Wiebke is an Associate Professor of Literature and one of her main research topics is the teaching of literature in inclusive settings at the University of Cologne.
Contact: w.dannecker@uni-koeln.de

DE MARIA, Francesco is an assistant professor and researcher in Experimental Pedagogy at the University of Florence. His work focuses on participatory evaluation research and Outcome-Based Evaluation to enhance the quality of educational and training systems.
Contact: francesco.demaria@unifi.it

DEL GOBBO, Giovanna is a Professor of Experimental Pedagogy and Chairholder of Transdisciplinary UNESCO Chair Human Development and Culture of Peace at the University of Florence. The topic of sustainability is transversal to her fields of interest. She is engaged in *EUniWell* with a specific focus on teachers' training and innovation in Higher education.
Contact: giovanna.delgobbo@unifi.it

DITTMANN-ZÖLLNER, Stefan is a secondary school teacher of biology, geography, and German. He is currently pursuing a doctorate at the University of Cologne on the topic of sustainability concepts in geography education. At the university's Centre for Teacher Training, he is committed to integrating ESD into the training of future teachers.
Contact: s.dittmann-zoellner@uni-koeln.de

ENGEN, Bård Ketil, Dr., is a full professor at the Department of Primary and Secondary Teacher Education, Oslo Metropolitan University, Norway. His research interests include the framework for and use of digital technologies in teaching and learning in primary schools and teacher education, and many of the research projects he has engaged in over the last 25 years have explored these aspects.
Contact: bkengen@oslomet.no

ENNS, Inna studied social Anthropology and Higher Education Management. She works at the Center of Teacher Education at the University of Cologne as part of the School Networks & Internationalisation team. She coordinates the *internships@schoolsabroad* project and works in different areas of the EU-funded Teacher Academy for a Future in Flux (*teff*), including the administrative coordination of the project.
Contact: inna.enns@uni-koeln.de

ERACLEOUS, Maria is a Teacher Trainer at the Cyprus Pedagogical Institute with extensive experience in early childhood education and teacher professional learning. She holds a PhD and MPhil in Educational Research (University of Cambridge) and an MA in Educational Studies (University of York). She coordinates national and EU projects and has delivered over 500 training workshops.
Contact: eracleous.m@cyearn.pi.ac.cy

FALCONER, Kathleen Ann has a B.Sc.in Physics, Chemistry, and Mathematics and a B.Ed. from Mount Allison University, Canada. She has an M.S. in Physics and an M.S.Ed. from Purdue University. She is pursuing a doctorate in physics education at the University of Cologne. She is interested in Action Research, Inclusion, and Educational Technology. She was elected Fellow of American Association of Physics Teachers in July 2018.
Contact: kathleen.falconer@uni-koeln.de

FELDMANN, Henning spent several years at the Ruhr University Bochum in the research area of adult education. There, he also completed his doctorate on the subject of social capital. Since 2010, Henning Feldmann has worked as managing director at the Professional School of Education and leads various national and international teacher training projects.
Contact: henning.feldmann@rub.de

FERNÁNDEZ-VILAR, María Ángeles holds a Bachelor's degree in Psychology, a Master's in Early Intervention, and a PhD in Psychology from the University of Murcia. She has taught there for 20 years and she has contributed to research and served on several academic committees. She currently coordinates Student Mental Health at the University of Murcia.
Contact: mafvilar@um.es

FRISON, Daniela has been *teff's* local coordinator for the University of Florence where she is Associate Professor of Experimental Pedagogy. Her main research interests include the well-being of teachers (students and in-service) and education professionals and their process of initial education and professional development.
Contact: daniela.frison@unifi.it

FUNARI, Chiara is part of *teff*'s University of Florence team. She is a PhD student in Educational Science and Psychology at the University of Florence. Her doctoral research focuses on the well-being of education professionals, with particular attention to the pedagogical perspective.
Contact: chiara.funari@unifi.it

GALEOTTI, Glenda, PhD, is an Associate Professor of General and Social Pedagogy at the University of Florence. She serves as the University's referent for Education and is a member of the technical committee on "Green Jobs" within the Italian Network of Universities for Sustainable Development (RUS). Her research focuses mainly on sustainability education, local development, and organizational innovation.
Contact: glenda.galeotti@unifi.it

GALVIN, Conor is based at UCD Dublin College of Social Sciences & Law, Ireland, directing PhD Education Programmes and supervising research on green and sustainability education, public policy, and research methods. His interests include sustainable development, policy networks, professional knowledge, and emergent technology impacts on learning.
Contact: conor.galvin@ucd.ie

GEUNIS, Lotte is a researcher at the KU Leuven and a partner in the *teff* project. She holds a PhD in political science and, in her role as parliamentary advisor, has worked with policy-makers for over fifteen years. Her research focuses on the engagement between policy makers and young people.
Contact: lotte.geunis@kuleuven.be

GLÆVER, Tonje Hilde is a full professor at the Department of Primary and Secondary Teacher Education, Oslo Metropolitan University, Norway. Her teaching is in teacher education, primarily within the master's program in Digital Learning Design. Her research interests center on digital competence in educational contexts, including cyber ethics, digital technologies for learning and digitalisation and school development.
Contact: tonjeh@oslomet.no

GUTIÉRREZ VANEGAS, María worked at the Centre for Teacher Education (CfTE) on various Erasmus+ projects focused on the internationalisation of teacher education, where she helped develop learning modules in collaboration with colleagues on future-oriented competencies for future and in-service teachers. She currently works as a consultant for digital school development, specialising in AI innovation, for the web app *lernlog*.
Contact: m.gutierrez@lernlog.digital

HADJITHEODOULOU LOIZIDOU, Pavlina has been at the Cyprus Pedagogical Institute since 2000. She leads the In-Service Teacher Training Department and is Chief Education Officer since 2024. She promotes teacher professional learning, inquiry-based methodologies, and intercultural education, presenting locally and internationally.
Contact: hadjitheodoulou.p@cyearn.pi.ac.cy

HATLEVIK, Ove Edvard, Dr., is a full professor at the Department of Primary and Secondary Teacher Education, Oslo Metropolitan University, Norway. His research interests include learning, self-efficacy, and achievements. One strand is about digital divide and how students apply digital competence and computational thinking. The second strand concerns how teachers implement digital technology in their own teaching practice.
Contact: ovedha@oslomet.no

HENRICHS, Lotte, Dr., is an Assistant Professor of Education and teacher educator at Utrecht University, the Netherlands. Within the teacher education programmes, she teaches courses on pedagogy, diversity-sensitive teaching, and equitable educational opportunities. She is involved in various projects in which teachers, students, and researchers conduct joint research. She was involved in the *teff* work package on Diversity and Inclusion.
Contact: l.f.henrichs@uu.nl

HÖFTING, Simon is a research assistant in physics education at the University of Cologne. His research focuses on the potential applications of 3D printing technology in inclusive STEAM education. Other areas of focus include teacher professional development and sustainable education practices.
Contact: simon.hoefting@uni-koeln.de

HOLZ, Oliver is professor at the Faculty of Economics and Business at KU Leuven. He has a master's degree in educational sciences, Psychology and Physical Education and a PhD in comparative education. He is a member of the research group 'Leuven Economics of Education Research (LEER).' Holz is a participant in and coordinator of different European projects. He is president of the annual conference IPiE 'International Perspectives in Education.'
Contact: oliver.holz@kuleuven.be

HOONDERT, Koen is a teacher educator and researcher at Utrecht University. Together with Karen van der Eng, he designed and taught the course 'Voorbij het Hokjesdenken.'
Contact: k.hoondert@uu.nl

HYYPPÄ, Iina is a Doctoral Researcher at the University of Helsinki, Faculty of Educational Sciences, with a background in Primary Education and Educational Research. Her dissertation focuses on futures thinking skills in various educational contexts, and currently explores how pre-service teachers envision hopeful futures and their ability to impact change.
Contact: iina.hyyppa@helsinki.fi

KADIR, Joana holds a Masters Degree in English Studies and History. Since 2020, she has been a Project Coordinator at the Professional School of Education at Ruhr University Bochum, where she focuses on digitalisation and internationalisation in teacher training.
Contact: joana.kadir@rub.de

KAMPHORST, Floor is an associate professor for science education with a background in physics didactics at the Institute for Teacher Education (ILU) at the Norwegian University for Technology and Science (NTNU). She developed and implemented the strategy for *eTwinning* for the International Center for STEM Education (ICSE Academy). Her interests are teacher's PCK, student reasoning in physics, thought experiments, and inquiry-based science education.
Contact: floor.kamphorst@ntnu.no

KLAVER, Lida is a researcher and teacher educator at Saxion University of Applied Sciences, the Netherlands. Her doctoral thesis focused on students' engagement with socioscientific issues and the current main focus of her research is on citizenship education in primary schools and teacher education.
Contact: l.t.klaver@saxion.nl

KNIEST, Marie is an educator and learning evaluator with extensive experience across the education sector. She runs K&R Education Malmö AB, developing sustainable learning processes, pedagogical methods, and whole-school approaches. She combines scientific expertise with practical experience to enhance learning and organizational development.
Contact: marie@kreducation.se

KNUDSMOEN, Hege works as associate professor and academic international coordinator Department of Primary and Secondary Teacher Education, Faculty of Education and International studies at Oslo Metropolitan University. She has conducted research in the field of adapted, inclusive, and special education. In recent years, she has a specific focus on international perspectives and has some EU-funded Teacher Academy for a Future in Flux (*teff*).
Contact: hegknu@oslomet.no

KRZYWACKI, Heidi, PhD, works as a university lecturer in mathematics education in the Faculty of Educational Sciences at the University of Helsinki. Her research focuses on teacher education and curriculum resources in teaching and learning mathematics, especially the interplay between curriculum resources and teachers in cross-cultural contexts.
Contact: heidi.krzywacki@helsinki.fi

LAAREDJ-CAMPBELL, Anne is the Head of Unit VH for *eTwinning* at the National Agency for Erasmus+ School Education (PAD) in Bonn. An educator and researcher with roots in Oregon and Germany, she earned her PhD in Ethnology from the University of Freiburg. Her experience centers on the CEFR/CV, action-oriented approaches to foreign language learning, and culturally responsive teaching.
Contact: anne.laaredj-campbell@kmk.org

LAHERTO, Antti, PhD, works as a senior university lecturer in Physics and Science Education in the Faculty of Educational Sciences at the University of Helsinki. His research focuses on futures thinking and sustainability in science education and teacher education.
Contact: antti.laherto@helsinki.fi

LANGER, Moritz studied special education with a focus on mathematics and physics. He is pursuing a doctorate in physics education at the University of Cologne on inclusion and education for sustainable development. Other areas of focus include game-based learning and co-supervising the physics education program at the Ecological Rhine Station.
Contact: rlanger2@uni-koeln.de

LINHARES, Elisabete holds a PhD in Education – Science Education and is a professor of initial and in-service teacher education at the Polytechnic University of Santarém – Higher School of Education, Portugal. Her research includes science education, ICT, environmental and socio-scientific activism, interdisciplinary science-math practices, environmental citizenship, and STEM/STEAM education.
Contact: Elisabete.Linhares@ese.ipsantarem.pt

LÓPEZ-SOLA, Alodía is a double PhD student in Educational and Developmental Psychology at the University of Murcia and in the department of European Culture and Literature at the University of Groningen. She has worked as an associate professor at the Department of Developmental and Educational Psychology at the University of Murcia. Her work is related to self-regulated learning in students.
Contact: alodia.lopezs@um.es

LORINI, Chiara is a Professor of Public Health at the University of Florence (Italy), where she teaches hygiene, health promotion and epidemiology. She coordinates the Health Literacy Laboratory of the Department of Health Science. She has been involved in health literacy research at local, national and international level for at least ten years.
Contact: chiara.lorini@unifi.it

LOUWS, Monika works as assistant professor at Utrecht University – Department of Education and teaches courses in the Graduate School of Teaching on practice-based research. Her current research interests focus on the school context as a learning environment for (student-)teachers, (student-)teachers' agency, educational leadership, and change processes in schools from a systems lens. Monika contributed to the *teff* workpackage on well-being.
Contact: m.l.louws@uu.nl

MAAß, Katja is the Director of the International Center for STEM Education (ICSE) and Professor for Mathematics Education at the University of Education Freiburg. Her work focuses on real-world connections, inquiry-based learning, citizenship education, and interdisciplinary approaches in STEM education, as well as on the design and evaluation of professional development programs for teachers and teacher educators.
Contact: katja.maass@ph-freiburg.de

MALMBERG, Isolde is a full Professor of Music Education at the University of Music and Performing Arts Vienna, Austria where she leads the study program for music education in secondary schools. Currently she is leading the Erasmus+ co-funded project TEAM (Teacher Education Academy Music). Research areas: mentoring in music, teacher professionalization in school internships, sustainability, transculturality, and design-based research.
Contact: malmberg@mdw.ac.at

MILITZER, Kaj is the coordinator of student counselling and coach at the Centre for Teacher Education (CfTE) at the University of Cologne. Her role and motivation is to support and advise prospective and current students from the moment they decide to study to the moment they graduate with a master's degree.
Contact: kaj.militzer@uni-koeln.de

OLMOS-SORIA, Marina has been part of the University of Murcia team in *teff*. She works as a university lecturer at the department of developmental and educational psychology of this University. Her actual work is related to student and teacher well-being, development in the life cycle and prevention of hate crimes, especially in educational contexts.
Contact: marolmos@um.es

PALAVITSINIS, Nikos holds a PhD in Information Science and Quality of Metadata (Alcala University, Spain). Working in e-Learning since 2005, he specializes in education data management and Moodle development across multiple domains, including education, research, and environment. He manages user involvement and course management for Eummena projects.
Contact: palavitsinis@eummena.org

PAPARISTODEMOU, Efi is a teacher educator at the Cyprus Pedagogical Institute, holding a PhD and MA in Mathematics Education (Institute of Education-UCL, University of London), a BSc in Mathematics and Statistics and a BA in Education (University of Cyprus). She has worked as a teacher, trainer, textbook author, and assistant professor. Her projects focus on Mathematics Education, Statistics Education, Technology, STEAM education, and teacher professional learning.
Contact: paparistodemou.e@cyearn.pi.ac.cy

PIEPER, Greta, M.Ed. (Geography & Mathematics), is a student at the University of Cologne (Geography Department) and worked as a student assistant at the *teff* Urban Lab.
Contact: gpieper3@uni-koeln.de

PITZIOLI, Maria is a Greek teacher and Assistant Principal in secondary education schools in Cyprus. Her work focuses on the integration of migrant or refugee students in school and teaching of Greek as a second language. She worked as a Teacher Trainer in the Cyprus Pedagogical Institute with main topic teachers' professional learning.
Contact: mpitzioli@te.schools.ac.cy

RASA, Tapio, PhD, is a Postdoctoral researcher at the Faculty of Educational Sciences, University of Helsinki. His research is focused on the concepts of futures, technology, and education, including future-oriented science education and the philosophy of futures in education.
Contact: tapio.rasa@helsinki.fi

REVYAKINA, Elena is a teacher educator and researcher at the University College of Teacher Education Vienna (PHW), Austria, working on Erasmus+ projects related to EfS, critical eco-media literacy, and service-learning. Her research focuses on reflective practice, professional networks, and teacher learning. She is also engaged in DINALab, exploring intersections of digital media and EfS.
Contact: Elena.Revyakina@phwien.ac.at

RODRÍGUEZ-ENTRENA, Maria Jesús is an Associate Professor in the Department of Didactics and School Organization at the Faculty of Education, University of Murcia, Spain. She currently serves as the director of the Center for Training and Professional Development at the University of Murcia. Her research interests include at-risk students, teacher education, and educational leadership.
Contact: entrena@um.es

ROTHSTEIN, Björn, Prof., has worked at the Department of German Studies at Ruhr University Bochum since 2009 after completing his doctorate in theoretical linguistics (2006), his teacher training program (2008), and his habilitation (2009) in first language language didactics. His work focuses on Language Awareness from a comparative and interdisciplinary perspective.
Contact: bjoern.rothstein@rub.de

SCHAEVERBEKE, Robin is a senior lecturer and researcher at the Faculty of Architecture, KU Leuven (Ghent & Brussels). Trained as a drawing teacher, he studied pedagogies of architectural drawing for his PhD "Extended Drawing," exploring extension as a driver for transformation in practice. Since 2019, he has managed and designed the faculty's teacher program, preparing architects and spatial thinkers to become secondary school teachers.
Contact: robin.schaeverbeke@kuleuven.be

SCHEMANN, Fabian (M.Ed. Geography & Physics), is a PhD student in Environmental Sciences at the University of Cologne (Geography Department). His research focuses on the topic "Transformative Learning for Sustainable Futures – Bridging Formal and Informal Pathways of Environmental Stewardship and Global Citizenship."
Contact: fschema1@uni-koeln.de

SCHMEHL-POSTAÏ, Annette, Dr., holds a PhD in Linguistics and teaches French Language and Literature Didactics at Nantes Université (France), Institut National Supérieur du Professorat et de l'Éducation (INSPE). As associate professor, she works at the CREN laboratory (Centre de Recherche en Éducation de Nantes). Part of her work focuses on teaching and learning literary reading, particularly texts that address socially relevant issues.
Contact: Annette.Schmehl@univ-nantes.fr

SÖDERVIK, Ilona, PhD, works as a university lecturer in university pedagogy at the Center for University Studies and Teaching (HYPE) at the University of Helsinki. Her research focuses on strengthening sustainability competencies and developing adaptive expertise in learning and teaching of life sciences.
Contact: ilona.sodervik@helsinki.fi

SOEFFNER, Julia has been responsible for creating learning modules on digital competencies and acted as advisor on learning design and assessment methods for all digital learning modules created within *teff*. She currently works for *Pacemaker Initiative* of the non-profit organisation *Education Y* as consultant on school development, learning designer and community manager. Her main areas of interest include media literacy, educational equality, students' participation, and future-oriented teaching and learning.
Contact: julia.soeffner@pacemaker-initiative.de

SPRINGOB, Jan, Dr., is the Managing Director of *teff*, a secondary school teacher, and holds a PhD in English Linguistics. Since 2015, he has worked at the Center for Teacher Education at the University of Cologne, where he heads the team School Network & Internationalization. One of his main responsibilities is the establishment and development of an (international) cross-phase network of schools and universities.
Contact: jan.springob@uni-koeln.de

STAVROU, Christina is a head teacher at a Primary School in Cyprus. Previously, she worked as a teacher educator at the Cyprus Pedagogical Institute (Teachers' Training Sector) for 15 years, specializing in teachers' in-school professional learning (TPL) as a teacher and as a text-book writer. She holds a first degree in Education, an MA in IT in Education (Institute of Education-UCL, University of London) and a PhD (University of Cyprus).
Contact: stavrou.chr@cyearn.pi.ac.cy

STOLLE, Karla is a university assistant at the University of Music and Performing Arts Vienna, Austria where she coordinates the Erasmus+ co-funded project TEAM (Teacher Education Academy Music). Her research areas include international music pedagogy, language-sensitive music education, practice-oriented teaching, and curriculum studies.
Contact: stolle@mdw.ac.at

STRASER, Oliver, Dr., is a senior lecturer and researcher at the institute for mathematics education at the University of Education Freiburg and vice director of the International Centre for STEM Education (ICSE). His research interests include exploring the application of 3D printing technologies, potential of AI-based assessment systems in science education, and investigating the use of escape rooms in STEM subjects.
Contact: oliver.straser@ph-freiburg.de

SVENDSEN, Bodil is an associate professor at the Norwegian University of Science and Technology (NTNU). Her research centers on classroom practices, with particular emphasis on school development, teacher professional learning, formative assessment, science education, pedagogy and adapted learning.
Contact: bodil.svendsen@ntnu.no

TEICHMANN, Anna has worked on creating *teff* digital learning modules on digital competencies and acted as an advisor on learning design and assessment methods for other modules. She currently works for the *Pacemaker Initiative* of the non-profit organisation *Education Y,* focusing on organisational development, people development, and learning design. Her main areas of interest include further educational equality and future-oriented learning.

TSAGARI, Dina, PhD, is Professor in the Department of Primary and Secondary Teacher Education at Oslo Metropolitan University, Norway. Her research interests include language testing and assessment, materials design and evaluation, differentiated instruction, multilingualism, distance education, learning difficulties and inclusive education. She is the editor and author of numerous books, journal papers, and has managed numerous EU-funded and other research projects.
Contact: dina.tsagari@oslomet.no

VAN ALTEN, David C.D., Dr., is Assistant Professor at the Department of Education and Pedagogy of Utrecht University, the Netherlands. At the Graduate School of Teaching, he contributes to the secondary education teacher program including the course digital literacy. His research explores themes as digital literacy, digital citizenship, and responsible AI in education.
Contact: d.c.d.vanalten@uu.nl

VAN DER ENG, Karen is a teacher educator at Utrecht University and an English language and literature teacher in secondary education. Together with Koen Hoondert, she designed and taught the course 'Voorbij het Hokjesdenken.'
Contact: k.vandereng@uu.nl

VAN DER SCHAAF, Marieke, PhD, is an educational scientist and full professor in research and development of health professions education and director of the Utrecht Center for Research and Development in Health Professions Education at the University Medical Center Utrecht. Her research focus is on professional development, adaptive expertise, and feedback and assessment at the workplace.
Contact: m.f.vanderschaaf-5@umcutrecht.nl

VAN RIJSWIJK, Martine, PhD, is the director of the Graduate School of Teaching of Utrecht University and works as an associate professor at the department of Education of Utrecht University. Her research focuses on topics like teacher identity development, resilience, workplace learning, adaptive expertise and sense of belonging. She was a board member for *teff*.
Contact: m.m.vanrijswijk@uu.nl

VAN TARTWIJK, Jan, Prof. Dr., is a full professor of educational sciences at Utrecht University. In his research and teaching, he focuses on teachers' interpersonal behaviour in the classroom and how that behaviour is related to their relationships with their students. He is also interested in the development of expertise of teachers and other professionals and how this development can be stimulated. In addition to his teaching and research, Jan fulfils a number of internal and external roles related to his involvement in teacher education and teacher professional development.
Contact: j.vantartwijk@uu.nl

VANDERBEKE, Marie, Dr., has worked at the Professional School of Education at Ruhr University Bochum since 2017, having completed her doctorate in foreign language didactics. She focuses her work on internationalisation in teacher training, as well as coordinating the Centre of Educational Studies and the Graduate School of Educational Studies.
Contact: marie.vanderbeke@rub.de

VERHOEVEN, Monique, Dr., is an assistant professor and teacher trainer at Utrecht University (Educational Sciences and Graduate School of Teaching). Within the teacher training program, she teaches courses on pedagogy and diversity-sensitive teaching. In her research she focuses on themes such as meaningful learning, diversity in the classroom, and the support of adolescents' (learner) identity development in school.
Contact: m.verhoeven1@uu.nl

VICKUS, Finnja, M.Ed. (Geography & English) worked as a student assistant at the *teff* Urban Lab and is currently a trainee teacher in the city of Aachen.
Contact: finnjavickus@ymail.com

WIESMANN, Meggi currently works in the Digital Teaching team at the Centre for Teacher Education (CfTE) at the University of Cologne. A primary school teacher and specialist for creating digital learning materials, her main areas of interest include digital literacy in education and the development of accessible, future-oriented learning opportunities for teacher education.
Contact: mwiesman@uni-koeln.de

WIKTORIN, Dorothea, Dr., is a lecturer at the University of Cologne (Geography Department) and was project manager of the *teff* Urban Lab. Her research focus lies on geography education and urban geography.
Contact: d.wiktorin@uni-koeln.de

ZHANG, Xinlan works as a Doctoral Researcher at the Faculty of Educational Sciences, University of Helsinki. Her research focuses on contributing future-oriented teacher education by understanding pre-service and in-service teachers' futures consciousness through a multi-method approach.
Contact: xinlan.zhang@helsinki.fi