Framework for Education for sustainability:

Enhancing competences in Education

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BACKGROUND

The project 'Schools Educating for Sustainability: Proposals for and from in-service teacher education' aims to contribute to teacher education for sustainability (EduS) in different European countries, to reach the EU level goals for a more sustainable society (European Commission, 2019). The project's goal is to develop new initiatives addressing teachers' and teacher educators' professional learning – promoting innovation and social inclusion through the exchange of experience and know-how in an open education format. It thus aims to contribute to sustainability and to produce EduS guidelines, as well as to make said guidelines understandable, for teachers in each partner country. Educators will be supported through project actions that focus on promoting more inclusive and equitable educational practices for sustainable education and improving expertise around the versatile use of technology in teaching and learning— along with promoting development that more effectively preserves the environment.

To achieve its previous objectives, the TEDS project included a phase (IO), in which a framework was co-constructed for EduS purposes. Researchers and teachers systematized and organized knowledge from different fields in education to develop this framework for the sharing, discussion, and reformulation of documents and materials on EduS in European schools. Their main goal was to make available and understandable a framework of reference around education for sustainability (EduS) – through the analysis and systematization (review) of research literature and by benchmarking national level strategies in various EU member states.

The creation of the framework was based on the existing scholarly literature on education for sustainability. This literature was used to provide a theoretical foundation and to characterize the state of the art of EduS.

Sustainability competencies are an important conceptualization within the EduS literature (UNESCO, 2017). We adhere to Wiek, Withycombe, and Redman's (2011) definition of sustainability competencies as the following: systems-thinking competency, anticipatory competency, strategic competency, normative competency, and interpersonal competency.

The EduS framework must acknowledge the different educational contexts and school systems of each country in Europe – providing a literature review, practical activities, and design principles that are more adjusted to each country's specific scenario.

The framework presented herein is based on academic work carried out in several European countries: Portugal (Universidade de Aveiro), Malta (Universita ta Malta), Lithuania (Vytauto Didziojo Universitas), France (Universite de Nantes), and Finland (University of Helsinki/ Helsingin yliopisto).

SAVE ENERGY

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Sustainable development includes broad dimensions of environmental, social, and economic sustainability (Our Common Future, 1987). These dimensions must be interpreted, so they can be taught as educational topics. Yet topic-related knowledge is not enough, when organizing teacher education or school teaching. One's ability to use the knowledge – one's competencies – are at least as vital. Global competencies, like critical and creative thinking, are too general to mitigate global warming and other similarly daunting challenges around sustainability (Wiek eta al.

2011). To solve sustainability challenges, more specific abilities are needed. Education for sustainability must thus emphasize both topic dimensions and competency dimensions. In the following section, we first present the broad topic dimensions of education for sustainability. These dimensions are aligned with the traditional environmental, social, and economic aspects of sustainable development (Our Common Future, 1987). Second, we present the sustainability competencies.

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ENVIRONMENT AND NATURAL RESOURCES

The environmental legislation of the European Union has a significant impact on its member states.

EU environment policy is based on Articles 11 and 191-193 of the Treaty on the Functioning of the European Union. Under Article 191, combating climate change is an explicit objective of EU environmental policy. Sustainable development is an overarching objective for the EU, which is committed to a 'high level of protection and improvement of the quality of the environment' (Article 3 of the Treaty on European Union) (EUR-Lex, n.d.).

EU policies encompass a wide range of issues, including climate change, waste management, air and noise pollution, water protection and management, protection of nature and biodiversity, soil protection, resource efficiency and the circular economy, and sustainable consumption and production. It is widely acknowledged, within the EU, that environmental quality is central to health and wellbeing.

The European Green Deal provides a roadmap for a sustainable EU economy, including moving towards zero net emissions of greenhouse gases by 2050 (EU, 2019). However, one of the fears brought about by the COVID-19 pandemic is that the European Green Deal will be put on hold, with resources being re-directed towards fighting the pandemic and stimulating the economy (Climate-KIC, 2020).

Environmental education is often perceived as a tool to help achieve policy targets. In 1993, the European Parliament passed a Resolution inviting Member States and the Commission to take various measures around environmental education. These included adopting the environmental dimension into all aspects of education, at all levels (Hesselink & van Kempen, 1999). The Erasmus + program supports various educational initiatives in the formal and non-formal sectors of education, which seek to promote solutions towards a better environment along with contributing towards SDG 4.7.

Civil society has been proactive in integrating environmental issues across the curriculum, with the eco-schools' program often mentioned as one of the most successful initiatives. This program tends to focus on 12 main themes: Biodiversity & Nature, Climate Change, Energy, Food, Global Citizenship, Health & Wellbeing, Litter, Marine and Coast, School Grounds, Transport, Waste, and Water (Eco-schools, n.d.). This gives us an idea of the breadth of topics that can be explored under the theme 'environment'.

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The extent of efforts towards greening the curricula varies from one Member State to another. Furthermore, some initiatives focus on 'soft' green issues that merely tinker with the status quo, such as recycling. Others challenge the status quo and ask for more radical changes, such as reducing consumption and adopting fair trade. Other initiatives go beyond the sustainable and move towards the regenerative, as in the case of permaculture initiatives in schools.

There are many other benefits of environmental education, beyond the more instrumentalized view of learning about the environment to help attain policy targets. These have been summarized by Project Learning Tree (2016) as:

01 Imagination and enthusiasm are heightened;

02 Learning transcends the classroom;

03 Critical and creative thinking skills are enhanced;

04 Tolerance and understanding are supported;

05 State and national learning standards are met for multiple subjects;

06 Biophobia and nature deficit disorder decline;

07 Healthy lifestyles are encouraged;

08 Communities are strengthened;

09 Responsible action is taken to better the environment;

10 Students and teachers are empowered.

The 2020 European State of the Environment Report describes a rather gloomy scenario, highlighting that the state of the environment has worsened and making an urgent call for scaling up and speeding up change (European Environmental Agency, 2019). Schools are well-positioned to be part of this urgent process of scaling up. Yet this requires creating further sustainable learning environments and investing more in building the capacity of teachers and other educators.

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RESPONSIBLE USE OF DIGITAL TECHNOLOGY

EU strategic documents and research findings encourage the use of information communication technologies (computers, tablets, interactive whiteboards, mobile phones, cameras, laboratory equipment, etc.) as sources of content, research, and knowledge creation in the educational process. Emphasis is placed on the development of a modern teaching/learning environment. The equipment and tools used correspond to the modern conception of students' learning, curriculum, and needs. They also empower students. European Commission sustainability policy documents, such as the European Green Deal, emphasize the possibilities of digitalization for attaining a more sustainable society (EU, 2019). Understanding the ethical use of digital technology is crucial for implementing sustainable policies in education.

Teachers are encouraged to use information and communication technologies in classroom activities, project work, and homework. Digital content and technology make learning more versatile and engaging for students. Virtual learning / learning environments use digital tools to offer distance learning programs, websites, social networks, communication, and collaboration environments, etc. Such virtual environments and learning media are chosen purposefully and are secure. Yet here, again, there is a risk of engaging merely at a policy level. If there are inconsistencies between declared commitments and real communication and activities, this may not lead to the desired changes regarding EduS in schools. To encourage teachers to rethink school curriculum—particularly by including the responsible use of digital technologies—we must support them by providing in-service training activities.

The theme Responsible use of digital technology includes the following topics, which are directly related to EduS: Information retrieval strategies, critical evaluation of information, media and information literacy, recognition of 'fake knowledge', and ethical content generation in the digital space. Safe use of the Internet has become a vital topic—as have understanding the digital concept, digital literacy, and digital competency. These include the peculiarities of personal data security, the review of harmful content on the Internet, and preventing potential threats to a person's social wellbeing on the Internet. It is also crucial to understand emerging threats online and to know how to protect your personal information—as well as how to protect yourself from harmful online content.

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DIALOGUE, DIVERSITY, AND SOCIAL INCLUSION

The theme Dialogue, diversity, and social inclusion is related to developing teachers' and students' multilingual and intercultural repertoires, to contribute to the construction of more inclusive and cohesive societies. This theme aims to promote valuing diversity (e.g. linguistic, cultural, social), empowering teachers and teacher educators to encourage learners' participation and commitment to our collective search for solutions to global / local problems.

This dimension exposes both educators and learners to diversity. It is based on a

critical approach (pedagogy of discomfort and inquiry), addressing how teachers and teacher educators represent the presence and value of diversity in educational contexts and in dialogue among people with different perspectives, languages, and cultures. This also provides opportunities to understand the importance of the relationships among participants—where languages and cultures play an essential role – as well to dialogue

around essential questions of sustainability at local, national, and global levels. To transmit these ideas in teaching, curriculum unit examples must be developed. Teacher educators and teachers must thus collaborate to reflect on the linguistic and cultural power of different groups and communities, and on the individual needs of learners/students. Following these reflections, teachers will plan, enact, and evaluate innovative curriculum units in cooperation with teacher educators.

ECONOMY AND FINANCIAL LITERACY

In schools, economic sustainability is perhaps one of the least implemented aspects of sustainability. One reason may be that schools typically do not offer economic subjects. In this project, we understand economic sustainability from the 'circular economy' point of view. The Circular Economy Action Plan, published by the European Commission (2020b; 2015) presents how a circular economy supports sustainable economic growth with new initiatives and by developing the life cycle of products. The circular economy is a more sustainable version of the linear economy model—that is, the 'take-make-use-dispose' or 'take-make-waste' model. Basically, the linear economy is a unidirectional economic model where the overall business strategy is to take resources from the ground and then turn them into disposable products (Andrews, 2015; Ellen MacArthur Foundation, 2017.) The circular economy is presented as an alternative model that—unlike the

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linear economy model— acknowledges the importance of the environment in maintaining a sustainable economic system (Ghisellini et. al., 2016). There is also a strong evidence base showing that the circular economy can help build resilience to the effects of climate change (Ellen MacArthur Foundation & Material Economics, 2019).

The new EC Action Plan (European Commission, 2020b) underlines 'tackling environmental problems by changing the way we consume and the way we produce'. In the circular economy model, all phases of a product's life cycle are to be reconsidered from the sustainable perspective. The European Commission (2015; 2020b) also notes that sustainable economic growth could be conducted by affecting product design, production processes, the consumption of products, and waste management—as well as by attempting to replace the usage of primary raw materials with secondary raw materials. However, it is noted that the same policies and strategies that support growth phases may be challenging in the transition and maintenance of sustainable states (Ghisellini et al., 2016). In any case, economic activity should aim at advancing the human capability sustainably (UN, 2019). This is where sustainability innovations come into the picture, as important transition enablers (de Jesus et al., 2018).

Sustainability innovations can be defined as new, or significantly improved, technological and non-technological products or processes (also combinations) that are good for the environment (OECD, 2018; de Jesus et al., 2018, p. 3014). Sustainability innovations can help save the environmental, as well as

offering benefits in terms of economics and job creation. They are prioritized and funded as investment objectives (INTERREG EUROPE, 2014; ICF, 2016).

Learning about the circular economy implicitly educates students for sustainability (Andrews 2015). It enhances students' ability to become conscious consumers, future producers, and managers—ones that come up with sustainable solutions instead of relying on purely economic reasoning (Kopnina, 2018). Teaching about the circular economy is a way to enhance knowledge, skills, and attitudes related to sustainability, i.e., sustainability competencies (e.g. Wiek et al., 2011; Andrews, 2015). While the European Commission's view on the circular economy may be incomplete (Ghisellini et al., 2016, p. 16; Korhonen et al., 2018; Pantzar et al., 2020), the EC's plans and actions to increase material circularity are still promising (Pantzar & Suljada, 2020). The circular economy and eco-innovative solutions are clearly part of the European strategy in the transition towards sustainability. In learning and advancing sustainability competence, the circular economy and eco-innovations are key content areas and topics.

SUSTAINABILITY COMPETENCIES

Sustainability competencies are educational concepts that differ from conventional syllabuses and didactic approaches. Competency-oriented teaching focuses on asking what problem-solving strategies, concepts, and abilities for social action should be developed in learners. Sustainability competencies are not restricted by boundaries of subjects or specific content knowledge (de Haan 2006). Instead, they represent cross-cutting and transversal learning objectives that are needed to deal with the complex challenges we face in today's reality (e.g. UNESCO, 2017; UNESCO, 2018a; Wiek et al., 2015).

As a concept, sustainability competencies provide an explicit and commonly shared framework that guides students' learning around the knowledge, skills, and attitudes that are needed to overcome the global sustainability crisis (see UNESCO, 2017; UNESCO, 2018a; Wiek et al., 2015; Olsson et al., 2020). In education, sustainability competencies are versatile tools needed to achieve the goal of transforming our way of living into a more sustainable way (Wiek et al., 2011a, s. 5; Wiek et al., 2015; United Nations, 2015; UNESCO, 2017; UNESCO, 2018b). By sustainable way, we mean a path that applies the following definition: 'Sustainability is the collective willingness and ability of a society to reach or maintain its viability, vitality, and integrity over long periods of time, while allowing other societies to reach or maintain their own viability, vitality, and integrity' (Wiek et al., 2015, p. 241).

In the present framework, as noted, we apply the interpretation of sustainability competencies as consisting of five components: systems-thinking competency, strategic competency, anticipatory competency, normative competency, and interpersonal competency (Wiek et al. 2011a).

SYSTEMS-THINKING COMPETENCY

The purpose of the systems-thinking competency is to develop the ability to address sustainability problems from a wider and more holistic perspective focusing on understanding the intermediate and root causes of complex problem constellations. The systems-thinking competency refers to higher level thinking and methodological skills that enable us to analyze comprehensively complex systems across multiple scales (local to global) and domains (e.g. society, environment, economy) using different types of data (qualitative and quantitative data, narratives etc.) with acquired systemic knowledge (structure, function, cause-effect relations, perceptions, motives, decisions and regulations) and analyzing skills (comprehension, empiric verification, articulation of system structure, key components utilization, and dynamics) (Wiek et al., 2011a.). The systems-thinking competency provides the intellectual basis for developing strategic competency (Wiek et al., 2011b; 2015).

In order to reflect on these issues with learners between 8 and 15, teachers can engage in activities such as, for example, consulting sites and discussing habits/cultural trends concerning food and nutrition, origins of

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food crops and economical and environment problems related to food production and food waste (see, for instance, https://blog.ciat.cgiar.org/origin-of-crops/).

Also using the food theme, teacher can propose learners to make a shopping list and fill out an identification card for each of the foods on the list. This identification may contain information such as, for example, country of origin or place of provenience of the listed food, distance traveled, type of transport used and if it's fresh or frozen. This reflection can be deepened through the calculation of the food ecological and water footprints. There

are several footprint calculators available and that can be used. It is suggested to consult the following:(https://www.bbc.com/news/science-environment-46459714; https://waterfootprint.org/en/resources/interactive-tools/product-gallery/).

Water and ecological footprints results for each food may be included on the identification cards. At the end of the activity, the teacher can help learners to reflect on the meaning of the food ecological and water footprints and to identify actions / consumption options that allow their reduction.

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STRATEGIC COMPETENCY

Strategic competency refers to the understanding of strategic concepts (intentionality, systemic inertia, path dependencies, barriers, carriers, alliances, etc.); strategic knowledge (viability, feasibility, effectiveness, efficiency of systemic interventions, potential of unintended consequences); and skills (designing, testing, implementing, evaluating, and adapting policies, programs, action plans, collaboration, etc.). Strategic competency is the ability to design and implement strategy plans towards sustainability that could justifiably avoid undesirable scenarios (interventions, transitions, transformative governance strategies) (Wiek et al., 2011a; Wiek et al., 2011b; Wiek et al., 2015).

Implementing strategic competency requires the capability to apply other sustainability competencies in action. Attempts to affect the current state of the social-ecological system are justified with the usage of the systems-thinking competency, while the direction towards more sustainable ways of living is determined through the normative competency and the anticipatory competency. The interpersonal competency is a necessity for co-constructing the knowledge and practical solutions needed in intervention strategies and transformative actions (Wiek et al., 2011b.) The action competency is the ability to act for sustainability and can be defined as a latent capacity to act sustainably (de Haan 2006; Olsson et al., 2020). This competency is crucial to achieving sustainable development goals. Change cannot happen through State intervention, legislation, new innovative technologies or efficient economies without the support of the population (de Haan, 2006).

In order to reflect on these issues with learners between 6 and 12, teachers can engage in activities such as, for example, exploring fables to emphasize the importance of social values and lead the learners to design intervention plans for their schools to promote respect and solidarity with other people and the environment (see, for instance, https://en.unesco.org/themes/education or https://www.ohchr.org/documents/publications/selfassessmentguideforgovernments.pdf).

Teachers can also organize a study trip with the learners, going, for example, to a nearby beach. The purpose of this visit would be to clean the beach, collecting as much garbage as possible. At school, the teacher can reflect with the learners about the scenery found on the beach, focusing on the origin and type of waste found and the way pollution causes damage to the visited ecosystem. The activity could end with a list of actions that prevent pollution of different ecosystems (eg, beach, forest, ...). Further, students may invent solutions to use school resources (such as tablets) more effective way. Or make mobile phone app (prototype) to help others to act more sustainable way.

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ANTICIPATORY COMPETENCY

Anticipatory competency involves specific analysis skills that focus on possible future trajectories and scenarios (sustainability issues, sustainability problem-solving frameworks, imagination play, creativity) (de Haan, 2006, p. 22–23; Wiek et al., 2011a; Wiek et al., 2011b; Wiek et al., 2015). Anticipatory competency is the ability to evaluate the leading edge of development, using systems-thinking competency and strategic competency. It brings together future-oriented knowledge (time and uncertainty) and skills (simulation and scenario analysis). This is the competency we use to systematically think about and envision future states and future generations (Wiek et al., 2011a; Wiek et al., 2011b; Wiek et al., 2015). Systems-thinking competency and strategic competency are thus essential in developing anticipatory competency (Meza Rios et al., 2018). In turn, anticipatory competency is needed in the creation of transition strategies, i.e., strategic competency (Swart et al., 2004).

In order to reflect on these issues with learners between 5 and 15, teachers can engage in activities such as, for example, exploring famous paintings, representing ideas concerning a new world/new cities through drawings and justifying their options and possible consequences (see, for example, https://www.travelandleisure.com/attractions/museums-galleries/museums-with-virtual-tours or https://www.youtube.com/watch?v=HhVMYNPWG88&feature=youtu.be).

Cadavra exquis can also be used (https://content.gulbenkian.pt/wp-content/uploads/sites/16/2020/05/05104127/Gulbenkian-em-casa-Cadavre-exquis.pdf). Learners, in pairs, represent, through different modalities of expression (words, phrases, expressions, symbols, diagrams, drawings, etc.), their vision of the current world and how they imagine the world to be in 20 years. Each learner fills his space on the sheet of paper or cardboard. While one learner starts one of the cadavra exquis that starts with the question "How is the world today?", The other one starts the other cadavra exquis with the question "What will the world look like in 20 years? when you are an adult?" After the first phase, the learners exchange the sheet of paper or cardboard with each other and discuss their drawings. In addition, to promote further reflection, the teacher may can also cask some questions about the world and how each learner sees it, such as: "What images or words do you associate with the current world? ; What do you like most about this world ?; What do you like least about this world ?; What is positive about the world ?; What happens less positive in the world ?; How do you think the world will be in 20 years? And 100 years from now?; If you could, what would you change in the world? How do you think you can help make the world better?".

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NORMATIVE COMPETENCY

Normative competency is defined as the ability to map, specify, apply, reconcile, and negotiate values, principles, goals, and targets. Understanding how key concepts vary across and within cultures indicates normative competence, which can be used in solving sustainability problems through conceptual deliberation and integration. Sustainability is inevitably a value-laden concept, since it addresses questions around how social-ecological systems should change and what they should be like. Normative knowledge (concepts of justice, equity, social-ecological integrity, and ethics) and skills (multicriteria assessment and structured visioning) are needed to comprehensively address, deliberate, and assess sustainability problems or phenomena. Normative competency implies values thinking. It actualizes as thinking and acting with respect to nature and sustainability, as promoting intergenerational equity, and in a willingness to collaborate towards social inclusion (Wiek et al., 2011a; Wiek et al., 2011b; Wiek et al., 2015).

In order to reflect on these issues with learners between 5 and 15, teachers can engage in activities such as, for example, discussing what is an education of quality focused on children's rights combining different perspectives namely related to culture and age (see, for example, https://www.youtube.com/watch?v=NQwqFKerFMg&list=PLuaYSS3ezmQAuqmz2En-BlEqb5bX2fUvM&index=7).

Teachers can also use the UNESCO video - SDG 4 - Quality Education - 30 ' https://www.youtube.com/watch?v=NQwqFKerFMg&list=PLuaYSS3ezmQAuqmz2En-BlEqb5bX2fUvM&index=7) as a starting point for exploring learners' ideas about the values that could / should be present for quality Education. At the end of the exploration and discussion of the video, learners can, in pairs, make a video-recorded or PowerPoint documentary that continues the message of the children in the video.

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INTERPERSONAL COMPETENCY

A collaborative approach is closely connected to learning and implementing all other sustainability competencies. Interpersonal competency implies social knowledge and skills (communicating, deliberating, negotiating, collaborating, leadership, pluralistic and trans-cultural thinking, and empathy). Interpersonal competence is the ability to understand, embrace, and facilitate cultural and societal diversity. It is essential to understand that sustainability is our common goal and that achieving sustainability requires interpersonally competent people (Wiek et al., 2011a; Wiek et al., 2011b; Wiek et al., 2015). According to de Haan (2006, p. 24), 'all conceptions for sustainability aim to promote more justice, always call for more just balance between the poor and the rich, the privileged and the disadvantaged, and strive to minimize or eliminate repression'. Interpersonal competency is about individual and collective competency: the ability to cooperate towards equity, solidarity, and justice between people (see de Haan, 2006; Wiek et al., 2011a; Wiek et al., 2011b; Wiek et al., 2015).

Interpersonal competency is recognized as one of the key competencies for change agents working to solve sustainability problems and advance sustainability worldwide. Communication, teamwork, and stakeholder engagement are important factors in advancing sustainability (Konrad et al., 2020; Brundiers & Wiek, 2017).

In order to reflect on these issues with learners between 5 and 15, teachers can engage in activities such as, for example, proposing that learners interview people different from them and then discuss the need to respect other people's identities considering several features: linguistic, cultural, social, environmental, economic, etc. (see, for example, https://terralingua.org/langscape_articles/pura-vida-costa-rican-peasants-fight-for-a-world-that-contains-many-worlds/ and http://www.linguistic-rights.org/pt/).

With learners between 5 and 10 teachers can use the "This is how we do it" (https://www.youtube.com/watch?v=NmXnPrd-Evk). Teachers / educators can use the link to initiate a dialogue related to the book's themes (depending on the children's interests and issues), such as: breakfast, forms of travel, forms of writing, games and traditional games, ways to collaborate at home, dinner hours, … Learners, together, discuss what they do differently or similarly to the children in the book and discuss the need to respect other people's identities.

DOCUMENT ANALYSIS
APPROACH

As noted, the main objective of IO1 is the construction of a framework of reference on education for sustainability (EduS) to guide the future actions of teachers and teacher educators. To attain this objective, the different teams carried out an analysis and systematization of the research literature and national benchmarking level strategies in various EU member states. The analysis included reviewing policy documents, dissertations, and PhD theses, and contributed to a national summary produced by each team. To achieve the objectives of IO1 – the construction of a framework for EduS – the following actions were taken:

a. Identification and reading of scientific papers (published in scientific journals) to construct the categories of content analysis;

b. Identification of relevant national level educational policy documents;

c. Exploratory content analysis of identified regional level educational policy documents;

d. Discussion and definition of the categories of analysis according to EduS;

e. Selection of national level documents;

f. Organization and analysis of data, with the support of webQDA software;

g. Discussion of the results of the analysis among the project partners;

h. Definition of criteria for the identification of national or regional dissertations and PhD theses on EduS;

i. Selection and analysis of dissertations and PhD theses, supported by webQDA software;

j. Discussion of the results of analysis in project meetings.

Our analysis started with a scientific literature review. The theoretical background was formed through the dimensions of the project. We consider the ultimate goal of education for sustainability to be boosting students' competencies to foster a more sustainable society. Based on the literature around education for sustainability, we thus selected the sustainability competencies as a frame for analyzing the educational policy documents and regional documents. Benchmarks for the sustainability competencies were determined from educational policy documents and sustainability education-related doctoral theses. A deductive content analysis was applied (see, e.g., Elo & Kyngäs, 2008).

The method of qualitative content analysis was chosen – due to its applicability to our intention to analyze text data through a systematic classification process of coding, with the purpose of identifying specific themes (Hsieh & Shannon, 2005, p. 1278). Familiarizing ourselves with the existing sustainability education research and policy led us to find the concept of sustainability competencies interesting. We discussed the academic work of Wiek et al. (2011a; 2011b; 2015) and the potential of sustainability competencies to direct our analysis and the forming of EduS design principles. We agreed to specify our intention for the analysis to be identifying the appearance of sustainability competencies in the documents of analysis for each country. The concept of sustainability competencies became the basis for constructing the analysis matrix.

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The question for analysis was:

How and to what extent do the sustainability competencies appear in the documents?

Each project partner selected national educational policy documents and regional doctoral theses they deemed important, considering the EduS aim to develop teacher education for sustainability. In formulating the analysis matrix, the aim was to consider that the documents to be analyzed would be the outcomes of varying educational settings and cultures. We strived to define categories in ways that would centralize and unify the analysis process. Categories were based on the definitions of sustainability competencies described above.

Sustainability competencies were found in various educational policy documents. Yet, as anticipated, there were differences in how they appeared – among both countries and sustainability competencies. We thus discussed the factors underlying these variations. Content analysis, as a method, is sensitive to the interpretation of the researcher (see, e.g., Elo & Kyngäs, 2008), but not all variance is explained by this factor alone. There are clearly structural differences in educational policy documents, which vary both across and within regions. Sustainability in the context of education was absent in some of the documents, but addressed in others. The written form of each document affected the number of times sustainability competencies appeared therein. What was considered important was the variance between the five sustainability competencies that we analyzed from the documents. The tables below report the findings of each region. The documents analyzed are introduced in Appendix 1.

We used a qualitative data analysis program, webQDA (https://www.webqda.net/), in our analysis process. With webQDA, we were able to unify our working process. Where appropriate, the partner teams shared the same analysis framework and matrix to conduct their part of the analysis. Table 1 describes the analysis features of each sustainability competence and Figure 1 presents an example of analysis in webQDA.

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TABLE 1. ANALYSIS FEATURES IN SUSTAINABILITY COMPETENCIES.

SUSTAINABILITY COMPETENCY		ANALYSIS FEATURES
System-thinking competency	A	Recognize and understand relationships
	B	Analyze complex systems
	C	Think about how systems are embedded within different domains and different scales
	D	Deal with uncertainty
Anticipatory competency	A	Understand and evaluate several futures (possible, probable, and desirable
	B	Create one's own visions of the future
	C	Apply the principle of precaution
	D	Assess the consequences of actions
	E	Deal with risk and change
Normative competency	A	Understand and reflect on the norms and values that underlie people's actions
	B	Negotiate sustainability values, principles, goals and targets (in contexts of conflicts of interest and concessions)
Strategic competency	A	Collectively develop and implement innovative actions that promote sustainability (locally and in wider contexts)
Interpersonal competency	A	Be able to learn from others
	B	Understand and respect other people's needs, perspectives and actions (empathy)
	C	Understand, relate to and be sensitive to others (empathic leadership)
	D	Handle group conflicts
	E	Facilitate collaboration and participation in problem solving

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Figure 1. Example of document analysis in webQDA software.

In webQDA, there are the number of references for the collection of selected units. We divided analysis units into 'high' and 'low'. A high-level appearance indicates that the researcher has interpreted the document, at that point, to present the competency indicated in our analysis within a clear sustainability education context. A low-level appearance is somewhat unclear and lacks explicit indication of the sustainability competency in question. A low-level appearance could also be a mere mention of the sustainability competency, while a high-level appearance is associated with qualitatively richer substance.

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THE ANALYSIS

Sustainability competencies did appear in the educational policy documents of the countries' analyses. In some cases, the absence of a particular sustainability context resulted in lower appearance findings. The Finnish case, for example, was virtually the only one where 'education policy for sustainability' appeared in the curriculum. Themes that were addressed on the other education policy documents included, for instance, language education, support and guidance for students, sport and physical education, education and training of immigrants, and continuous learning, but not education for sustainability.

The systems-thinking competency appeared implicitly in the educational policy documents and doctoral theses we analyzed, in multiple ways. This indicates that the systems-thinking competency is understood as the realization that it is necessary to confront complex sustainability issues from as many perspectives as possible, to overcome the sustainability crisis. To achieve our sustainability related goals, we need to include perceptions from different groups and individuals in decision- and policy-making.

These are directly related to the government, its institutions and the political parties. Political parties should actively aim to reduce the sense of futility by seeking young people's opinions through voluntary meetings, organized seminars and debates on current environ-mental issues, in which young people are heard and given center stage (High-level appearance, NSESD, Malta).

The systems-thinking competency implies real-world problem-solving knowledge and skills that are already being taught in schools and applied in educational policy decisions. Information and communication technologies (ICT) are understood as learning and thinking tools that are advancing our capacity to tackle challenging sustainability problems.

Capabilities for systemic and ethical thinking develop gradually as the pupils learn to perceive the interactive relationships and interconnections between things and to understand complex issues (high-level appearance, The National Core Curriculum for Basic Education, Finland).

Virtual learning environments engage students in learning individually, in pairs, in teams. ICT helps to deepen subject knowledge, present work and discuss, research and experiment (Low-level appearance, The Good School Concept, 2015, Lithuania).

OUTCOME OF THE ANALYSIS

The documents analyzed demonstrate that a future-oriented perspective and future competency requirements, in the context of sustainability, are acknowledged in educational sustainability research and policy. Intergenerational appreciation was found to be a motivational factor that justifies sustainability related plans and acts. Developing a future thinking ability was understood as an important part of learning and advancing ethical thinking competence, one that was associated with sustainability education goals.

Understand the consequences of depleting natural resources for current and future generations (high-level appearance, Environmental Education Framework for Sustainability, Portugal).

In the case of France, the official description texts of the Common Base of Knowledge, Skills and Culture and the national education curricula for the mandatory education period contain references that were considered weak for sustainability competencies. The term sustainable development is not always used, but has been interpreted as such when referring to the environment and the planet's resources. This is the most recurrent systems-thinking competency, in a very general form; it is therefore analyzed as 'low-level'.

The need for students to understand the imperative of sustainable and equitable development of the human habitation of the Earth and the issues involved in structuring geography education in Cycles 3 and 4. They introduce a new relationship to the future and enable students to learn to place their thinking in a longtime frame and to imagine alternatives to what is thought to be an inevitable future (low-level appearance, Socle commun des compétences, France).

The normative competency was associated with concern about the current state of the environment. In both implicit and explicit ways, valuing sustainability was found in the documents of analysis. The normative competency appeared as an appreciation of nature and the environment, but also as an understanding of the importance of social justice and equality and their meaning in sustainable development.

The school empowers young people with knowledge and values for the construction of a more just society, centered on the person, on human dignity and on the world as a common good to preserve (high-level appearance, Student Profile, Portugal).

OUTCOME OF
THE ANALYSIS

In the documents of analysis, strategic competence appeared as an implementation of sustainability education's principles. Concrete examples of acting for sustainability were also associated with the appearance of the strategic competency.

The importance of the interpersonal competency was clearly noted in the research—and especially in educational policy. Solving sustainability issues is understood as a common objective that requires collaboration.

School is open to the world: school community members are interested in a changing environment and responsive to change (high-level appearance, The Good School Concept/Geros mokyklos koncepcija 2015, Lithuania).

Students are guided to adopt a sustainable way of life… In basic education, contradictions in consumption and production patterns are considered in relation to a sustainable future. Solutions are sought, formulated and implemented together with patience (high-level appearance, The National Core Curriculum for Basic Education, Finland).

Must demonstrate how to identify and respect cultural differences between students and the rest of the educational community (high-level appearance, National Strategy for Citizenship Education, Portugal).

Educators should start to introduce techniques to allow learners to make increasingly greater use of self-assessment to identify their strengths and development needs from the evidence of their efforts and act on feedback given from peers as well as educators in order to plan their next steps (low-level appearance, NCF, Malta).

Responsibility in interpreting publicly available information. Respect of personal data and copyright protection laws, ethical and moral standards, and maintain the reliability of published information (low-level appearance, Description of the primary, basic and secondary education Curriculum/ Pradinio, pagrindinio ir vidurinio ugdymo programų aprašas, 2015, Lithuania).

OUTCOME OF
THE ANALYSIS

The normative competency presents, in the case of France, the second most important occurrence in the texts analyzed. This competence is associated with concern for health and for assessing the impacts of human activities on the environment.

Adopt ethical and responsible behavior: identify the impacts (benefits and costs) of human activities on the environment at different scales. Basing one's choice of responsible behavior with regard to one's health or the environment on scientific arguments (Programs cycle 4, Life and Earth Sciences—France).

What was considered most important was the variance between the five sustainability competencies that we analyzed from the documents. Tables 2–6 show the frequencies with which the sustainability competencies appear in the policy documents in each country. All five competencies were found in the local analyses. In Malta and Portugal, the systems-thinking competency was the highest and the normative competency scored the lowest. Lithuania's results differed from the others. In Lithuania, the interpersonal competency was noticeably high and the strategic competency low. Yet in Finland, the strategic competency was the highest category. Finland's results differed from the other countries regarding the appearance of the anticipatory competency, which was the lowest in the Finnish educational policy. In France, the most frequently mentioned competency was systems thinking, while interpersonal competency was mentioned just a few times. Table 7 illustrates the summary of the findings from the analysis of documents in each country.

OUTCOME OF
THE ANALYSIS

TABLE 2. APPEARANCE OF SUSTAINABILITY COMPETENCIES IN MALTESE DOCUMENTS

DOCUMENT	SYSTEMS-THINK-ING	ANTICIPATORY	STRATEGIC	NORMATIVE	INTERPERSONAL
NSESD	2	4	7	0	4
NCF	5	12	9	9	6
A contextual study of EE in Malta	8	4	7	0	0
Maltese youth and the Environment	15	7	2	0	7
Learning through Nature program	7	1	1	1	3
Total	37	28	26	10	20

TABLE 3. APPEARANCE OF SUSTAINABILITY COMPETENCIES IN PORTUGUESE DOCUMENTS

DOCUMENT	SYSTEMS-THINK-ING	ANTICIPATORY	STRATEGIC	NORMATIVE	INTERPERSONAL
Environmental Education Framework	43	1	12	29	22
National Strategy for Citizenship Education	1	1	1	2	14
Student profile	29	9	8	15	21
Basic Law of the Portuguese Educational System	19	28	12	14	7
Decree Law 240-2001	2	2	3	3	5
Pre-School Curricular Guidelines	22	15	0	4	12
Total	116	78	51	39	66

OUTCOME OF
THE ANALYSIS

TABLE 4. APPEARANCE OF SUSTAINABILITY COMPETENCIES IN LITHUANIAN DOCUMENTS

DOCUMENT	SYSTEMS-THINKING	ANTICIPATORY	STRATEGIC	NORMATIVE	INTERPERSONAL
The Good School Concept	4	3	3	5	15
Description of the primary, basic and secondary education Curriculum	4	2	1	5	6
Concerning the adoption of the guidelines for the updating of the Curriculum	8	10	4	7	14
Concerning the educational plans for learning in secondary schools in 2019–2021	0	3	0	1	0
Total	16	18	8	18	35

TABLE 5. APPEARANCE OF SUSTAINABILITY COMPETENCIES IN FINNISH DOCUMENTS

DOCUMENT	SYSTEMS-THINKING	ANTICIPATORY	STRATEGIC	NORMATIVE	INTERPERSONAL
Finland's Stability Program	0	0	0	0	0
Teacher Education – Guidelines for Development	0	2	1	0	0
The National Core Curriculum for Basic Education	428 (interpreted through "underlying values")	264	312	712	439
Basic Education Act 628/1998	0	0	0	0	0
Basic Education Evaluation Plan 2020	0	0	0	0	0
Finland's National Reform Program 2019	0	0	0	0	0
Total	428	264	312	712	439

OUTCOME OF
THE ANALYSIS

TABLE 6. APPEARANCE OF SUSTAINABILITY COMPETENCIES IN FRENCH DOCUMENTS

DOCUMENT	SYSTEMS-THINK-ING	ANTICIPATORY	STRATEGIC	NORMATIVE	INTERPERSONAL
Thesis Carole	22	7	18	17	1
HDR JM Lange	3	2	1	3	2
High School Pro-gram	3	4	8	3	0
Program Elementary and middle schools	14	2	7	12	1
Circular 2015	4	2	2	3	2
Total	39	16	37	31	6

TABLE 7. PROPORTION OF THE COMPETENCIES IN NATIONAL DOCUMENTS. SUMMARY OF THE RESULTS

DOCUMENT	SYSTEMS-THINK-ING	ANTICIPATORY	STRATEGIC	NORMATIVE	INTERPERSONAL
Malta	31%	23%	21%	8%	17%
Portugal	33%	22%	15%	11%	19%
Lithuania	17%	19%	8%	9%	37%
Finland	20%	12%	33%	14%	20%
France	30%	12%	29%	24%	5%
Average	26%	18%	21%	13%	20%

CONCLUSIONS AND
RECOMMENDATIONS

Our analysis shows that sustainability, in the context of education, is not present in all of the documents reviewed. This is due to differences in the culture of education across the various countries. Structural differences were also reported in educational policy documents; these varied both across and within countries. The written form of each document also affected the number of sustainability competence appearances therein.

Education has a special – and a vital – responsibility to provide us with the knowledge, skills, and attitudes that can enable us to overcome the sustainability crisis we are now inevitably facing, world-wide.

EduS targets learning to value nature as a necessity to our existence and way of living. The importance of values seems to be noted, in the documents we analyzed. Ethical thinking and cultural values are discussed as the key components of sustainability education.

The complexity of climate change is widely recognized and acknowledged. A holistic or comprehensive multidimensional approach in EduS research was often a starting point for further research or design. The need to develop the systems-thinking competency was mentioned multiple times. Yet in education policy documents, the systems-thinking competency was not necessarily seen as a sustainability competency.

Overall, the concept of sustainability competencies could be applied to provide a more explicit framework and clarify sustainability education. Sustainability issues involve complex and multidimensional phenomena. This awareness did appear in the educational policy documents and national curriculums we analyzed, in which the sustainability competencies' appearance was implicit.

SUSTAINABILITY COMPETENCIES IN TEACHER EDUCATION

The aim of this EduS framework is to have an impact in different curricular areas and in different cycles of school systems—allowing for the transferability of teaching knowledge and the reconceptualization of this knowledge with a clear EduS intention. Tables 8–12 present the design principles as a framework, to guide the embodiment process of the EduS vision in teacher education. The framework integrates sustainability themes and competencies.

CONCLUSIONS AND RECOMMENDATIONS

TABLE 8. DESIGN PRINCIPLES FOR THE DIMENSION OF ENVIRONMENT AND NATURAL RESOURCES

COMPETENCY	DESIGN PRINCIPLE
Systems-thinking competency	Understanding that natural resources are finite and that the way we use them has consequences for the environment (and thus for humanity, since we are part of an ecological system).
Anticipatory competency	Previewing consequences (positive and negative) for the environment, of how we choose to use natural resources
Strategic competency	Studying, previewing, and testing sustainable ways of using natural resources.
Normative competency	Analyzing present norms and values, to identify changes that are necessary to preserve the natural and social environments.
Interpersonal competency	Presenting individual/group perspectives on the use of natural resources and their consequences for the environment and accepting the need to compare them with other points of view.

TABLE 9. DESIGN PRINCIPLES FOR THE DIMENSION OF EQUITY AND SOCIAL SOLIDARITY

COMPETENCY	DESIGN PRINCIPLE
Systems-thinking competency	Understanding that people are all different and thus complementary, because each has a role to play in society.
Anticipatory competency	Previewing consequences (positive and negative) of attitudes towards persons or social groups, in terms of respect for equity and human solidarity.
Strategic competency	Conceiving new ways of arranging social relations, to promote equity and social solidarity.
Normative competency	Analyzing present norms and values, to identify their potential regarding equity and social solidarity.
Interpersonal competency	Individually or collectively analyzing situations from the point of view of their potential to promote equity and social solidarity.

CONCLUSIONS AND RECOMMENDATIONS

TABLE 10. DESIGN PRINCIPLES FOR THE TECHNOLOGY DIMENSION

COMPETENCY	DESIGN PRINCIPLE
Systems-thinking competency	Understanding benefits resulting from modern technology, along with the problems it can generate.
Anticipatory competency	Foreseeing consequences (positive and negative) of technology, to make a balanced use of it.
Strategic competency	Studying the role technology may play in sustainable development (remembering that technology was conceived to serve people, not the reverse).
Normative competency	Analyzing present norms and values, to identify their potential regarding a balanced use of technology.
Interpersonal competency	Presenting individual/group perspectives on the use of technology and its consequences and accepting the need to compare them with other points of view.

TABLE 11. DESIGN PRINCIPLES FOR THE DIMENSION OF DIALOGUE AND SOCIAL INCLUSION

COMPETENCY	DESIGN PRINCIPLE
Systems-thinking competency	Understanding the importance of analyzing the role played by people different from us, in society.
Anticipatory competency	Previewing consequences (positive and negative) of certain attitudes towards persons or social groups, in terms of understanding the role they play in the human society.
Strategic competency	Learning to accept that differences are important, because they have positive consequences for social balance.
Normative competency	Analyzing present norms and values, to identify their possible contribution to dialogue and social inclusion.
Interpersonal competency	Individually or collectively analyzing one's conception of other people/groups, based on the idea of acceptance.

CONCLUSIONS AND RECOMMENDATIONS

TABLE 12. DESIGN PRINCIPLES FOR THE DIMENSION OF ECONOMY AND FINANCIAL LITERACY

COMPETENCY	DESIGN PRINCIPLE
Systems-thinking competency	Understanding the difference between the effective use of materials vs. the current widely unsustainable way of living.
Anticipatory competency	Understanding that decoupling economic growth from the use of material resources can lead to new occupations and business opportunities.
Strategic competency	Inventing sustainable products and solutions.
Normative competency	Understanding that different people value different things. Students learn to value sustainable ways of living.
Interpersonal competency	Inventing products and solutions that positively influence others' behavior, as well as one's own.

This work led to the construction of a framework of EduS focused on competencies to be developed in/with learners, pedagogical-didactic activities to plan, implement and assess in educational contexts – which can also be considered as examples for the construction of other activities by educators and teachers adapted to the contexts in which they work – and a national and transnational curricular background in Europe. Although the contexts are very diversified and in spite of their specificity, all of them include opportunities of curricular development that try to place EduS in the center of educational concerns, presenting this notion as a complex entity, capable of articulating among them several dimensions of knowledge and demanding comprehension, action and refection related to modern world and possibilities of transforming it.

REFERENCES

Andrews, D. (2015). The Circular economy, design thinking and education for sustainability. Local Economy: *The Journal of the Local Economy Policy Unit*, 30(3), 305–315. doi:10.1177/0269094215578226

Brundiers, K. & Wiek, A. (2017). Beyond Interpersonal Competence: Teaching and Learning Professional Skills in Sustainability. Education Sciences, 7(1), 39. doi:10.3390/educsci7010039

Climate-KIC. (2020). The EU's coronavirus response initiative: An Interview with Felicity Spors, head of international affairs strategy at EIT Climate-KIC. https://www.climate-kic.org/community/the-eus-coronavirus-response-initiative/

Daun, H. (2011). Globalization, EU-ification, and the New Mode of Educational Governance in Europe. European Education, 43(1), 9–32. doi:10.2753/EUE1056-4934430102

de Jesus, A., Antunes, P., Santos, R., & Mendonça, S. (2018). Eco-innovation in the transition to a circular economy: An Analytical literature review. *Journal of Cleaner Production*, 172, 2999–3018. doi:10.1016/j.jclepro.2017.11.111

Eco-schools. (n.d.). Eco-schools themes. https://www.ecoschools.global/themes

Ellen MacArthur Foundation & Material Economics (2019). Completing the picture. How the circular economy tackles climate change. (V.3—26 September 2019).

Ellen MacArthur Foundation (2017). What is the circular economy? https://www.ellenmacarthurfoundation.org/circular-economy/what-is-the-circular-economy

Elo, S. & Kyngäs, H. (2008). The Qualitative content analysis process. *Journal of Advanced Nursing* 62(1), 107–115. doi: 10.1111/j.1365-2648.2007.04569.x

EU. (2019). The European Green Deal. https://ec.europa.eu/info/sites/info/files/european-green-deal-communication_en.pdf

European Environmental Agency. (2019). Europe's State of the Environment 2020: Urgent action needed to reverse degradation and ensure prosperity. https://www.factorco2.com/en/europes-state-of-the-environment-2020-urgent-action-needed-to-reverse-degradation-and-ensure-prosperity-/new/6745

EUR-Lex. (n.d.). Environment and climate change. https://eur-lex.europa.eu/summary/chapter/environment.html?root_default=SUM_1_CODED%3D20&locale=en

European Commission (2020). Communication from the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. A New Circular Economy Action Plan. For a cleaner and more competitive Europe. COM(2020) 98 final. Brussels.

REFERENCES

European Commission (2015). Communication from the Commission to the Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Closing the loop—An EU action plan for the Circular Economy. COM(2015) 614 final. Brussels.

Ghisellini, P., Cialani, C. & Ulgiati, S. (2016). A Review on circular economy: The Expected transition to a balanced interplay of environmental and economic systems. *Journal of Cleaner Production*, 114, 11–32. doi:10.1016/j.jclepro.2015.09.007

de Haan, G. (2006). The BLK '21' programme in Germany: A 'Gestaltungskompetenz'-based model for Education for Sustainable Development. *Environmental Education Research: Environmental education in three German-speaking countries: Research perspectives and recent developments*, 12(1), 19–32. doi:10.1080/13504620500526362

Hesselink, F. & van Kempen,P.P. (1999). Environmental education and training in Europe: Background paper for the European Union Conference on EE&T in Europe, Brussels 3–4, May. http://www.vankempenconsultancy.com/html/resources/6D/6DD8C46E-3DE7-447F-BEA9-3074AF03DF56/EU_BG_Paper.pdf

Hsieh, H. & Shannon, S. E. (2005). Three Approaches to Qualitative Content Analysis. Qualitative Health Research, 15(9), 1277–1288. doi:10.1177/1049732305276687

INTERREG EUROPE (2014). Strategic Environmental Assessment Environmental Report. Prepared by Dr. Dräger & Thielmann Frankfurt. Retrieved from https://www.interregeurope.eu/fileadmin/user_upload/documents/Interreg_Europe_Environmental_Report_final_version.pdf

ICF (2016). Analysis of the results achieved by CIP Eco-innovation market replication projects (EACI/ECO/2013/001). Final Report Annex A2—Global project report. Brussels. Retrieved from https://ec.europa.eu/easme/sites/easme-site/files/2_-_global_report.pdf

Konrad, T., Wiek, A. & Barth, M. (2020). Embracing conflicts for interpersonal competence development in project-based sustainability courses. *International Journal of Sustainability in Higher Education*, 21(1), 76–96. doi:10.1108/IJSHE-06-2019-0190

Kopnina, H. (2018). Teaching circular economy: Overcoming the challenge of green-washing. *Handbook of Engaged Sustainability*, 809–833. doi:10.1007/978-3-319-71312-0_48 Retrieved from www.scopus.com.

Korhonen, J., Honkasalo, A. & Seppälä, J. (2018). Circular Economy: The Concept and its Limitations. *Ecological Economics*, 143, 37–46. doi:10.1016/j.ecolecon.2017.06.041

OECD (2018). Oslo Manual 2018. Guidelines for collecting, reporting and using data on innovation, 4th edition. https://www.oecd-ilibrary.org/docserver/9789264304604-en.pdf?expires=1589785872&id=id&accname=guest&checksum=FD951997579E05BC1D-214B4703671EAB

REFERENCES

Olsson, D., Gericke, N., Sass, W., & Boeve-de Pauw, J. (2020). Self-perceived action competence for sustainability: The Theoretical grounding and empirical validation of a novel research instrument. *Environmental Education Research*, 26(5), 742–760. doi:10.1080/135046 22.2020.1736991

Pantzar, M. & Suljada, T. (2020). Delivering a circular economy within the planet's boundaries: An Analysis of the new EU Circular Economy Action Plan. Institute for European Environmental Policy (IEEP) and Stockholm Environment Institute (SEI): Brussels and Stockholm.

Project Learning Tree. (2016). Top 10 benefits of environmental education. https://www.plt.org/educator-tips/top-ten-benefits-environmental-education/

Swart, R., Raskin, P. & Robinson, J. (2004). The Problem of the future: Sustainability science and scenario analysis. *Global Environmental Change*, 14(2), 137–146. doi:10.1016/j.gloenvcha.2003.10.002

UNESCO (2018a). *Issues and trends in education for sustainable development.* Written by A. Leicht, J. Heiss & W. J. Byun (eds).

United Nations (2015). Nagoya Declaration on Higher Education for Sustainable Development. https://sustainabledevelopment.un.org/content/documents/5864Declaration%20-%20Higher%20Education%20for%20Sustainable%20Development%20Nagoya%202014.pdf

UNESCO (2017). Education for the Sustainable Development Goals. Learning Objectives. https://unesdoc.unesco.org/ark:/48223/pf0000247444

UNESCO (2018b). Global Action Programme on Education for Sustainable Development. https://unesdoc.unesco.org/ark:/48223/pf0000246270

UNESCO (2019). Teacher Policy Development Guide. Paris. https://unesdoc.unesco.org/ark:/48223/pf0000370966?posInSet=19&queryId=N-647e137d-b522-4981-b1c0-d369ce716db8

United Nations (UN) (2019). The Future is Now. The Science for achieving sustainable development. Global Sustainable Development Report 2019. https://sustainabledevelopment.un.org/content/documents/24797GSDR_report_2019.pdf

Wiek, A., Bernstein, M., Foley, R., Cohen, M., Forrest, N., Kuzdas, C., Kay, B., & Withycombe Keeler, L. (2015). Operationalising competencies in higher education for sustainable development. In M. Barth, G. Michelsen, M. Rieckmann, I. Thomas (Eds.) Handbook of Higher Education for Sustainable Development (pp. 241–260). Routledge, London.

Wiek, A., Withycombe, L., Redman, C. & Mills, S. B. (2011a). Moving forward on competence in sustainability research and problem solving. *Environment: Science and Policy for Sustainable Development*, 53(2), 3–13.

Wiek, A., Withycombe, L. & Redman, C. (2011b). Key competencies in sustainability: A Reference framework for academic program development. Sustainability Science, 6(2), 203–218. doi:10.1007/s11625-011-0132-6

APPENDIX
ANALYZED DOCUMENTS

MALTA

MALTA	KEY FINDINGS
Academic Papers	The papers presented either discuss the effectiveness of various programs on the knowledge, attitudes and behavior of schoolchildren or youth or are an analysis of the development of ESD on the islands including an analysis of the evolution of ESD in the schooling system. The paper that focuses on ESD development in Malta clearly identifies the dominant educational ideology as one of the main factors that slowed down ESD development. This ideology mostly values good marks in examinations, and, therefore, most school activities get sacrificed to make way for exam drills. Individual teachers with an interest in the environment may attempt ESD in their school, but, collectively, teachers are hampered with little timetable time and lack of locally produced resources. The two more recent studies indicate that there has been improvement at the school level and some innovative projects, especially those introduced by NGOs have had a good effect on the pro environmental behavior of children at the school level.
Policy documents	The local policy documents in Malta have clearly been developed through proper ESD frameworks and display the depth required of such official documents. Both the NSESD and the NCF highlight the importance of ESD and as one of the ways in which to engage and empower citizens in sustainability issues. The importance of ESD at the school level both for pupils and teachers and in initial teacher education programs are the main themes explored. The documents exhibit the work of both a top down and a bottom up approach. There is clarity in thinking and the policy documents are grounded in research and have also vastly utilized the voices of various stakeholders. Nonetheless it is clearly apparent that notwithstanding the proper framework and well-designed policies of these documents, there is a lot of difficulty in actual implementation in the school context. There appear to be a lot of barriers including teacher preparation, the examination mentality, weak leadership and uncooperative management.
Doctoral theses	No doctoral thesis specifically focusing on ESD and schools are currently locally available. The lack of such thesis stems from the very small local population and facilities rather than a lack of interest.

APPENDIX
ANALYZED DOCUMENTS

NATIONAL DOCUMENTS

National Strategy of Education for Sustainable development (the first national document that covers ESD from a holistic perspective. The document still requires Parliamentary approval – probably in 2020.)

A National Curriculum Framework for All (2012). Ministry of Education and Employment Malta. (the national education framework document)

MESD THESIS

Cassar C., (2015) Sustainable development: An ambivalent cliché or a tangible reality? Exploring its complexities from the eyes of Maltese youths.

A dissertation presented to the Centre of Environmental Education Research (CEER) in part fulfilment of the Requirements for the Degree of Master in Education for Sustainable Development.

Cordina Cassar M. (2015) Maltese Primary School Teachers: Their Perceptions towards Education for Sustainable Development.

A dissertation presented to the Centre of Environmental Education Research (CEER) in part fulfilment of the Requirements for the Degree of Master in Education for Sustainable Development.

PUBLISHED PEER REVIEWED PAPERS

Mifsud M., Chisholm H., (2017). An analysis on the Effectiveness of the Lifelong Learning Through Nature Program

This study is an analysis of the LLN program and its potential for making links between outdoor learning, fieldwork and education for sustainable development

Mifsud M., (2012). 'A contextual study of the events that have shaped the development of environmental education in Malta'. Journal of Teacher Education for Sustainability, 12(2), 110-128.

This paper discusses the origins of environmental education in Malta and focuses on politics, education and colonialism and their role in the relative slow growth of ESD on the Maltese Islands.

Mifsud M., (2011). 'Maltese Youth and the Environment: A Qualitative Study'. Journal of Teacher

Education for Sustainability, 12(2), 110-128. ISBN: 978-960-466-060-5, ISSN: 1790-3859. One of the first local studies on youth and environment which attempts to identify the extent to which various factors influence the formation of pro-environmental attitudes and behavior in Maltese Youth. The paper proposes an 'Environmental Perspectives Model' which was designed following thematic

APPENDIX
ANALYZED DOCUMENTS

PORTUGAL

PORTUGAL	KEY FINDINGS
Environmental Education Framework for Sustainability	The document with the highest number of references for the key competences for EduS, with 88 references. In this document, the Strategic and Systemic Thinking competencies are presented with great evidence.
The Teacher Profile and Pre-School Guidelines	Documents are the ones with the least amount of evidence regarding the key competences: 14 and 16 respectively.
Doctoral theses	The greatest number of theses on EduS appears: Education - 9; Didactics - 5; Multimedia and Education - 2; Environmental Education - 2; Environmental Sciences and Engineering – 1 The University of Aveiro is, based on the sources consulted, the institution with the most doctoral studies in the field of EduS. Regarding the context of realization, we found that only 2 theses (Ph- DMM-201; PhD- CC-2013) focus on teacher education, and that the largest number of works in EduS focuses on Basic Education (1st and 2nd cycles) (e.g., PhD-SS-2012; PhD-VC -2015)
	The most represented key competence is Strategic competence, with 182 evidences in total, followed by Anticipatory competence, with 115. The least representative competence is Systemic Thinking, with 46 evidences distributed among the 14 theses of the corpus.

APPENDIX
ANALYZED DOCUMENTS

LEI DE BASES DO SISTEMA EDUCATIVO
BASIC LAW OF THE EDUCATIONAL SYSTEM

https://dre.pt/web/guest/pesquisa/-/search/222418/details/normal?p_p_auth=D688OvBC
It is a Law, n. 46/86, that establishes the general framework of the Education System. Although it needs to be occasionally restructured, it holds the main principles and guidelines by which Education should be governed.

ORIENTAÇÕES CURRICULARES PARA A EDUCAÇÃO PRÉ-ESCOLAR
THE CURRICULAR GUIDELINES FOR PRE-SCHOOL EDUCATION

https://www.dge.mec.pt/ocepe/sites/default/files/Orientacoes_Curriculares.pdf
The Curricular Guidelines for Pre-School Education are based on the global pedagogical objectives defined by Pre-School Education Framework Law, n. 5/97, February 10th, and are intended to support the construction and management of the curriculum in the kindergarten, which is the responsibility of each educator in collaboration with the team of the educational establishment that linked. The document covers a total of 112 pages and is divided into three main parts, which are subdivided, namely:
General Framework: Fundamentals and principles of childhood pedagogy; Educational intentionality – To build and manage the curriculum; Organization of the educational environment. Content Areas: Personal and Social Training Area; Expression and Communication Area; World Knowledge Area. Educational Continuity and Transitions.

PERFIL DOS ALUNOS À SAÍDA DA ESCOLARIDADE OBRIGATÓRIA
PROFILE OF STUDENTS LEAVING COMPULSORY EDUCATION

https://www.dge.mec.pt/sites/default/files/Curriculo/Projeto_Autonomia_e_Flexibilidade/perfil_dos_alunos.pdf
The Profile of Students Leaving Compulsory Education is a reference document for the organization of the whole education system, which contributes to the convergence and articulation of decisions inherent to the various dimensions of curriculum development. The purpose is to contribute to the organization and management of curricula and to the definition of strategies, methodologies and pedagogical-didactic procedures to be used in teaching practice. The document is structured in Principles, Vision, Values and Areas of Competence and covers a total of 30 pages which is divided into six parts, namely: Introduction, Principles, Vision, Values, Competence areas, Practical implications.

APPENDIX
ANALYZED DOCUMENTS

ESTRATÉGIA NACIONAL DE EDUCAÇÃO PARA A CIDADANIA
THE NATIONAL STRATEGY FOR EDUCATION FOR CITIZENSHIP

https://www.dge.mec.pt/sites/default/files/Projetos_Curriculares/Aprendizagens_Essenciais/estrategia_cidadania_original.pdf
The National Strategy for Education for Citizenship (ENEC) is the responsibility of a working group created for this purpose in 2017 under the supervision of the Secretary of State for Citizenship and Equality and the Secretary of State for Education. This strategy integrates a set of rights and duties that must be present in the citizenship education of Portuguese children and young people, so that in the future they become adults with a civic conduct that privileges equality in interpersonal relationships, the integration of difference, the respect for human rights and the valorization of democratic citizenship. The document covers a total of 15 pages and is divided into seven parts, namely: introduction, international and national reference documents, assumptions and starting points, expected learning outcomes in Citizenship and Development, operationalization in Citizenship and Development, teacher education and articulation with stakeholders. The most relevant section for the TEDS project is the one concerning teacher education. This section mentions the need to integrate Citizenship Education in pre- service teacher training and to develop continuing professional development programs for in- service teachers. These should take on a theoretical and practical nature, and should be centered on the school, on its priorities, needs and contexts, in conjunction with the school's curricular and extracurricular activities.

REFERENCIAL DE EDUCAÇÃO AMBIENTAL PARA A SUSTENTABILIDADE
ENVIRONMENTAL EDUCATION FRAMEWORK FOR SUSTAINABILITY

https://www.dge.mec.pt/sites/default/files/ECidadania/Educacao_Ambiental/documentos/referencial_ambiente.pdf
The Environmental Education Framework for Sustainability is organized by levels of education and teaching cycles. It is considered a guiding document for the implementation of that area of education for citizenship in pre-school education and in basic and secondary education. The aim of this document is to encourage the introduction of cross-cutting themes in order to contribute to the change in behavior and attitude towards the environment by young people and children and also by their families and communities. It includes a glossary and a list of resources grouped according to their nature and purpose. It is supposed to support teacher training and action concerning environment and sustainability issues. The document covers a total of 124 pages and is divided into five parts, namely: Introduction; Environment and Sustainability; Organization and Structure of the Referential; Themes, Subthemes, Objectives and Learning Outcomes.

APPENDIX
ANALYZED DOCUMENTS

LITHUANIA	KEY FINDINGS
Policy documents	Sustainability competencies as System thinking, future thinking, values thinking, action and interpersonal competences appears in latest documents on national curriculum development as strategies, attitudes, intendent learning outcomes, tasks. Analyses of the Good School Concept/Geros mokyklos koncepcija (2015), Description of the primary, basic and secondary education Curriculum/Pradinio, pagrindinio ir vidurinio ugdymo programų aprašas (2015), and the latest document Concerning the adoption of the guidelines for the updating of the Curriculum /Dėl bendrųjų programų atnaujinimo gairių patvirtinimo (2019) provides example of evidences. However, only engaging at a policy level might not lead to the desired changes regarding sustainability at the school, as there may be inconsistencies between declared commitments and real communication and activities. Support for teachers by providing in-service training activities is needed to encourage teachers rethink school curriculum.
Doctoral theses	Very limited number of doctoral thesis found. Researchers confirm that Sustainable development is a complex concept and a complex process for the well-being of present and future generations. The integrity of ecological, economic and social capital is one of the preconditions for successful implementation of sustainable development. Researchers argue that global education can serve as a tool for implementing sustainable development. (Pivorienė, 2014), and harmonious personality traits should be based on the essential values. The environment is changing so rapidly that when thinking about education for sustainability the most modern learning trends needs to be taken to the account - the needs of information, knowledge, learning, networking, virtual or wisdom society (Targamdze, 2019, p.30). Digital learning becomes more popular, but at the same time, the importance of active learning and learning from experience is recognized. Therefore, the organization of education in schools is changing - achievement standards (standards) set for a certain age are less respected, more flexible grouping and individualization is appreciated. It is not enough to integrate the concepts of sustainable development into the study programs, but institutional, innovative and organizational changes in the universities must also be implemented (Balčiūnaitienė, 2016).

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The Good School Concept/Geros mokyklos koncepcija (2015)

Description of the primary, basic and secondary education Curriculum/Pradinio, pagrindinio ir vidurinio ugdymo programų aprašas (2015)

Concerning the adoption of the guidelines for the updating of the Curriculum /Dėl bendrųjų programų atnaujinimo gairių patvirtinimo (2019)

Concerning the educational plans for learning in secondary schools in 2019-2021 /DEL 2019–2020 IR 2020–2021 MOKSLO METU PAGRINDINIO IR VIDURINIO UGDYMO PROGRAMU BENDRUJU UGDYMO PLANU PATVIRTINIMO (2019)

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FRANCE

FRANCE	KEY FINDINGS
High School Programs	Sustainable development is adopted in its classical sense as an approach to restoring dynamic balances between the environment, the social world, the economy and culture. Education for Sustainable Development (ESD) is a cross-cutting education, which integrates the challenges of sustainable development into the new curricula of primary schools and into the disciplinary curricula of general, technological and vocational secondary schools". References to sustainable development are included in the curricula, but with the exception of a few disciplines (above) they are rarely explicitly formulated in the form of competencies. Rather, they are formulated in terms of intention or theme in which the knowledge worked on appears as educational contributions to sustainable development. However, the analysis does show some direction: A marked expectation for action-oriented and normative competences rather than concerns about understanding sustainability phenomena.
Doctoral thesis Thesis by Carole Voisin	The author seeks to identify difficulties and obstacles in environmental education. She proposes a triple analysis: philosophical, didactic and epistemological of biodiversity education in order to show the stakes but also the risks for the French republican school. The analyses show tensions that are not so obvious to overcome, but important to take into account. Thus, she wonders how to participate in the construction of an environmental awareness without falling into practices that tend towards conformism. French institutional texts leave a "vagueness" and allow the pursuit of several educational goals. However, an education for sustainable development whose vocation is to train a citizen according to a previously determined model risks making impossible an educational aim at the heart of the school: the emancipation of the citizen. To take up a question shared in educational philosophy, it is a question of asking how can one educate without conforming? The second tension in relation to the first concerns the status of the knowledge at stake. This is also particularly present in the analyses. In the framework of ESD, there are different registers of knowledge, in various scales of time and space and integrating controversies and uncertainties. However, it shows that knowledge is sometimes reduced to one of its dimensions (a more scientific focus or through actions in favor of the environment, for example), summoned in a utilitarian perspective or denied its stakes and discussions. The question then arises of identifying more precisely what "systemic" knowledge can or should be (what knowledge, what articulation of this knowledge, what element of knowledge) and how to construct it with the pupils. It proposes to reflect on the progressive nature of the construction of these skills from nursery school onwards, without going towards a purification such that knowledge loses its meaning.
Doctoral theses	The author seeks to develop specific didactics for Education for Sustainable Development (ESD). This didactic "contents oriented towards acting in society (COA)" is intended to be a prototype for other "education for living together", particularly health education.
Habilitation Thesis (HDR) Jean Marc Lange	Jean-Marc Lange outlines the aims of an education for sustainability: - to learn about the collective through social practice - to underpin belonging to the world by updating the issues at stake - to learn to anticipate and reduce our vulnerabilities by developing sustainable solutions - to develop a sense of empathy for present and future humanity, and towards non-human beings. He outlines what he calls an action-oriented content didactics. This is structured by the tri-pole of educational actions, complemented by multi-referential investigations of issues and by disciplinary contributions. This didactics is characterized by the importance given to action, to societal issues, to the implications of acts and decisions, to the mobilization of proactive, hybrid knowledge, with explicit reference to values under the permanent constraint of a moving politicized project, in continuous rectification.

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https://eduscol.education.fr/pid34150/cycle-3-ecole-elementaire-college.html

Cycle 4 Program - Effective as of the start of the 2018-2019 school year

https://eduscol.education.fr/pid34185/cycle-4-college.html

Common base of knowledge, skills and culture https://www.education.gouv.fr/le-socle-commun-de-connaissances-de-competences-et-de-culture-12512

Special Official Bulletin No. 1 of 22 January 2019 Curricula for the general and technological second class and the first and final classes of the general and technological pathways.

https://www.education.gouv.fr/pid285/bulletin_officiel.html?pid_bo=38502

Circular of 5 February 2015 including an Instruction on the deployment of education for sustainable development in all schools and educational establishments for the period 2015-2018. https://www.education.gouv.fr/au-bo-du-5-fevrier-2015-education-prioritaire-education-au-developpement-durable-orientation-et-4175

Jean-Marc Lange. Éducation au Développement Durable : problématique éducative / problèmes de didactique. Education. ENS Cachan, 2011. Habilitation Thesis.

Carole Voisin. Enseigner la biodiversité -obstacles et difficultés à un enseignement généralisé : approche philosophique, épistémologique et didactique. Education. Université de Nantes - CREN, 2017. Français. PhD Thesis.

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FINLAND

FINLAND	KEY FINDINGS
See e.g.: Finland's Stability Program (The General Government Fiscal Plan 2020-2023), Finland's National Reform Program 2019, Basic Education Act 628/1998	Identifying and developing (future) competence is mentioned in educational policy documents, but not in sustainability context. In Finnish education system, The National Core Curriculum for Basic Education is the most important policy document in implementing education for sustainability. This emphasizes the role of the teacher as a curriculum theorist who has big responsibility in the implementing process of the curriculum that comes along with the high level of teacher autonomy.
See: The National Core Curriculum for Basic Education 2014	Transversal competence includes topics or contents from sustainability competencies presented, but many parts are not linked to sustainability. Underlying values of the curriculum enables the interpretation that transversal competence, content areas and learning objectives could be interpreted in the context of sustainability education. The Finnish educational policy for teaching sustainability is open to different interpretations and implementations – also the ones that avoid interpretations that are related to sustainability education. Implementing the curriculum from the perspective of sustainability competencies requires interpretation of the curriculum through its underlying values.
See: Basic Education Evaluation Plan 2020	According to our analysis, in grades 3–9 there is only few assessment criteria (for good / numerical grade 8) that has mention of explicit sustainability related learning objective. In order to evaluate sustainability competence, teachers need to interpret and implement learning objectives including transversal competence in teaching and evaluation.
Guidelines for Development (Teacher Education)	Finnish teacher education is already focusing on the same kind of competence as sustainability competencies represent – with the exception that it lacks the context of sustainability. According to our analysis, Finnish teacher education needs to adopt more explicitly sustainability as its priority.
Doctoral theses	Systems-thinking competence appeared as a holistic approach to sustainability that indicated comprehensive understanding about complex causes that determine and affect climate change and sustainability related issues (e.g. Ratinen, 2016; Saloranta, 2017; Raus, 2018; Herranen, 2019; Laine 2019) For example, Raus (2018) argues that sustainability is fundamentally a system failure. Ratinen (2016) claims that root level causes leading to climate change results from the lack of people's factual knowledge and conceptual understanding. Normative competence was emphasized as a core principle that justified research and argumentation. The importance of teaching the "right" values was noticed. Especially connection to nature and fundamental respect to sustainability were presented as the learning objectives that could transform our societies through cultural changes into sustainable state. (e.g. Saloranta 2017; Raus, 2018.) Sustainability problems were understood as outcomes of dominant worldviews that reinforce the wrong values in our societies and cultures (e.g. Raus, 2018). The main aim for sustainability education was presented as favourable changes in the behaviour of humans or even environmental citizenship (Aarnio-Linnavuori, 2018). In this sense, action competence becomes important learning objective in education for sustainability. The importance of cultural and social inclusion in sustainability education was concluded (Laine, 2019) and mentioned (e.g. Siirilä, 2016; Ratinen, 2016; Raus, 2018) Anticipatory competence was implicitly present in the form of concern about the current unsustainable societal state, but it was not presented as an independent learning objective.

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DOCTORAL THESES:

Aarnio-Linnavuori, E. (2018). Ympäristö ylittää oppiainerajat: Arvolatautuneisuus ja moninaisuus koulun ympäristöopetusken haasteina. Helsinki: University of Helsinki.

Herranen, J. (2019). Towards learner-driven science teacher education for sustainability. Helsinki: University of Helsinki.

Laine, M. (2019). Kohti kulttuurisesti kestävää kasvatusta: Kulttuurisesti kestävän kasvatuksen määrittyminen ja siihen liittyvät tulevaisuuden tarpeet. Helsinki: University of Helsinki.

Ratinen, I. (2016). Primary student teacher's climate change conceptualization and implementation on inquiry-based and communicative science teaching. A design research. Jyväskylä: University of Jyväskylä.

Raus, R. (2018). Teacher ecological self. Negotiating teacher ecological identity in the context of teacher education for sustainable development. Tampere: University of Tampere. Saloranta, S. (2017). Koulun toimintakulttuurin merkitys kestävän kehityksen kasvatuksen toteuttamisessa perusopetuksen vuosiluokkien 1-6 kouluissa. Helsinki: University of Helsinki.

Siirilä, J. (2016). Tulkintoja kestävän kehityksen käsitteestä YK:n kestävää kehitystä edistävän kasvatuksen teemavuosikymmenen 2005-2014 yhteydessä. Helsinki: University of Helsinki.

Wang, Y. (2019). Restructuring science curriculum for the twenty-first century: An assessment of how scientific literacy and twenty-first century competencies are implemented in the Finnish and Chinese national primary science curricula. Helsinki: University of Helsinki.

EDUCATIONAL POLICY DOCUMENTS:

Basic Education Act 628/1998, Education policy and strategy Finland.

Finnish National Agency for Education (2020). Oppilaan oppimisen ja osaamisen arviointi perusopetuksessa. Perusopetuksen opetussuunnitelman perusteiden 2014 muutokset (Basic Education Evaluation Plan 2020).

Finnish National Agency for Education (2016). National Core Curriculum for Basic Education 2014.

Ministry of Finance (2020). Finland's Stability Program: April 2020 (The General Government Fiscal Plan 2020-2030). Publications of the Ministry of Finance 2020:38.

Ministry of Finance (2019). Europe 2020 program – Finland's National Reform Program 2019. Publications of the Ministry of Finance 2019:32.

Ministry of Education (2016). Teacher Education Development Guidelines. Ministry of Education and Culture Publications 2016:34. (Opettajankoulutuksen kehittämisen suuntaviivoja. Opetus- ja kulttuuriministeriön julkaisuja 2016:34)

Framework for Education for sustainability:
Enhancing competences in Education

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