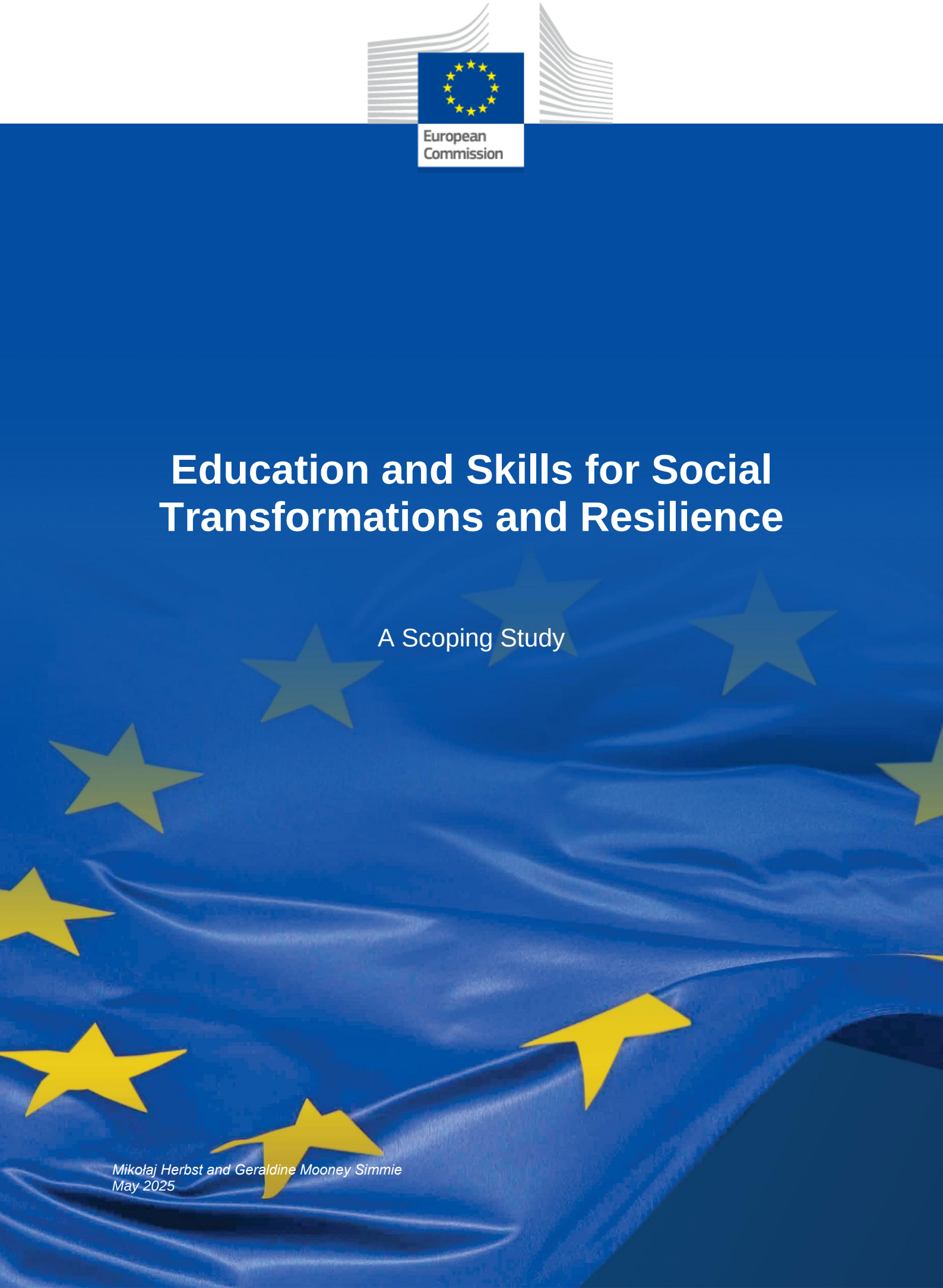

Education and Skills for Social Transformations and Resilience

A Scoping Study

Mikołaj Herbst and Geraldine Mooney Simmie
May 2025

EUROPEAN COMMISSION

Directorate-General for Employment, Social Affairs and Inclusion
Directorate F — Employment and Social Governance, Analysis
Unit F3 — Fair Green and Digital Transitions, Research

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Manuscript completed in May 2025

1st edition

Luxembourg: Publications Office of the European Union, 2025

PDF ISBN 978-92-68-31302-2 doi:10.2767/5319066 KE-01-25-201-EN-N

Contents

1. Introduction

This is a joint report by Mikołaj Herbst (first part) and Geraldine Mooney Simmie (second part) on different perspectives to fostering education and skills in light of major social transformations. The study has been prepared in the context of the development of the Social Transformations and Resilience (STR) Partnership under Horizon Europe. Expected to be launched in 2027, this Partnership aims to create a transformative research and innovation programme in the social sciences and humanities to strengthen resilience, fairness, inclusiveness, and social cohesion in response to major societal challenges, like climate change, technological disruptions, demographic shifts and unexpected shocks. One of the Partnership's key impact areas is education and skills development.

More specifically, this report is a review of recent research in the broad field of education and skills, placed in the context of the four drivers of social transformations, which are central to the STR Partnership: the green and digital transition, demographic change and unexpected shocks.

There is no doubt that today decision makers need to rethink the meaning of education and skills in relation to deliberative human change and development, and the changing nature of teachers' knowledge base as an advanced professional practice in a fast changing Europe that seeks a future of peace, prosperity and a polity of care and justice for the greater good of pluralist democratic societies, the economy and the planet.

Working within an understanding that the multidisciplinary and transdisciplinary field of education and skills holds in play multiple worldviews. The authors examine this social scientific problem using worldviews, and also disciplinary approaches that frame the key question differently. They advocate for the potential benefit of this approach of 'staying with the trouble' (Haraway, 2018), given that the best educational research can ever hope for is to provide a partial view of a highly complex problem. This partial approach has great significance for a new futures thinking and action in the policy space in Europe wanting to have a successful green and digital transition as it supports human flourishing, to become agile, flexible, cooperative, caring, competitive and socially and environmentally just.

Mikolaj Herbst examines the problem from the perspective of mainstream research in education and skills in contemporary times that views learning and sustainability as an empirical problem needing stronger, tighter and more effective scientific approaches and new modes of effective evaluation.

Herbst begins his analysis with a systematic review of scientific articles on education published over the past 10 years, focusing on key issues of the STR Partnership: digital transformation, climate change, and external shocks affecting living conditions and human mobility. In the second part of the analysis, Mikołaj Herbst examines the extent to which and in what form topics relevant to the STR Partnership are addressed in research projects conducted under the Horizon Europe programme. He utilizes the EuroSciVoc classification, which is used to categorize projects in the CORDIS database.

In contrast, Geraldine Mooney Simmie draws her scoping literature review from the philosophy of education and skills, in particular from critical and feminist perspectives. Perspectives that today are largely positioned on the margins, especially given the dominance of the sciences in this century and their reconstruction of education and skills as an evidence-based social science discipline. Bringing the arts and the humanities into the frame of education and skills inspires practices of critical reflexivity and creativity, reimagining education as a perpetually open question for new ways of thinking, being and acting in a shared world and in a futuristic Europe of care, sustainability and justice.

Differently from the contribution on Mikolaj Herbst, which strongly emphasizes functional aspects of educational policies, Mooney Simmie's scoping literature review frames education and skills as a social scientific problem in humanising ways that are emancipatory and problem-posing for a learning journey that is concerned both with individual consciousness, and the collective consciousness of a caring and just society, economy and environment in a futuristic Europe. Bazzul (2022) asserts that education is an intense ethical calling that is 'perpetually caught between the vital tasks of conserving the world and changing it' (p. 4) and 'bears responsibility for doing both' (p.4). The review is therefore underpinned by this open philosophical question of how education and skills can be emancipatory in the context of a turbulent political context in a democratic Europe and in a future that is about having the wisdom and the resilience (a combination of personal and public values, knowledge and skills) for dealing with future unforeseen shocks in humanising ways that demonstrate competence to be active and responsible citizens for the greater good of society and the environment. The social scientific problem under study is a cultural problem that strongly relies on the arts and humanities to cultivate a critical reflexivity and creativity in education and skills in order to inspires young people to know, to be, to act, to dream and to live well with others in pluralist democracies, thriving economies and for an equitable and sustainable green and digital transition in a futuristic Europe.

2. Recent Educational Research in the Context of STR Partnership - Mikołaj Herbst

This study attempts to answer several research questions, namely:

- How the recent research on education, both funded by the EU, and independent of the EC's support, address the main threads as stressed by the STR Partnership?
- What are the main conclusions from these studies?
- What are the subjects and issues largely omitted or not studied with enough intensity in the current research?

The answer to the first two questions is based on an in-depth review of publications in scientific journals and other scholarly publications, as well as on the analysis of projects carried out under the Horizon Europe framework programme, which operates from 2021 to 2027.

When it comes to publications, the focus is on the last ten years (2015-2024). Queries were conducted using journal databases and tools designed for searching articles on specific topics. In particular, searches were performed in the Scopus publication database, materials indexed in Google Scholar, and through the research tool Elicit. A variety of search terms were used. Examples include:

- Green and Digital Transition in Education
- Climate Change in Education/Didactics
- Integration of Artificial Intelligence in Education Systems
- External Shocks and School Education
- Impact of Pandemic on Education in Europe
- War and Immigration Effect on Education
- Immigration and Education Dynamics in Europe
- Strategies for Migrant Integration in Education

The attempt to answer the third question, on the other hand, is based on the research experience and expert knowledge of the report's author.

2.1. Relevant Topics in the Research Literature on Education

2.1.1. Digital Transformation

There are no doubts that digital technologies are transforming education, offering new opportunities for inclusive and equitable learning (Haleem et al., 2022; Iivari

et al., 2020). The COVID-19 pandemic accelerated this transformation, forcing rapid adoption of online learning (García-Morales et al., 2021; Williamson et al., 2020). However, this shift has highlighted digital divides and the need for schools to better prepare students for a technology-rich future (Colmenero et al., 2015; Iivari et al., 2020). Emerging trends in educational technology include changes in learning objectives, contexts, processes, and governance (Wastiau, 2013; Burbules et al., 2020). The digital transition also contributes to environmental, economic, and social sustainability through applications like smart urban development and the circular economy (Rosário & Dias, 2022).
Higher education institutions are moving towards smart education, integrating e-learning with advanced technologies (Parusheva et al., 2023). Research on sustainable management of digital transformation in higher education has grown exponentially, with key focus areas including sustainability, innovation, and environmental management (Abad-Segura et al., 2020).

2.1.2. Artificial Intelligence

Recent research highlights the growing integration of Artificial Intelligence (AI) in K-12 education, focusing on its potential to enhance learning experiences and prepare students for an AI-driven future. 2023). AI applications in schools range from predictive analytics and intelligent tutoring systems to curriculum design and personalized learning (Bablu Karan & Angadi, 2023; Florence Martin et al., 2023; Lijia Chen et al., 2020). Studies emphasize the importance of AI literacy and prompt engineering skills for students and educators (D. Ng et al., 2023; Yoshija Walter, 2024).

While AI shows promise in improving administrative tasks, instruction quality, and learning outcomes (Mostafa Zafari et al., 2022; S. Ahmad et al., 2021), challenges remain in terms of implementation, ethical considerations, and equity (Florence Martin et al., 2023). Practical experiments demonstrate the potential of generative AI tools like ChatGPT in creating personalized learning materials and enhancing student engagement (Jussi S. Jauhiainen & Agustín Garagorry Guerra, 2023). Overall, the integration of AI in education requires careful consideration of pedagogical approaches, teacher training, and curriculum adaptation (Yoshija Walter, 2024).

In European context, education systems are making strides towards integrating AI, but are still at the beginning of the process. Tertiary education institutions appear to be better prepared and more willing to deal with the AI challenge compared to schools at lower tiers. Universities are adapting curricula to include AI literacy, prompt engineering, and critical thinking skills (Walter, 2024). However, there are concerns about ethical implications and the need to balance benefits with risks to fundamental rights (Berendt et al., 2020). AI in education offers personalized learning experiences and support for diverse educational

needs (Walter, 2024; Chen et al., 2020), but also poses risks of cognitive decline, especially with the increasing use of generative AI (Kosmyna et al., 2025). It therefore requires significant educator training and curriculum adaptation (Abulibdeh et al., 2024). The EU is advancing towards responsible AI development through guidelines and legislation (Andrea Aler Tubella et al., 2023), while researchers emphasize the importance of embedding ethical considerations in AI tool development and deployment (Berendt et al., 2020). Despite progress, there is still a need for more comprehensive integration of AI in education systems, particularly in areas such as ethics and sustainable development (Bozkurt et al., 2021; Abulibdeh et al., 2024).

2.1.3. Impact of External Shocks on the Education Sector

Recent research on education shocks in Europe has focused primarily on the COVID-19 pandemic and its impacts. Studies have examined the sudden shift to distance learning (Bansak & Starr, 2021), learning losses and widening educational inequalities (Blaskó et al., 2022), and the emergency digitalization of education systems (Cone et al., 2021). The pandemic has also influenced public debates about the EU's role in education (Rauh Pařízek, 2024) and prompted reflection on the future of European education policy (Grek &Landri, 2021). Other researched shocks include health-related events, with studies exploring how physical health shocks affect cognitive functioning in older adults (Schiele &Schmitz, 2022) and the role of education in mediating mental health responses to physical health shocks (Di Novi et al., 2021).

Additionally, research has investigated the degree to which education systems are prepared for the shocks caused by climate change. One example is the impact of heatwaves and system shocks on educational buildings' thermal resilience (Sengupta et al., 2023). However, as noticed by Groppo &Krrhnert (2015), extreme weather events negatively impact educational opportunities not only through school closures and disruption in schools' functioning, but mostly through reductions in household income.

Finally, recent research on education in Europe has highlighted another significant challenge: the impact of immigration on schooling systems. While much of the existing literature focuses on immigration from African and Asian countries to Western Europe (Osler, 2020; Creighton et al., 2022), newer studies are examining the large-scale influx of students from Ukraine. This migration has been driven by the ongoing war with Russia, which has forced millions of families to relocate (Herbst & Sitek, 2023).

Covid-19

The COVID-19 pandemic significantly disrupted education across Europe, forcing a rapid shift to online learning (Adrián Zancajo et al., 2022; Lucas Cone et al., 2021). This transition highlighted and exacerbated existing educational inequalities, particularly concerning the access to digital resources and parental

support (Kostas Dimopoulos et al., 2021). The crisis accelerated the digitalization of education systems and consolidated the involvement of various actors in educational infrastructures (Lucas Cone et al., 2021).

While the pandemic presented challenges, it also offered opportunities for reflection and reform in education policy and research (Sotiria Grek & Landri, 2021). The response varied among European countries, influenced by their educational systems and specific challenges. For example, approaches to school closures and re-openings varied significantly. Decisions on whether to close or keep schools open were shaped by two competing narratives: viewing schools either as sites of infection risk or as essential spaces for social support and care (Lindblad et al., 2021; Toshkov et al., 2020). Similar divergence was evident at the pre-school level, where policy responses ranged from lenient to strict and from universal to targeted measures (Blum & Dobrotić, 2020). Regarding digitalization, while the shift to remote learning was nearly universal, the long-term focus and intensity of related policy measures differed widely. One contributing factor to this divergence was the varying levels of digital readiness across countries prior to the pandemic (Zancajo et al., 2022).

More generally, countries differed in how scientific evidence was used to inform and justify decisions following the spread of the pandemic. Research shows that England prioritized meeting basic needs with a pragmatic approach, while Germany had a principled debate about unequal impacts, and Italy highlighted existing difficulties with limited political response (Kelly et al., 2021).

It is important to stress, that long-term effects of COVID-19 may include potential loss of trust in educational institutions (Inka Bormann et al., 2021) and the need for more resilient and flexible education systems (Aras Bozkurt et al., 2022; N. Reuge et al., 2021).

War and immigration

Recent research on immigration to Europe highlights the complex interplay between education systems and immigrant integration. Studies show that while immigrant youth often have high educational aspirations, they face institutional obstacles in unfamiliar educational systems (Berggren et al., 2020). Education policies emphasizing language acquisition and national values may fail to address everyday injustices and racism (Osler, 2020). The educational mobility of immigrants can moderate antipathy towards immigration in certain contexts (Creighton et al., 2022). However, choice-driven education systems may lead to skills gaps between immigrants and natives with similar qualifications (Heisig & Schaeffer, 2020). Factors such as engagement, language support, and parental involvement can improve academic resilience among immigrant students (Martin et al., 2022; Gabrielli & Impicciatore, 2021). Integration policies promoting equal rights may contribute to higher education and labour force participation among immigrant women (Autiero & Nese, 2024). These findings underscore the need for multifaceted approaches to immigrant integration in European education systems.

The war in Ukraine has had profound impacts on education across Europe. In Ukraine, the conflict has devastated higher education infrastructure and forced many students and faculty to flee (Lugovyi et al., 2023). This has led to significant losses in human capital and long-term productivity (Égert & de la Maisonneuve, 2023). Neighboring countries, particularly Poland, have worked to integrate Ukrainian refugee students into their education systems, facing challenges related to resources and distribution (Herbst & Sitek, 2023). Despite these difficulties, Ukrainian education has shown resilience, even though it has been severely disrupted, with schools, faculty, and students under great strain (Kremen, 2023; Mayer et al., 2023). As the conflict continues, there is a need for sustainable integration strategies and international cooperation to address the ongoing challenges in education (Rataj & Berezovska, 2023; Herbst & Hrynevych, 2023).

Climate change

Climate change significantly impacts education, particularly affecting vulnerable populations like children (Leal Filho et al., 2023). Education plays a crucial role in climate change adaptation through three pathways: education infrastructure, general education, and adaptation learning support (Feinstein & Mach, 2020). While climate change education (CCE) is gaining importance, research shows that students' understanding of this issue is often limited and influenced by media (Rousell & Cutter-Mackenzie-Knowles, 2020). There's a growing need for participatory, interdisciplinary approaches to CCE (Nepraš et al., 2022). Universities are increasingly incorporating climate change into their curricula and research (Leal Filho et al., 2021). Innovative educational resources, such as digital tools and games, can enhance adaptive capacity for climate change planning (Hügel & Davies, 2024). However, global monitoring of CCE progress remains inadequate, highlighting the need for improved reporting and research-policy collaboration (McKenzie, 2021).

2.1.4. Vocational Education and Training (VET)

The effectiveness of VET systems varies across countries due to differences in economic coordination, partisan power (Busemeyer & Schlicht-Schmälzle, 2014), and institutional characteristics (Markowitsch & Hefler, 2018). But in all EU countries VET faces significant challenges in addressing digital and green transformations, as well as evolving labour markets. The digital era demands broader theoretical knowledge, higher technical skills, and interdisciplinary understanding from workers. VET systems must adapt to meet these needs, with strategies ranging from mainstreaming specific elements into school curricula to offering specific short courses (Clarke et al., 2020). The green transition requires VET to develop new competencies and balance technological solutions with

human-centric approaches. Some authors call therefore for radical transformative approaches to VET that address social justice and power dynamics, not just technical skills. (Persson Thunqvist et al., 2023). Also, entrepreneurship education is proposed as a tool for developing transformation competencies (Mets et al., 2021). From a broader perspective, challenges in VET include balancing short-term benefits with long-term career prospects (Roosmaa et al., 2019) and addressing social perceptions of non-academic labor (Gessler et al., 2021).

2.1.5. Lifelong learning

Recent research on lifelong learning in Europe reveals complex patterns of participation and policy implementation. While adult learning is seen as crucial for employment and growth (Beblavý et al., 2014), participation rates vary significantly across countries and demographic groups (Ingham et al., 2017; Roosmaa & Saar, 2017). The highest participation rates (covering both formal and informal education) were observed in Sweden (70%), the Netherlands (62%), Germany (57%), and Hungary (57%). Conversely, the lowest rates were reported in Greece (15%), Bulgaria (19%), Poland (22%), and Romania (23%). In terms of policy arrangements, Nordic countries focus on non-formal education, while central European countries emphasize formal attainment (Beblavý et al., 2014). Barriers to participation include institutional, situational, and dispositional factors, with post-socialist and Southern European countries facing more challenges (Roosmaa & Saar, 2017). Retirement policies influence learning participation, particularly for women and highly educated men (Melesk, 2020). Despite EU efforts to promote lifelong learning (Holford et al., 2014), progress in participation rates has been limited (Federighi et al., 2024). Research suggests a need for more targeted policies addressing equity issues (Head et al., 2015) and considering the impact on vulnerable young adults' life course transitions (Parreira do Amaral & Zelinka, 2019).

2.2. Horizon Europe (HE) Projects in the Context of STR Partnership Goals

Horizon Europe is the current European Union Framework Programme for Research and Innovation, aimed at boosting scientific research, technological development, and innovation. It operates in 2021-2027 timeframe, with a budget of EUR 95.5 billion. Horizon Europe's activities are organized under three Pillars (1) Excellent Science, 2) Global Challenges & European Industrial Competitiveness; 3) Innovative Europe). While Pillar I supports bottom-up

research through the European Research Council (ERC) and the Marie Skłodowska-Curie Actions (MSCA), Pillar II supports calls for proposals under six thematic areas (‘Clusters’). It is under Cluster 2 ‘Culture, Creativity and Inclusive Society’ that the STR Partnership will be launched, and will be the first European Partnership dedicated to the social sciences and humanities. Meanwhile, as current practice shows, the largest portion of funding has been allocated under Pillar II, Cluster 5: ‘Climate, Energy, and Mobility’. The total maximum EU commitment to approved projects in this area exceeds EUR 250 million (see Figure 1).

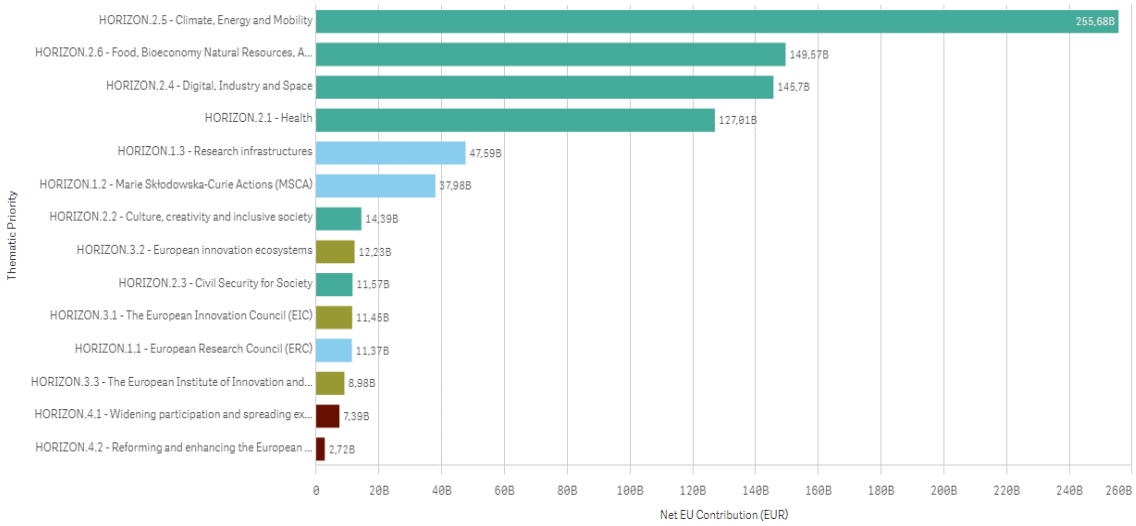

Figure 1. Net EU contribution (EUR) in Horizon Europe projects by thematic priority

2.2.1. What Does EuroSciVoc Tell Us About Education and Skills Research within Horizon Europe

The thematic scope of projects conducted under the Horizon Europe program can be explored using semantic analysis facilitated by the EuroSciVoc classification. EuroSciVoc is a multilingual taxonomy that organizes all major fields of science discovered from CORDIS content through a semi-automatic process based on natural language processing (NLP) techniques.
For the purposes of this study, the set of analyzed projects was narrowed. The focus was placed specifically on social sciences and humanities projects where the term "education" appeared in the project titles. The projects were then categorized by the most frequently occurring thematic areas, and the results are presented using a word cloud.

An analysis of this subset revealed that in research initiatives directly referencing education, the key focus remains on didactics and the connections between education and the labor market (see Figure 2). This suggests a relatively

conservative perspective on educational issues and indicates a limited role for global challenges that form the core of the STR Partnership in such studies.

Figure 2. Word cloud based on Euro_Sci_Voc categories assigned to Horizon Europe projects belonging to Social Science or Humanites and with “education” in project title. Visualized using wordart.com (N=152)[1]

Since the requirement to include the terms “education” or “skills” in the project title is quite restrictive, a slightly different approach was applied in the further analysis. It focuses on projects in the fields of social sciences and humanities that include terms such as “learn,” “teach,” and “school” in the description of their objectives[2]. The selection of these terms is not random. The first one relates to topics that, according to project authors, decision makers should better understand. The second term directly refers to teaching as an organized process, which is typically assumed to take place in a school. The third term explicitly evokes the school as the environment to which the project relates. As in the case of Figure 2, the mapped words are EurSciVoc categories assigned to the projects.

Among all projects that refer to “learning” in their objectives, the most frequently occurring EurSciVoc category turns out to be “sustainability” (see Figure 3). The awareness of resource depletion and the necessity of adapting to the needs of future generations is therefore deeply embedded among Horizon project consortia. The next two most frequently appearing categories —“governance” and “economy”— indicate two key contexts in which sustainability should be understood and acknowledged.

[1] N refers to the number of different Eur_Sci_Voc categories assigned to selected projects

[2] Projects within the fields of social science and humanities were identified by looking up the *EurSciVocPath* field in the Eur_Sci_Voc database. The terms of interest where then searched within the *project_objectives* field in the same database.

Figure 3. Word cloud based on Euro_Sci_Voc categories assigned to Horizon Europe projects belonging to Social Science or Humanites and including “learn” in description of project’s objectives. Visualized using wordart.com (N=1001)

However, the emphasis of the project objectives shifts when, instead of using the term “learn,” the authors select projects based on the term “teach,” which links the project to the formal education environment (see Figure 4).

Figure 4. Word cloud based on EurSciVoc categories assigned to Horizon Europe projects belonging to Social Science or Humanites and including “teach” in description of project’s objectives. Visualized using wordart.com (N=259)[3]

Apart from the term “didactics,” which was intentionally omitted from the analysis, the most frequently used category is “history.” Project objectives are also often related to employment and social inequalities, which are traditional contexts in the debate on education.

The next step in the analysis focuses on projects that include the term “school” in their objective descriptions. The four most frequently used EurSciVoc categories within this group are “History,” “Human,” “Social,” and “Inequality” (see Figure 5). This characterizes educational projects as being strongly oriented toward drawing lessons from the past and emphasizing the social aspect of education.

Figure 5. Word cloud based on Euro_Sci_Voc categories assigned to Horizon Europe projects belonging to Social Science or Humanites and including “school” in description of project’s objectives. Visualized using wordart.com (N=306)[4]

The Cordis database does not allow for a quantitative analysis of more specific education-related terms, such as “vocational training” or “informal learning,” as they appear too rarely in project objective descriptions. Specifically, the term “vocational” appears only 18 times across the entire project database, while “informal” in combination with “learning” appears only 15 times. This may indicate

[3] The term „didactics” was excluded from the mapped categories, as is naturally associated with teaching and it outnumbered other categories.

[4] The term „didactics” was excluded from the mapped categories, as is naturally associated with school and it outnumbered other categories.

that projects of this profile are relatively rarely funded under the Horizon Europe programme.

2.2.2. Examples of Relevant HE Projects

Title: **Hopeful and resilience perspective in climate change education to inspire (promote) action competence**. ID: 101160082

Link: https://cordis.europa.eu/project/id/101160082

The HARP (Hopeful And Resilience Perspective) project, a collaborative endeavor involving Masaryk University, University of Utrecht, and University of Vienna, targets the gaps and inconsistencies in Climate Change Education (CCE) across Europe. HARP is designed to foster actionable, inclusive, and emotionally-engaging CCE strategies to promote climate change mitigation. HARP identifies the uneven state of CCE in Europe, often fragmented and insufficiently integrated into national curricula. Its objective is to transform CCE into a primary driver for climate action, making CCE more holistic by incorporating various disciplinary perspectives. The initiative targets two primary objectives. Firstly, enhancing the capacities of partner institutions for Climate Change Education Research (CCER), emphasizing strengthening research design and improving the overall CCER quality across Europe. Secondly, the formation of a European CCE and CCER network to bolster collaboration and share findings, complemented by national and international advisory boards. In sum, HARP's intent is to uplift the quality, breadth, and influence of CCE, enabling a community of learners, educators, and researchers equipped to significantly contribute to climate change mitigation.

Title: Global Strategy for Skills, Migration, and Development. ID: 101132377

Link: https://cordis.europa.eu/project/id/101132377

GS4S seeks to better understand global skills shortages in selected sectors (Digital, Care and Construction) and strengthens evidence-based policies through new evidence on various overlooked global mobility schemes. The project focuses on skilled (migrant) workers' experiences with skilling, upskilling and reskilling in EU and non-EU regional contexts. Using mixed-methods research, the interdisciplinary consortium (with partners in Austria, Belgium, Estonia, Italy, Netherlands, Switzerland, Egypt, Nigeria, and Bangladesh) aims to provide exploitable datasets and practical tools for policy makers, businesses, and educational institutions in the EU and non-EU countries towards improved matching of skills to address labour market needs. In doing so, the project aims to contribute to a socially sustainable (well-being oriented) global strategy for skills, migration and development.

Title: Understanding the Consequences of Major Health Crises for Education: Learning from the COVID-19 Pandemic (LEARN). ID: 101163266

Link: https://cordis.europa.eu/project/id/101163266

Public debate lacks a systematic understanding of how major disruptive events affect children's educational development, largely because such events tend to also disrupt the collection of high-quality data on children's education. The COVID-19 pandemic offers a unique opportunity to advance the understanding of the consequences of major health crises. LEARN leverages this opportunity to reveal the principal pathways through which the pandemic has affected the educational development of children in different world regions, as well as the key factors that reduce or exacerbate its adverse consequences. LEARN is aimed at generating and applying high-quality, cross-national data and advanced quantitative and meta-analytical techniques to achieve five core objectives:(1) Trace children's recovery of COVID-19 learning deficits using a living meta-dataset and online tracker; (2) Assess COVID-19 effects on children's early-life trajectories; (3) Map the processes through which the pandemic affected children's educational development; (4) Reveal the factors that reduce or exacerbate COVID-19 effects; (5) Identify the most effective remedial education interventions to promote children's learning recovery.

Title: Co-designing human centric pathways for future skills in manufacturing through augmented, empowered, inclusive, and symbiotic complementarities between AI, automation and human task. ID: 101177783

Link: https://cordis.europa.eu/project/id/101177783

The modern manufacturing landscape is undergoing a transformative twin transition, integrating green and digital technologies to bolster value chain resilience and explore re-shoring options. Amidst this paradigm shift, concerns about job displacement by machines, particularly through the rise of Artificial Intelligence (AI) and Machine Learning (ML), have become more pronounced. This proposal delves into the challenges posed by the pursuit of excellence in the Industry 5.0 framework, focusing on the potential impact of digital technologies on job nature and the ensuing need for human-technology complementarity. The potential for AI to exacerbate social disparities and inequalities, especially for vulnerable groups, is also a significant concern. Additionally, the manufacturing sector faces labor shortages, impacting innovation capacity and economic competitiveness. The mission of SKillAIbility is to address these challenges, emphasizing the need for a human-centric approach to assess digital technologies and enhance workers' employability. The proposal also outlines the short, medium, and long-term contributions of SKillAIbility towards a resilient,

inclusive, digital transition in the manufacturing industry. This initiative provides tools and methodologies to understand and respond to the impacts of emerging digital technology advancements on human tasks, skills, training, and policymaking. SKillAIbility's holistic impact spans various societal, industrial, academic, and regulatory dimensions, affecting citizens, people with disabilities, workers, trade unions, industry players, research institutions, and governmental bodies. Through upskilling and reskilling initiatives, SKillAIbility aims to empower citizens and workers, mitigate the risk of task automatization, and increase employability within the advanced manufacturing sector.

2.3. Thoughts on the Existing Evidence and Directions of Future Research in the Field of Education

2.3.1. Digital Transformation and the Development of Artificial Intelligence

Digital transformation is perceived dichotomously by educational researchers – on one hand, as a new factor driving development and a source of research tools, and on the other, as a threat and an ethical challenge. Notably, this division largely aligns with the distinction between research on science and higher education and studies focused on general education for children and youth.

In the realm of science and academic education, new technologies, particularly tools utilizing so-called artificial intelligence, are viewed both as an opportunity for development and as a challenge that necessitates changes to established habits and practices. However, research on school education appears to insufficiently address the changes brought about by the development of artificial intelligence.

There seems to be a growing need for more studies on how digital transformation will reshape the entire education model – from the foundations of curricula, the impact on students, to the preparation of teachers for the profession – rather than focusing solely on the immediate challenges associated with new technologies.

2.3.2. The Impact of External Shocks on Education

In recent years, Europe has experienced various shocks that have significantly affected its social and economic life. Research in the social sciences and humanities often highlights two primary themes: migration and the COVID-19 pandemic. Less frequently, however, references are made to climate change. This pattern also applies to studies and publications related to education.

Regarding the relationship between migration and education, most research focuses on the influx of migrants to Western Europe. On the one hand, Western countries, long-time migration destinations for populations from former colonies, are increasingly struggling with the integration of second and third generations of migrants. On the other hand, Europe, particularly its southern regions, is facing mass migration caused by wars and climate change in Africa and Asia. Questions arise about how education can support the integration of people from different cultures and counteract social inequalities stemming from immigration. Concerns exist that current education models—both in organizational structures and curriculum content—may exacerbate disparities rather than mitigate them.

There seems to be a need to view migration processes as a source of inspiration for transforming education systems and revising educational goals to leverage the potential of multicultural schools. Furthermore, despite their shared membership in the European Union, European countries differ significantly in mechanisms of selection, specialization in education, and evaluation of educational achievements. These areas warrant deeper reflection in the context of migration to Europe.

A new phenomenon is the mass migration from Ukraine to Europe following Russia's invasion of Ukraine in 2022. Unlike previously discussed migration sources, this process particularly affects Ukraine's immediate neighbours, especially Poland. Early publications and studies on this topic primarily address the scale of the phenomenon and organizational responses to the crisis, including in education systems. There seems to be a need for a systematic review of lessons learned from "old" and "new" migration in Europe and reflection on how these experiences can improve integration processes, mitigate conflicts, and ensure harmonious coexistence.

So far, the issue of Ukrainian migration is underrepresented in ongoing Horizon Europe projects (only six directly address Ukraine). However, this situation is expected to change.

Nevertheless, the most frequently discussed example of an external shock and its impact on education is undoubtedly the COVID-19 pandemic. Research generally focuses on the destructive effects of the pandemic on school education and the risk of increased social inequalities due to the weakened compensatory role of schools. However, there seems to be a lack of in-depth reflection on the lasting changes brought about by the pandemic in teaching methods and the need to adapt to these changes, as seen in business or, to a lesser extent, higher education.

2.3.3. Climate Change

The impact of climate change on education remains a relatively underexplored topic in Europe, except when considered in the context of societal changes

caused by the climate crisis (e.g., migration). While climate and its changes are subjects of research within HORIZON Europe, the educational context is not strongly represented in these studies.

Typically, climate-related issues are examined in terms of curriculum content and methods of communication. However, there is an urgent need for research into the organization of education in the era of climate change. Greater synergy is required around the topics of shared interest in this field.

Climate change already affects the everyday functioning of the education sector in Europe. In France, Greece, and Spain, heatwaves have led to shortened school days and adaptations such as installing air conditioning in schools. These experiences, along with lessons from regions at the forefront of the climate crisis, can teach Europe a great deal about the challenges it will face in the near future.

For instance, hurricanes like Katrina and Harvey in the United States have destroyed school buildings, displaced students, and forced extended closures. In the Philippines, frequent typhoons result in school closures and damage to infrastructure, disrupting education continuity. In 2022, flooding in Pakistan submerged thousands of schools, impacting millions of children and interrupting education for months.

Rising temperatures make classrooms uncomfortable or unsafe for learning, particularly in schools that are poorly ventilated or lack air conditioning. For example, in India, extreme heat has forced schools to adjust schedules, reduce class hours, or close during peak summer months. Even when schools remain open, high temperatures in classrooms without proper cooling infrastructure impair student concentration and performance.

Another adverse effect of climate change is the exacerbation of air pollution, which in some areas negatively impacts student health and restricts outdoor activities. In China and India, severe air pollution often leads to temporary school closures and the cancellation of outdoor programs. Similarly, in the United States (California), wildfires contribute to hazardous air quality, leading to school closures or "smoke days."

Water scarcity poses yet another challenge to the functioning of education, particularly in African countries such as Kenya, Ethiopia, and South Africa. A lack of water for drinking, sanitation, and hygiene affects student attendance and health.

Finally, one global effect of climate change is its psychological impact. Students face increased stress and anxiety due to climate-induced disruptions. In many locations, students report heightened levels of eco-anxiety and trauma. Children exposed to disasters often experience long-term emotional and cognitive challenges.

Future changes in education models could result from the combined influence of climate change, other external shocks, and the digital transformation of societies. This calls for a more integrated approach to understanding and addressing the evolving demands on educational systems in response to these interconnected challenges.

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3. How Education and Skills can contribute to an Equitable and Sustainable Green and Digital Transition in Futures Thinking and Acting in Europe - Geraldine Mooney Simmie

> *Education always involves a risk…the risk is there, because, as WB Yeats has put it, education is not about filling a bucket but about lighting a fire. The risk is there because education is not an interaction between robots but an encounter between human beings…Yes, we do educate because we want results and because we want our students to learn and to achieve. But that does not mean an educational technology, that is, a situation in which there is a perfect match between 'input' and 'output', is either possible or desirable. And the reason for this lies in the simple fact that if we take the risk out of education, there is a real chance that we take out education altogether* (Biesta, 2013, p.1).

The quote above from the philosopher of education, Gert Biesta (2013) in relation to what he calls the 'beautiful risk of education' is a timely reminder that any scoping literature review of Education & Skills in a futuristic Europe needs to hold in play the multiple and contradictory purposes of education so as to ensure it doesn't fall into a reductionist space of empiricism and standardisation. Education & Skills is always caught between conserving the world and changing it, and bears the ethical responsibility for doing both at the same time (Bazzul, 2022).

There clearly needs to be a fresh rethink and action in relation to the contribution of the social sciences and humanities (e.g. foundational disciplines, the arts and humanities, deliberative traditions) that view education as 'an intense ethical calling' (Bazzul, 2022), for what is nowadays understood as a discipline and an advanced professional practice (Barrett & Hordern, 2023; Hordern, 2022; Hordern, Muller & Deng, 2021).

This is especially pertinent when the question of how to achieve an equitable and sustainable green and digital transition through Education & Skills in a future Europe, the key question at the heart of this scoping literature review, can readily become narrowly framed as a risk-averse technical and instrumental problem of 'what works' rather than a more expansive cultural problem for a humanising view of education and the necessary dialogue between scientific knowledge and the ethical, political and ecological (Burnard et al., 2022; Colucci-Gray, 2014).

This concern about reducing Education & Skills to the instrumental is embedded in the theorizing of many of the great educational theorists and philosophers throughout the last century. The imperative for educators, researchers and teachers to actively engage with the philosophy of education today can be challenging given the diminution in the value of the arts and humanities, especially since the start of this century. The Editor of the European Commission's newsletter, entitled Research*eu explains the importance of

philosophical perspectives and values and their distinctive difference from scientific questions of knowledge: 'We rely on science to advance our technological capabilities and help us to understand the universe better, and science is indeed going to be vital in our struggle against major modern-day challenges such as, climate change but science can't definitively provide the answers on what makes a good life or what makes a life worth living. It can tell us how our bodies work but it can't tell us what it truly means to be a human being. This is philosophy's turf' (p.2).

This open philosophical question of what makes a good life in associated living with others and with the environment, at any one moment in time has always held a central place in the field of education (Bazzul, 2022). This is especially the case for educators from the arts and humanities who view education as a relationship of learning between the teacher and student and the ethical heart-work this entails. The philosopher Martin Buber (1923/2023) presented a philosophy of relationship which has significance for Education & Skills. Buber asserted that all relationships, and especially educative relationships consist of two inseparable aspects, a functional I-IT aspect (e.g. needing results) and an I-Thou aspect that is always immeasurable and upstream of the functional. For example, the concept of *Bildung,* practiced for hundreds of years in northern Europe, understood education as holistic and more than the functional and the sum of the parts. The argument goes that the relationship of learning between the teacher and student needs the I-Thou aspect, recognising the human as a subject, in order to secure the immeasurable values of trust, care, solidarity, and wellbeing. Young people need to experience a felt sense of community, and a collective wellbeing and resilience for a good life in associated living with others and the environment. Sjöström & Eilks (2021) theorise that scientific literacy today needs to be framed using this critical reflexive notion, key principles underpinning an ethos of care and justice for the greater good of society, the economy and the environment.

Philosophers of education today are grappling with new questions of what it means to nurture different and more enabling ways of being, becoming and acting in the world today. Positioning education as a transdisciplinary field allows 'disciplines like sociology, theology, biology, and the visual arts all have their say' (Bazzul, 2022, p.6). It suggests that Education & Skills are closer to cultural studies than to psychology. Giroux (2024) asserts that educators always act as cultural critics and public intellectuals, who grapple with ethics, critique, wisdom, cultural context, knowledge and complexity. This is indeed the case if Education & Skills is to hold in play its deep ethical and political responsibility toward assuring the greater good of the commons, and a suitable vison for an equitable, caring and just democracy. A broad and deep democracy that can demonstrate capacity to change as the need arises and always in the direction of equality, care, agency, justice and sustainability for all (Edling & Mooney Simmie, 2020; Mooney Simmie & Edling, 2019).

While there are several international reports today in relation to partnerships in Education & Skills for a new type of sustainability and social justice, however, there are few that challenge the systemic issues of structure, agency and power in contemporary times that can slow down, if not prevent entirely the attainment of a collective vision and values of a good life, a good society and a cared-for environment. This is especially the case when the social and political order continues to frame the economic and political model at the heart of Europe using human capital theory for primacy of a growth economy (Tan, 2014). Education clearly needs to harness the interruptive power of the arts and humanities in order to frame the problem of sustainability for futures thinking and acting while asking who benefits from the changes that will be ushered in by policy influencers and research funders for the *Social Transformations and Resilience* (STR) partnership.

Cain (2016) showed that educators and researchers in Europe were divided in their worldviews of education. While many in the early decade of this century were coming from a place of 'what works' (and the psych-disciplines) more were coming from an understanding of education as an emancipatory journey of change with teaching primarily viewed as a relationship of learning and schools as communities of practice. This latter expansive positioning is found in the research work of feminist philosophers, such as the Stanford philosopher of Education, Nel Neddings (Noddings, 2003) and the posthuman feminist Rosi Braidotti (Braidotti, 2022, 2019). A feminist worldview of Education & Skills is in sharp contrast to a human capital view of what it means to be human today, where education is considered as little more than a data-driven system of performance management (Selwyn & Gašević, 2020), and schools are reconceptualised as High Performing Learning Organisations (Fielding, 2007).

Taking a humanising view of Education & Skills, it becomes clear that the scoping literature review undertaken here needs to 'research the margins' (Marshall, 1999) in order to 'stay with the trouble' (Haraway, 2018) of this complex and contradictory problem in the turbulent political climate of contemporary Europe (CORDIS, October 2021). The key question becomes how best to rethink and to frame this social scientific and humanities problem of Education & Skills for a futures-oriented Europe, for an equitable and sustainable green and digital transition and to heed the powerful contribution from the arts and humanities – Biesta (2013), Buber (1923/2023), and Cain (2016), that desired values for an ethic of trust, care and justice belong to the I-Thou aspect of educational relationships that cannot and must not be counted and measured.

The study is structured as follows. First, the study explains and justifies the selection of a scoping literature review using the guidance of Arksey & O'Malley (2005) and shows how this iterative cycle of inclusion and exclusion resulted in the identification of a select literature. Second, the study presents a critical and feminist scrutiny of this literature review in three phases. In Phase I, the study

explores perspectives in moral and political philosophy, critical and feminist perspectives at the margins in a recent literature sharing alternative framings in relation to how people are framed as a human species within the complex and contradictory purposes of education. In Phase II, the study critically scrutinises the fast globalising policy background and context in Education & Skills in relation to Lifelong Learning & Skills for Sustainability in Europe. In Phase III, the study interrogates the problem as it relates to teachers' advanced professional practices today and the new vision, ethical values, knowledge, ways of knowing and the border-crossing partnerships required for teachers' democratic assignment to secure this equitable and sustainable green and digital transition. Finally, the authors discuss the critical insights emerging from both studies.

3.1. Research Methodology

The scoping literature review undertaken in this study followed the conceptual and methodological guidance of Arksey and O'Malley (2005). They suggest the aims of a scoping literature review are to hold in play a broad-based research question rather than a tightly defined question or to pursue clarity of definition. Arksey and O'Malley (2005) allow scope to identify areas of the literature that have been largely neglected or positioned in the margins, especially when more tightly framed systematic literature reviews are undertaken.

This is pertinent to the social sciences and humanities, and especially the discipline and practice of education and teacher education in this century where the interruptive power of the arts and humanities, the foundational disciplines and the deliberative traditions (such as, *Bildung*) were largely jettisoned in favour of a more muscular and data-driven worldview (Hordern, 2022). Where the Arts & Humanities were returned to the discourse they are often introduced as a minor player that can release much needed creativity rather than act as co-equal disciplines with the sciences, and with inbuilt capacity for critical reflexivity and creativity to sap power, to interrupt the discourse and to make the familiar strange (Ball, 1995; Burnard et al., 2022; Colucci-Gray 2014).

The broad-based nature of the research question, suggests the need to hold in play an expansive view of Education & Skills in Europe for the purposes, principles, policies, pedagogies and practices in any futuristic, fair and sustainable vision. A problem that is highly complex and needs inclusion of scientific knowledge and the ethical, philosophical and political as it demonstrates capacity to 'stay with the trouble' (Haraway, 2018) of multiple and contradictory purposes in a futuristic Europe of uncertainty and change.

A scoping literature review can 'map' the research gaps in Education & Skills in a future Europe in ways that holds in play a transformative worldview that is inclusive of what Biesta (2013) calls this 'beautiful risk' of education. The aim

therefore of this review is to identify important 'research gaps in the existing literature' (p.21) and assist in framing Education & Skills for the achievement of an equitable and sustainable green and digital transition in carefully considered ways that support the development of individual consciousness and, at the same time, the collective consciousness needed for securing peaceful and pluralist democratic societies, thriving economies and a sustainable environment in a futuristic, thinking and acting Europe.

Arksey and O'Malley (2005) suggest that a scoping study is best conducted in identifiable stages or phases that make meaning for the reader, albeit within an understanding that the process of interpretation underway is more iterative than linear. The research studies of the author are interpretive studies that use a transformative worldview and draw from critical and feminist perspectives. This emancipatory research design in education integrates advocacy for care and justice in a field shot through with power and privilege. This suggests that the key question of how best to achieve an equitable and sustainable green and digital transition in a futures thinking and acting Europe needs to engage with scientific knowledge as an open, complex and nuanced question in a transdisciplinary field that is in constant dialogue with the arts and the humanities, with ethics, politics and the ecological.

The study engages with recent literature coming from philosophical perspectives, especially critical and feminist perspectives that take humanising views of the purposes of education, beyond education for primacy of a growth economy, and post-positivistic views of education for problem-solving and linear rational systems of policy implementation. The literature search included a google scholar search first using the following keywords, education and skills, purposes of education, philosophical perspectives, critical perspectives, feminist perspectives, democratic societies, teachers' knowledge base, green and digital transition, Futures Europe, education and sustainability. This was followed by a search for articles in recent years in journals in the social science categorisation of education, including, Studies in Philosophy and Education, Educational Theory, Critical Studies in Education, Cultural Studies of Science Education, Journal of Education Policy, Journal of Curriculum Studies, Educational Review, Discourse: Cultural Studies in the Politics of Education, and The European Journal of Teacher Education. Finally, the study reviewed the CORDIS (*Community Research and Development Information Service*) database of the European Commission using the key words above. This latter study identified six relevant publications. However, while there were studies taking a gender perspective there was no mention in the CORDIS database of studies taking 'feminist perspectives' in education.

The study then features a critical scrutiny of this select literature based on the theoretical perspectives provided above, inclusive of research excellence in the field of critical and feminist philosophical studies in education (Mooney Simmie,

2023; Mooney Simmie & Moles, 2024), and from the experience of the author as a transnational partner in four European Comenius 2.1 teacher education and training projects, across twelve European countries in relation to pedagogical innovation through school university partnerships with STEM teachers (Mooney Simmie & Lang, 2018). The findings are presented in three phases. In Phase I, the study critically scrutinises philosophical perspectives currently positioned at the margins in relation to Education & Skills. In Phase II, the study conducts a critical scrutiny of the fast globalising background policy and context calling for an equitable and sustainable green and digital transition and learning for sustainability in Europe and internationally. In Phase III, the study critically interrogates what these new framings might mean for teachers' processes of policy enactment through new forms of open schooling. Finally, the scoping study summarises the emerging insights from both studies.

3.2. Findings from the scoping literature review

3.2.1. Philosophical Perspectives in Education & Skills

Education as a multidisciplinary, interdisciplinary and transdisciplinary field of social study, has traditionally been built as a social science on a base of foundational studies and deliberative traditions that are concerned with the journey of human being, becoming, development and deliberative change in a stated policy (political) direction. At the same time, it needs to be acknowledged that academic freedom in relation to education confers a special responsibility on the role of the university to act as the social conscience of the state, to hold the state and supranational policy actors to account in any vibrant view of democracy (Butler, 2017). The education system of a country presents as a state apparatus tasked with securing and conserving the social order and at the same time, an especially in a democracy, needs the contradictory capacity to change when the need arises. In this regard, policy is not and cannot ever be made equal to practice (Ball, 2021).

Lynch & Baker (2005) view education as a holistic and cultural problem of human change and development rather than an atomistic, technical rational problem of management and data driven outcomes. When Education & Skills are viewed as a cultural problem this includes the affective, aesthetic, the ethical and the spiritual alongside the social, economic, scientific, technological, political and the material (Bazzul, 2022). The first phase of the study (phase I) draws from moral and political philosophy as a way of identifying the tensions and contradictions involved in the multiple purposes of education and embedded in teachers' practices.

The philosopher of education, Gert Biesta explains the multiple purposes of education as three interconnected purposes, namely: (1) qualification (2) socialisation and (3) subjectification (Biesta, 2020). The qualification purpose connects to the desired attitudes, skills and knowledge required for the world of work at any one moment in time. This changing purpose depends on the fast changing needs of the economy, science, technology and politics, and can be seen today in the increasing role of *Artificial Intelligence* (AI) and the skillsets needed in Europe for a flexible, resilient and competent workforce that requires regular upskilling (CORDIS, August 2023).

The second purpose involves socialisation into the existing social order, for social cohesion, dutiful citizenship, peacebuilding and the multiple aspects of associated living with others such as the social, emotional, ethical, wellbeing, cultural, political and taste aspects that give rise to a felt sense of belonging, wellbeing and membership of a society. Bourdieu, the French intellectual and sociologist understood this socio-political and cultural framing of education. Bourdieu understood this inbuilt tension in the ethical and political calling of education, the need to conserve the world and at the same time to change the world, and the dangers inherent in any atomistic view that reduced education to standardisation and predictive outcomes in advance. Bourdieu regarded any predetermined view of Education & Skills as 'symbolic violence' and showed how this could readily lead to domestication and/or colonisation (Bourdieu, 1986).

There is a strong European policy interest in this socialisation purpose today, especially in times of fast changing demographics, with the rise of the far right, with the threats to democracy and within increasingly diverse societies and an urgent need to foreground intersectionality in educational practices (e.g. social class, gender, race, disability) (CORDIS, October 2021). This is reflected in policies of *Equality, Diversity and Inclusion* (EDI) across schools and education institutions. There are clearly varied measures of success in how effective EDI policies are in securing inclusive democratic societies that truly celebrate pedagogies of difference (Braidotti, 2022, 2019). However, the question of how to evaluate the effectiveness of such policies will be different depending on whether or not one views the EDI problem as holistic and cultural [more than the sum of the parts and deeply embedded in the often hidden cultural values of a society] or as atomistic, predictable and thereby measurable. In the latter case, the solution would be to increase the level of data-mining in education policy evaluation, and to go harder, tighter and stronger into performance management.

The third purpose of education according to Biesta is 'subjectification'. This purpose is concerned with on one hand, the personal and ethical journey of becoming, becoming a human subject in ones' own right and on the other with developing as an engaged citizen in associated living with others and the environment. Subjectification is therefore concerned with personal development and with becoming an active, responsible, and risk-taking citizen who not only

participates in a democratic world but who critically and actively engages with others in remaking the world as a more equal and just place for all (Giroux, 2024)

The American philosopher, John Dewey writing in his book 'Democracy and Education' (Dewey, 1916/2024) argued that democracy needed to be born anew with each new generation and that the education system needs to act as the midwife of democracy. Assuming democracy as a dynamic construct that changes as the need arises, citizens clearly need to reconsider what they might mean by democracy today in Europe. Where does the line need to be drawn in a shared responsibility between the state, schools and society, and the various policy actors in the education system and in the wider world (e.g. school leaders, teachers, students, ministries of education, parents/guardians, civil society actors, entrepreneurs, community groups, actors in state agencies). Today, STR partners are now called to work together for the achievement of an equitable and sustainable green and digital transition in a futures thinking and acting Europe.

Sant's (2018) study shows that the contemporary neoliberal (political) project in education is anti-democratic and the notion of democracy presented in the mainstream literature in education today involves little more than a requirement for socialisation into the status quo, the attainment of a *Self-regulating, Motivated, Adaptive, Responsible and Technically competent* (SMART) individual (Lee & Lee, 2018) aligned with externally provided norms (for a dutiful citizen). The challenge with universal norms, found in externally provided prescriptions of desirable attitudes, values and dispositions suggests there is no requirement for any critical reflexive interplay between values and standards and the policy actors in education (Pillow, 2003). Within the ever pressing danger of populist and fascist thinking in Europe today there clearly needs to be a considered response from all policy actors in education that nurtures a critical, creative, caring and reflexive approach to pressing problems in preference to the search for certainty embedded in numerical data - not everything that counts needs to or can be counted (CORDIS, October, 2021; Lynch, 2022).

Howie (2020), a school principal in an Australian school, whose doctoral study explored education and democracy showed the current erosion of quality of the public debate and public interest values in relation to the good society and the good environment in the neoliberal design of contemporary education and the resulting danger in the asphyxiation of democracy in Australia and worldwide:

> *'In closing down dialogue and setting normative standards…it closes the public space, reducing social relations to obligation…..barriers go up….what should be open to question and not reductively represented as self-evident, including research methodologies and outcomes, are standardised and ranked' (Howie, 2020, p. 683).*

Analytical philosophers of education coming from essentialist and Kantian worldviews draw from a vision of the human being as an Enlightenment Man of

Science. By contrast, posthuman feminists, such as Rosi Braidotti (2022, 2019) challenge all previously assumed notions of what it means to be human, as they seek to topple the current elite and Eurocentric notion of this exceptional human off its Cartesian perch based on an argument that this modernist notion of humanity was originally derived from an outdated view of the 'Man of Science' shot through with power and privilege. This stereotypical 'Man of Reason' was white, a member of a wealthy elite social class, ascetic, and assumed to be virtuous while all others, including women and minorities were 'othered', marked as different and from nature, and perceived as exploitable (Lynch & Crean, 2019).

What is of interest to Education & Skills in relation to the framing of the human is that education is a lifelong journey of deliberative human change is connected to who people think they are, whether the knowledgeable 'homo sapiens' or 'homo economicus'. Fricker (1999) uses the term epistemic injustice to describe what happens when the listener is interested not only in what is being said but who has the right and the authority to say it. The aims and purposes of Education & Skills in a future Europe are therefore never innocent and neutral and are imbued with a vision of reproducing the social and political order of the day, shot through with power and privilege in relation to who is considered human and who is labelled as 'other' or less than (Braidotti, 2022, 2019).

The critical insights, emerging from this PART I of the study suggest that a key question that needs to be asked today in Europe, and the wider global world is how to frame Education & Skills for Sustainability, Justice and Resilience in ways that keep the question open and the tensions alive where education is understood as an intense ethical calling for nurturing new and different ways of being, becoming and acting in the world (Bazzul, 2022). Critical questions that prompt a fresh rethink and action about the policy imperatives in relation to the complex, care-based and contradictory purposes of Education & Skills, who people think they are as humans today, why people need to rethink Education & Skills differently and how they need to thereby support an equitable and sustainable green and digital transition for a new social and ecological contract in a futuristic Europe- and by implication teachers' practices, knowledge base and curriculum development.

While the sciences are indeed necessary they are not sufficient on their own to keep in play the multiple and contradictory purposes embedded in the 'beautiful risk' of education. The arts and humanities provide the creativity, the critical reflexive capacity and the open enough spaces for debating philosophical dilemmas and contrarian views. This provides the much needed holistic vision for Education & Skills in a futuristic Europe that needs knowledge, culture, ethics and spirituality as much as it needs politics.

3.2.2. Education Policy Background and Context

A crucial question for the European Commission (EC) is how it might frame this social science problem of Education & Skills, especially the conceptualisation and practices involved in the new STR partnership for a new personal, social and ecological contract for an equitable and sustainable green and digital transition taking place in the midst of rapidly changing demographics in Europe and a future of change, uncertainty and unforeseen shocks.

In order to rethink Education & Skills in a fast changing Europe, and globalising world, it is necessary to make meaning of where the discourse is positioned today in relation to the education policy process, and what lessons from history can help point it in the right direction in the futuristic ethical decision-making as much as in the evidence-based decision-making. Philosophy teaches people that doing the right thing is as much about ethics and wisdom as it is about knowledge (Research*eu, 2021).

Since the start of this century, people on the continent witnessed a large number of unforeseen shocks that give pause for thought. In 2008-2009, Europe and the global world experienced an economic crisis that has resulted today in a massive increase in wealth disparity and inequality at a level not previously seen (Gerstle, 2024; Lynch, 2022). Tan (2014) explains the enormity of the task facing public policy today, in particular in education, given that the primacy of the economy in Human Capital Theory (HCT), is perceived as a ‘good enough’ model to describe human behaviour, and where the positioning of the ethical, socio-cultural and political needs of the individual, society and the environment are regarded of secondary importance. This HCT view of education for primacy of the performative, the competitive individual, is in sharp contrast to a relational view of education and the primacy of the ethics for new relations with self, others and the planet.

In 2021, UNESCO called for a new social contract for education that can repair injustices and inequalities and set Education & Skills on a new course toward a humanising discourse that is distinguished by a commitment to the policy and practice of community-based partnerships and Equality, Diversity & Inclusion (EDI), releasing the transformative potential for learning, dreaming and achieving in a global world emerging from the coronavirus pandemic. Today, Europe is clearly at another historical juncture where a new paradigm is desired beyond the political project of neoliberalism (Gerstle, 2024; Giroux, 2024; Lynch, 2022).

The history lessons for Europe, from fascism and genocide in World War II and the turbulent political climate today, remind us that knowledge alone while necessary is never sufficient when it comes to securing an equitable, fair, caring and just democratic society with a diversity of people and cultures. Democracy is never about living well with people who are like us. It is far more about living well

with people who are not like us and who do not share the same values (Edling & Mooney Simmie, 2020; Mooney Simmie & Edling, 2019).

How to conceptualise and to enact in practice this notion of more equal, diverse and inclusive democratic societies in Europe, a thriving economy for all, a successful green and digital transition that supports an ethic of care, justice, resilience, climate action and sustainability through Education & Skills - and for teaching as an advanced professional practice - is the broad-based key question at the heart of this scoping literature review.

The CORDIS results pack of studies examining 'challenges to democracy in Europe' reveals the importance of inspiring young people to actively engage in a 'participatory democracy' and to develop competences in relation to playing their part as active citizens, especially at a time of increasing populism and the constant threat of extreme radicalisation (CORDIS, October, 2021). The studies noted the 'worrying decline' in the quality of public discourse and the fear that it is becoming one-sided and shallow (p.31). While participation in the existing social order was strongly encouraged ('socialisation'), the central paradox in education involving the open question of reimagining a more ethically just and sustainable future for public interest values and the search for the common good of a democratic society ('subjectification') was largely missing from the discourse.

However, one research study in the CORDIS pack for 'open schooling', coordinated by the University of Bologna in Italy, shared a futuristic conceptualisation of science education as a balancing process between the sciences and the arts and humanities, for a fitting and elaborate mixture of 'sense-making skills' [critical and analytical thinking], 'strange-making skills' [creative, imaginative, anticipatory thinking], coupled with a sense of 'feeling at home' and at the same time 'accepting the risk to go out of your comfort zone' (CORDIS, February 2024, p.8). The research team conducted this research study through eighteen open schooling networks in Bologna, Oxford and Helsinki. In order to foster creative thinking and foresight they set up an 'interdisciplinary boundary zone' and inhabited this third space as 'epistemological nomads', where different ways of knowing were respected, not only scientific knowledge.

While the UN Sustainable Development Goals provide a blueprint of universal values for educators in Europe to share with students, the question of how this list is brought to life in educational settings is a crucial question. Are the goals shared as just another scripted list of values to be complied with or are they open to critical scrutiny and debate as a way of breathing a new ethics into the curriculum of climate action, scientific literacy, digitalisation, STR partnership, justice, care and sustainability in a futures thinking and acting Europe?

Lifelong Learning and Skills for Sustainability

Wuelser et al. (2020), in their White Paper on *Priority Themes for Swiss Sustainability Research* from the Swiss Academies of Arts and Sciences, tackle this question in ways that inspire new futures thinking and action. They make the case that this problem requires changes in perspective and consciousness in people's relationships to themselves, to others, and to nature, and in identifying shared values, visions and pathways for sustainability. Their claim is that 'sustainability', 'far from being an objectively defined concept, is underpinned by assumptions, discursive elements, values and paradigms, many of which are implicit and even contradictory. These need to be identified and debated so that Europe can develop a shared vision of a sustainable future and a strategy for achieving it' (pp. 7-8).

While they accept that traditional research will continue to have a place they are seeking new ways for multidisciplinary, interdisciplinary and transdisciplinary research to flourish and for the co-production of knowledge in educational settings, ways that develop mutual understanding and considered responses. This White Paper brings many features, formerly found in critical pedagogy and in feminist studies in from the margins, such as the importance of problem-posing and dialogical ways of co-learning where 'sound reasoning and an ethical perspective are required to make clear which values are favoured and why' (p.18). They recognise that 'much of this research relates to cultural, ethical, social behavioural, legal and political issues, such that the social sciences and the humanities will have important contributions to make' (pp.29-30).

A key concern is that much of the political, economic, scientific and technological system today is designed toward unchecked growth. While this exponential imperative toward growth is fostering deep inequalities and destabilising the planet's natural systems 'the needs of the poor and others who suffer the consequences of environmental degradation are neglected, as are those of future generations' (p.34). Wuelser et al. (2020) are not alone in their advocacy for a critical appraisal of this HCT model which affords primacy to a growth economy in all matters of public social policy including education. Instead, they consider how alternative models of financial systems can work to support the greater good of society and the planet. Rawworth's (2017) model of doughnut economics calls for a new ethics and a new political will in relation to financial systems where the regulatory systems act for the common good of the people and the planet, to secure a floor below which no one falls, and a ceiling on activities that damage the climate and the planet.

Furthermore, Wahlund and Hansen (2022) explore economic pathways from the perspective of awakening an understanding that a green and digital transition in a futuristic Europe is about securing the future of humanity through the collective care of the local environment and the planet as the shared dwelling home. The

CORDIS results pack on the ‘circular economy’ provides evidence of new and innovative thinking in relation to an acceptable model of the economy for Europe, and by implication for the purposes of education (CORDIS, May 2021). The studies declare that ‘today’s’ take-make-dispose’ economic model is wasteful and unsustainable’ (p.2), as they set about finding futuristic and sustainable ways of reusing, reducing, recycling and recovering materials and waste management in textiles, digital products, biowaste, plastics and in buildings.

Education systems across Europe approach the academic, pedagogical and the vocational education and training of young people differently, especially in the often parallel tracks for apprentices in lower and upper secondary education, and in relation to apprentices’ access to upskilling and to pathways of higher education. Some European countries, such as Germany, Austria, France, Norway, the Netherlands and Denmark have made greater advances than others when it comes to the provision of national systems of apprenticeship (Kuczera, 2017, p.8). What has becoming increasingly clear for Education & Skills in a futuristic Europe is that there is an urgent need to modernise apprenticeships across Europe to meet the upskilling requirements for a successful digital transition for all (Cedefop and OECD, 2024), and for greener economies and societies (Cedefop and OECD, 2022). Striking the right balance between the more traditional academic and the vocational education and training pathways is already under interrogation at the OECD level (Kuczera, 2017) and in the European Alliance for Apprenticeships (EAFA Action Plan, 2025).

A more educationally sound and coordinated system of apprentices in a future Europe is urgently needed to improve the lifelong learning, upskilling, pedagogical and training opportunities for apprentices, through new types of blended learning programmes with education and training providers and better working conditions with employers but also within a new realisation that access to more expansive pathways of higher education need to be included if apprentices are to move beyond what has traditionally been the initial stages of success in the labour market (Markowitsch & Wittig, 2022; Jorggensen, 2017).

The critical insights from Phase II, suggest that an equitable and sustainable green and digital transition in a futuristic Europe need a cultural worldview of ‘sustainability for lifelong learning and upskilling’ that balances the sciences and skills development with the arts and humanities in ways that can deliver this desired change in a holistic, creative, human flourishing and meaningful way. What is becoming clear is that this is not a linear rational process of policy implementation, but rather a complex, contradictory, intelligent and ethical-political process of policy enactment, where teachers translate and interpret policies through open questions with young people in their local contexts (Ball, 2021; Giroux, 2024; Lynch, 2022).

3.2.3. Teacher's Knowledge Base

The literature reviewed so far strongly suggests that questions of Education & Skills are best framed within an open discourse that calls on the arts and the humanities, on ethics, politics and ecological concerns in addition to scientific knowledge. These philosophical perspectives show that decision makers will need a new conceptual map and language for a humanising discourse of education change, and for teachers' practices that are undertaken within a primacy of ethics (Mooney Simmie & Moles, 2020, 2024).Therefore, any framing of teachers' practices, whether teaching or teacher professional learning, will need to change to foster cultural identity and affiliation with Europe, as well as individual and collective consciousness and the needed to secure an equitable and sustainable green and digital transition. The crucial question here is where to draw the line between the state, schools and society so that the teachers' democratic assignment for an equitable and sustainable green and digital transition has the necessary open pedagogical spaces for the 'beautiful risk' of education, for dialogue, problem-posing, debating critical views, creativity, critical and anticipatory thinking, learning why and how to make wise decisions. Decisions that need scientific knowledge as well as the arts and humanities for securing a good ethical life, not only for the individual and those who benefit, but for the public interest values of a pluralist democratic society, the common good of the collective, the local community and environment, and for a felt sense of a united Europe (Burnard et al., 2022; Colucci-Gray, 2014; Howie, 2020).

Coming from a different direction, Lee Shulman, the renowned educational psychologist who coined the term *Pedagogical Content Knowledge* (PCK) asserted that while a systematic study of the scholarship of teaching, beginning in the late 1980s was necessary to improve standards, any effort to standardise education, and by implication teacher education was going to lead to a 'loss of soul' and would inevitably damage the teaching profession (Shulman, 1987).

From the early years of this century, the policy imperative in Education & Skills in Europe and elsewhere in relation to a fast globalising reform movement has been to categorise and systematise education in ways that increasingly atomise the discipline for an evidence base turn that is no longer in need of dialogue much less critical dialogue, contradictory views, historical consciousness or philosophical inquiry (Mooney Simmie, 2023).

Hordern (2022) and Barrett & Hordern's (2021) assert that teachers' knowledge base for an advanced professional practice in contemporary times is not only defined by a 'science of teaching' but it also needs to include the social sciences and humanities (e.g. the arts, culture, ethics, aesthetics, philosophy of education, history of education). This is in addition to the deliberative traditions, such as *Bildung* in Europe, that take into account the situated, experiential, ethical, aesthetic, cultural, political, the symbolic and relational nature of the deliberative

journey that is involved. Here Education & Sills are understood as a journey of human becoming as a subject in associated living with self, others, humans and non-humans and the environment. This includes the signs, symbols and immeasurable contours of a holistic education as a discipline, a ritual and a practice that clearly defies all attempts at reductionism and prediction (Mooney Simmie & Moles, 2020, 2024).

The Social Transformations and Resilience (STR) Partnership will therefore need a model of human change, one that not only takes into account the science of education but also the interruptive power of the arts and humanities, including creativity and critical reflexivity and careful consideration of the power and limits of science (Mc Intyre, 2021). Once a futuristic model of human change is defined for Education & Skills, including the tensions involved in the contradictory purposes of education along with the desire for an equitable and sustainable futuristic Europe then a more expansive model of teachers' knowledge base will clearly be needed.

Hordern (2022) reframes teachers' knowledge base as consisting of three dimensions taking a complex worldview of the discipline and practice of education, and of teaching as an advanced professional practice, as follows:

1) The 'science' of teaching comes for the most part from the psych disciplines in the social sciences, the natural sciences and the applied sciences and is typically understood using a 'what works' approach (e.g. diagnostics, problem-solving, constant comparison).

2) The foundational disciplines originate in the social sciences and the humanities, especially the arts, history and philosophy with their interruptive power of creativity and critical reflexivity where care and justice remain as open questions worthy of continuing dialogue, contestation and critical debate.

3) The deliberative traditions that are variously connected to a holistic view of education as an ethical, cultural and spirit raising journey for a good life in the world, such as found in curriculum studies, aesthetics, affectivity, experiential learning, critical pedagogy, feminist studies and teaching as a situated practice.

What has become increasingly clear in Phase III of the scoping literature review is that teachers cannot do this expansive work of educating on their own or while left to their own singular communities of practice. New approaches to border-crossing partnerships in the social sciences and humanities, such as the STR partnership, will depend on the willingness of all policy actors to give of their time and attention to forming new relationships of learning with teachers that will necessitate new rules of ethical and political agreement, recognition of the openness, complexity and contradictory nature of the problem and the necessity to lower power and respect different ways of knowing (Mooney Simmie & Lang, 2019; Galvin & Mooney Simmie, 2017). It is not something that can be done in

an expedient way, and especially not something that can be done exclusively on-line, camera to camera. The CORDIS results pack for 'ethics and integrity in research' recognises that 'scientific and technological advancements raise complex ethical questions and may have significant societal impacts' (p.2). The studies suggest that decision makers will need to rethink education practices and 'the values they hold dear' (p.2). They express concern that decisions are more often driven by 'financial or populist interests, at the expense of people and the planet' (p.3) (CORDIS 2024).

A critical insight emerging from Phase III, is that framing teachers' knowledge base in a futuristic Europe will need inclusion of the 'strange-making' power of the arts and the humanities, recognition of the power and limits of evidence-based policy making, and inclusion of the deliberative traditions with their open enough pedagogical spaces for creative and critical reflexive literacies, and wholesome debate of contemporary ethical and political issues.

However, there is always the inherent danger that any alternative concept of scientific literacy and digital literacy for an active, responsible and risk-taking (democratic) citizenry runs the risk of capture by the current neoliberal (political) project in education and may be reframed as something codifiable and with 'pretension(s) to universalise' (Valladares 2021, p. 562). Valladares (2021) asserts that such capture could turn a relational, holistic, cultural and otherwise care-full ethical framing of the problem into:

…the opposite of a transformative purpose, that is, into a concept that, instead of strengthening students' participation and emancipation, contributes to the reproduction of socio-educational dependencies and cultural exclusions (p. 562).

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4. Emerging Critical Insights from Both Studies

The scoping literature reviews conducted here focused on areas of research that are currently missing from the mainstream literature of Education & Skills today, and have implications for the framing of social science problems in education, including framing the problem of achieving an equitable and sustainable green and digital transition in a future Europe through new thinking and actions.

In a changing working world due to the green and digital transition which is furthermore influenced by direct and indirect climate change consequences, it is of utmost importance to empower future workers-to-be by educating them properly. It is therefore important to think about the complete chain of education equally as it involves not only pupils in primary and secondary schools or student in academia but also young people during their vocational educational training and apprenticeships. The educational perspective of the STR partnership could benefit from a more holistic view on education starting early in childhood and considering all roads of education (vocational education as well as academic education).

The first part of the study revealed that educational researchers view digital transformation in two contrasting ways—either as a driver of progress and a valuable research tool or as a threat with ethical concerns. This divide aligns with different educational contexts: higher education and scientific research embrace new technologies, including AI, as opportunities for growth and change, whereas school education research largely overlooks their impact. There is a growing need for studies that go beyond short-term technological challenges to examine how digital transformation will reshape entire education models, from curriculum foundations to teacher education and training.

Digital and green transformation are particularly challenging for vocational education. The digital era demands broader theoretical knowledge, higher technical skills, and interdisciplinary understanding from workers. On the other hand, VET needs to address social justice and power dynamics, not just technical skills.

External shocks, such as migration and the COVID-19 pandemic, have significantly influenced education, but climate change remains a less common focus. Migration research primarily examines integration challenges in Western Europe, highlighting disparities in education systems that may reinforce rather than reduce social inequalities. The recent large-scale migration from Ukraine to neighboring countries, especially Poland, presents new challenges and opportunities for education. The pandemic's impact on schooling, particularly in terms of increased inequalities and disrupted learning, has been widely studied, but there is little research on lasting changes to education methods and necessary adaptations.

Climate change is an underexplored topic in education research, despite its growing impact on school infrastructure and student well-being – from comprehensive general education, through vocational training, to university studies. Extreme weather events like heatwaves, hurricanes, and floods have already disrupted education in Europe and beyond, leading to school closures, infrastructural damage, and health risks. Rising temperatures and air pollution affect learning environments, while water scarcity in some regions threatens school attendance. Additionally, climate-induced anxiety is becoming a growing concern among students. Addressing these challenges requires a more integrated approach, considering the combined effects of digital transformation, external shocks, and climate change on the future of education systems.

On the other hand, the second part of the study highlights that any tight scientific framing of Education & Skills can readily fall into a technocratic, clinical and dehumanising space of externally-provided lists of desirable attitudes, values, knowledge and skills with no recognition of the 'beautiful risk' embedded in education, the importance of the immeasurable or the creative and critical reflexive work needed for education's role in remaking democracy in Europe as a living and dynamic entity for each new generation. In reality with much of the focus today on the attainment of an ideal SMART student and delivery of pre-scripted outcomes, there is little or no mention anywhere in policies, or 'what works' literature of the need for the development of the individual consciousness and the social consciousness needed for living well with others in democratic societies and for the new individual and collective decisions needed for care and justice for others, human and non-human and eco-justice for the planet and environment.

One critical insight emerging suggests that Education & Skills needs to be reframed in humanising ways - that retain the openness, complexity and contradictory nature of this social science problem - that can offer European citizens a good life that supports thriving economies, pluralist democracies and an equitable and sustainable green and digital transition. While mainstream literature and policy fosters Education & Skills today as a data-driven system of performance management (Selwyn & Gašević, 2020), the six research studies in the CORDIS database, revealed the importance of inclusion of the arts and humanities working alongside the sciences and the necessary capacity for problem-posing, appropriate risk-taking and care for others and the planet.

A critical scrutiny of the CORDIS database showed there were no educational studies taking feminist perspectives, for a relational ethics of care and the importance of affectivity in the humanising values of trust, care and solidarity. The CORDIS studies were for the most part concerned with what Biesta (2020) called qualification and the needs of the workplace, and the regulatory codes, attitudes, dispositions and values needed for socialisation into the existing society. There was little or no mention of the purpose of 'subjectification' through education

(Biesta, 2020), the personal and ethical task of becoming a human subject in one's own right, and at the same time, the ethical and political task of learning to become an active, responsible and risk-taking citizen for remaking and shaping a more just and caring society, continent and environment for all.

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KE-01-25-201-EN-N

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