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EDUCATION POLICY COMMITTEE**

E2030 CONCEPTUAL FRAMEWORK: KEY COMPETENCIES FOR 2030 (DeSeCo 2.0)

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This paper has been drafted by Dominique Simon Rychen, the former director of the DeSeCo project, in close cooperation with the OECD Secretariat in order to revisit the DeSeCo and reconceptualise the key competencies for 2030. This paper should serve as the background paper for the progress report on the OECD learning conceptual framework: OECD Learning Compass 2030 [EDU/EDPC(2016)23].

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Education 2030: Key competencies for the future

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«Sustainable development and social cohesion depend critically on the competencies of all of our population – with competencies understood to cover knowledge, skills, attitudes and values».
(OECD Education ministers, 2001)

The contribution *Education 2030: Key Competencies for the Future* based on the theoretical and conceptual work of the OECD Project *Definition and Selection of Competencies: Theoretical and Conceptual Foundations* (DeSeCo) was prepared as an input paper for the OECD Secretariat in relation to the Education 2030 Project. It is written in my personal capacity based on my experience as former project leader of DeSeCo.

1. Introduction

1.1. Aim

The aim set for this paper is three-fold:

1. reconsidering the normative orientation and global challenges that served as a backdrop for the definition and selection of key competencies¹ in the beginning of the 21st century in light of the **contextual factors in 2030**;
2. specifying implications for how these new or changing contextual factors in 2030 would set out the **demands for competencies or different priorities on the demands for competencies** for today's students to lead a successful life in and shape the world in 2030 for the better by referring to the overarching conceptual framework developed by the OECD Project DeSeCo²;
3. setting out implications for how these new or changing contextual factors in 2030 would set out **demands for specific constructs in the OECD Education 2030** conceptual framework.

It must be noted that carrying out new research on and a systematic analysis of contextual factors in 2030 and their implications for competencies is beyond the scope of this mandate. However, the original, rich material provided by scholars and experts to DeSeCo have been revisited in light of the expected contextual changes in 2030. The underlying assumptions, main findings and conclusions are still valid but some issues that have been anticipated or addressed in the original scholarly or expert contributions might not have been sufficiently highlighted in DeSeCo's final report and executive summary, for instance, the importance of practical skills, the narrative dimension or dealing with dilemmas and ambiguity.

This paper intends to provide preliminary ideas as food for thought building heavily on the substantial interdisciplinary research and synthesis work carried out in the context of the OECD Project *DeSeCo*. The theoretical and conceptual foundations that underpin DeSeCo's competence framework and the conceptualization of the three categories of key competencies (*acting autonomously, interacting in socially heterogeneous groups, using tools interactively*) remain relevant. Yet, the DeSeCo competence framework needs to be taken forward and refined. In an earlier commentary to the Education 2030 the following development areas were highlighted from the DeSeCo perspective:

- Operationalization of each of the key competencies identified within the categories acting autonomously, interacting in socially heterogeneous groups, and using tools interactively.
- Empirical and conceptual exploration of the assumed linkages between the key competencies and desired outcomes both at the individual and societal level.

¹ DeSeCo used the notion key competencies which equates with terms such as transversal, generic, core or 21st century competencies.

² DeSeCo, the acronym of the OECD project *Definition and Selection of Competencies: Theoretical and Conceptual Foundations* (www.deseco.ch) was launched in 1998 and concluded with the final report [Key Competencies for a Successful Life and a Well-Functioning Society](#) in 2003 and with the [Executive Summary](#) in 2005.

- Identification of the effective learning and teaching strategies for different age groups in different contexts from the lifelong learning perspective.
- Exploration of how the material, institutional and socio-economic environment could enhance the development of key competencies.
- Identification of existing school practices (including but not limited to curriculum) where opportunities to learn such competencies already exist.
- Provision of recommendations for how to create inclusive and equitable opportunities for learning and developing these competencies through formal and non-formal education in the context of the 2030 Agenda for Sustainable Development.

The OECD Education 2030 Project addresses some of these areas and aims to create a more concrete and actionable competence framework that can support countries in their curriculum reforms by refining and further developing DeSeCo's overarching frame of reference through additional interdisciplinary research and foresight studies, through confrontation with new empirical data, a country survey on curricula redesign, and a broad based stakeholder consultation.

1.2 Background

Before tackling the topic of this paper it is important to briefly explain why, how and under which premises DeSeCo's overarching conceptual competence framework was constructed.

1.2.1 DeSeCo's mission

At the forefront of DeSeCo's multi-year research program³ was the question: *Apart from basic skills «what competencies do we need to lead a successful and responsible life and to face the challenges of the present and future»?* DeSeCo was designed to complement international comparative assessments by stepping back from an immediate concern of how to measure or develop competencies in order to focus on questions such as *what is a competence* and *which competencies* are important and *important for what*. Its main mission was to define a comprehensive, theory-grounded set of key competencies and to provide a basis for an overall long-term strategy for international assessments and a reference point for the development of important competencies from a lifelong learning perspective.

1.2.2 Addressing key issues

Conceptual clarification and definitional criteria

Reviews of various initiatives revealed a lack of rigor and consistency in the use of terms related to competence. In public discourse and sometimes also in specialized literature, there was – and still is – a tendency to use terms such as skills, literacy, qualifications, education goals, and competencies either imprecisely or interchangeable. Sometimes there are also misunderstandings related to the concept of competence: For instance, that knowledge is not an integral part of a competence; that a competence is equivalent to cognitive skills or that a competence equates with the task broken down into its subcomponents.

One of DeSeCo's added value is the provision of a research based, conceptually sound definition: **A competence** is defined as the *ability to successfully meet complex demands in a particular context through the mobilization of knowledge, (cognitive, metacognitive, socio-emotional and practical) skills, attitudes and values*. Underlying is an action competence model (cf. 1.2.3).

³ It included the review of the relevant literature; the commission of scholarly papers from multiple disciplines and expert opinions; country consultations and multi-stakeholder exchanges and symposia. Collaboration took place across disciplines and sectors involving sociologists, economists, an anthropologist, philosophers, education researchers, statisticians, assessment specialists, policy makers and stakeholders from the business, labor and health sector and various international organizations including UNESCO, ILO, the World Bank.

Building on the concept of competence the research process resulted in a widely accepted definition of **key competencies**, namely that they

- are learnable and, to some extent, teachable;
- contribute to *highly valued individual outcomes* (gainful employment, income, personal health and safety, political participation, intellectual resources, social networks, cultural participation) *and societal outcomes* (economic productivity, democratic processes, solidarity, social cohesion, human rights and peace, equity and equality, ecological sustainability);
- are instrumental for meeting important, complex demands in a wide spectrum of contexts;
- are important for all individuals;
- involve a higher level of mental complexity, identified as reflectivity/reflectiveness or reflective practice implying the use of metacognitive skills, creative abilities and taking a critical stance.

There is no dichotomy between a specific competency and key competency. The latter is at a higher level of complexity than other simpler competencies.

A common vision of the world as a backdrop

Conceptual clarifications, theoretical models and definitional parameters were important inputs into the conceptualization of a set of key competencies. Yet defining, selecting and developing important competencies is an attempt to explicitly value some competencies over others. What is considered important or necessary depends on the socio-economic and cultural context and the development we are aiming at. *«If one wants to go beyond an individual's adaptation level to the world of today with its limited possibilities of further development, and change the world by providing people with the appropriate competencies, it is necessary to choose a normative starting point, and not an empirical one, when defining key competencies»* (Weinert, 2001).

Broad societal goals and global challenges served as a backdrop for defining and selecting key competencies for the 21st century. DeSeCo referred to international conventions and agreements, in particular, the Universal Declaration of Human Rights, the Rio Declaration on Environment, and the World Declaration on Education for All to delineate some desirable common goals. The assumption that there are common features and shared values was underpinned by the philosophers' contribution. Canto-Sperber & Dupuy (2001) identify – consistent with any major moral theory – key values that account for *the good life* in general: close relationship with others; an understanding of oneself and one's world; autonomous interaction with one's physical and social environment; and a sense of accomplishment and enjoyment.

1.2.3 A Competence – a combination of knowledge, skills, attitudes and values⁴

Gonczi (2003) in his contribution to DeSeCo points out that most educational thinking in the West has a direct line from the ancient Greeks through the enlightenment to the present day reflected in many of the dichotomies which underpin contemporary educational thought: mental versus manual, theoretical versus practical, mind versus body. In line with Weinert (2001) Gonczi (2001) argues for a relational, integrated, and holistic approach to competence⁵: One which links the attributes of individual (i.e. knowledge, cognitive, practical and socio-emotional skills, attitudes, values) to the demands and challenges which individuals encounter in the context of work and in life.

DeSeCo opted for a demand-oriented or functional approach, which places the complex demands and challenges at the forefront of the concept of competence. This approach to competence has implications for the conceptualization of a competence. As Witt and Lehmann (2001) pointed out, *«without the functional approach no consideration of relevance is possible for competencies; without*

⁴ For an in depth elaboration on the concept of competence cf. Weinert (2001).

⁵ The holistic understanding of competence resonates with the pedagogical 'trinity' model valuing education in terms of learning by hand-heart-head as, for instance, postulated in the 18th century by the Swiss pedagogue and educational reformer Johann Heinrich Pestalozzi (1746–1827).

research on internal structures, no barriers can be provided against the temptations and traps of mere 'ability-to' expressions». The components of the internal competence structure encompass a wide range of attributes. There is no question that cognitive skills or intellectual abilities (such as analytical or critical thinking skills, decision-making skills, or general problem-solving skills) and the knowledge base constitute crucial mental resources that need to be mobilized for competent performance or effective action. However, there is a broad agreement among experts that meeting a demand or accomplishing a goal also requires the mobilization of social and behavioral components such as motivation, emotions, and values.

The primary focus is on the results the individual achieves through an action, choice, or way of behaving with respect to the demands.

This approach is consistent with the **action competence model** which combines knowledge and cognitive and non-cognitive components that together represent a complex control system and result in a person taking action: *«The theoretical construct of action competence comprehensively combines those intellectual abilities, content-specific knowledge, cognitive skills, domain-specific strategies, routines and subroutines, motivational tendencies, volitional control systems, personal value orientations, and social behaviors into a complex system»* (Weinert, p. 51)

1.2.4 DeSeCo's conceptual framework for key competencies

The construction of the three categories of key competencies – *using tools interactively, acting autonomously, and interacting in socially heterogeneous groups* – and the identification of particular key competencies within each of the three categories followed different, though complementary logics. The three categories of key competencies were constructed by way of a deductive approach mainly based on the initial scholarly theorizations from different disciplines including sociology, psychology, philosophy, economics, history, and anthropology and the subsequent interdisciplinary and multi-stakeholder exchanges.

The key competencies put forward within each of the three categories are the result of an examination of the many lists received from experts and country reports in light of the established normative, definitional and conceptual criteria. It is important to note that these key competencies are relevant in a context in which democracy and respect for human rights and sustainable development are considered core values; they apply to multiple areas of life; they can be learned and imply the development of a critical stance and a reflective practice in order to cope with the varied and complex demands of modern life. This requires individuals to reach a level of social maturity that allows them to adopt different perspectives, make independent judgments and take responsibility for their decisions, behavior and actions.

2. Global trends and challenges ahead

2.1. Shaping the future

Multiple interrelated factors influence how the future is being shaped. Future and foresight studies provide valuable insights on expected longer-term global trends that will have major societal impact in all spheres of life and challenge societies, organizations, institutions and ultimately the individual, his or her mind.

For instance, the National Intelligence Council's Global Trends 2030 report (2012) asserts that the world of 2030 will undergo radical transformation. As megatrends that will gain much greater momentum in the future are identified: *individual empowerment*, the *diffusion of power* among states and from states to informal networks; *demographic patterns*, especially rapid aging, urbanization and growing migration; and *growing resource demands* which, in the cases of food and water, might lead to scarcities. Similar, the OECD (2016a) clusters megatrends around *demographics, international*

migration, and urbanization; water, energy, food and climate nexus; the changing geo-economic and geopolitical landscape; global divide related to wealth, health and knowledge and emerging technologies such as the internet of things, big data analysis, artificial intelligence neurotechnologies, nanomaterials, additive manufacturing, synthetic biology or blockchain and *digitalization* (OECD 2016b) that will shape the ways we interact, live and work.

What is recognized or expected as future challenges, risks and opportunities, has also to do with the *future we want*. It is therefore not only relevant to consider the contextual factors that shape the demands placed on societies and individuals but also to take account of the societal aspirations that give point and direction to the future development. For instance, the *Transforming our world: the 2030 Agenda for Sustainable Development* adopted in 2015 by 193 countries of the UN General Assembly provides a normative reference frame and *transformative vision for a better world*. This vision echoes with the common values and societal goals to which DeSeCo referred to when defining and selecting key competencies. Also, the Sustainable Development Goal 4.7, namely to ensure that by 2030 «*all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development*» is congruous with the DeSeCo's competence framework with the exception that SDG 4.7 does only mention *skills and knowledge*.

Conceptually speaking, *attitudes and value orientation* cannot be neglected or separated. Knowledge and skills, attitudes and values form a complex interrelated system resulting in a person taking action. OECD's focus on 2030 competencies provides an added value as it explicitly refers to the holistic concept of competence implying the mobilization of a combination of knowledge, cognitive, practical and socio-emotional skills, attitudes, and values. This holistic understanding echoes with the orientation of education for peace and sustainable development as UNESCO's overarching goal of its education program. As a way forward UNESCO is promoting the concept of global citizenship education to develop «*the knowledge, skills, values and attitudes learners need to build a more just, peaceful and sustainable world and to thrive as global citizens in the twenty-first century*» (UNESCO, 2014). The OECD Education 2030 project cooperates with the UNESCO Global Citizenship Education and the Education for Sustainable Development, the Council of Europe Global Citizenship Education, and other similar efforts

Even within a common normative framework countries and societies differ in terms of economic and political goals and priorities, power relations, cultural traditions, environmental settings, available resources, and employment and social opportunities. Increasing diversity and heterogeneity, however, is only one common facet of our world. Globalization, interconnectivity and complexity are other central features. Today the representation of the world as global, interdependent, complex, multipolar, rapidly changing, diverse, conflict-affected, fragile, uncertain has become part of the mainstream discourse.

The expression «*VUCA world*», first used in the military context in the 1990s, has been established as a useful concept to reflect on the risks and opportunities of a world marked by *volatility* (nature and dynamics of change, and the nature and speed of drivers of change), *uncertainty* (lack of predictability), *complexity* (the confounding of issues, no cause-and-effect chain) and *ambiguity* (cause-and-effect confusion).

In many ways the challenges of a VUCA world resonates with the contextual analyses and conceptualization of DeSeCo's competence framework which is grounded in a vision of the world as «*complex, diverse, interdependent, and conflict-prone*». DeSeCo defined key competencies in function of complex demands driven to a great extent by challenges and issue that affect most if not all countries including climate change, ecological destabilization, loss of biodiversity; globalization;

substantial global inequalities; growing diversity; poverty and population movements; conflicts and new forms of violence; rapid technological changes, new forms of communication and interaction, large-scale value changes, instability of norms, imbalance between economic, social and environmental development.

Many of the socio-economic challenges and global issues apparent when the DeSeCo Project was carried out remain. Some problems have further aggravated and pose global risks. Other changes such as technological innovation and the rapid worldwide spread of new technologies have accelerated and provide also new social, economic and individual opportunities.

2.2 Global trends: Risks and opportunities

The recent OECD publications *An OECD Horizon scan of megatrends and technology trends* (2016a) and *Trends shaping education* (2016c), and also the Survey report *Deep shift, technology tipping points and societal impact* (WEF/GAC, 2015), for instance, provide systematic analyses of global trends and future challenges. – In the present paper only a few issues that shape the demands individuals are confronted with are highlighted for illustration purpose.

2.2.1 Rapid technological changes – 4th industrial revolution⁶

The nature and speed of current economic and social change is unprecedented, partly due to the rapid technological innovation impacting increasingly all areas of the economy and society. Emerging technologies such as the internet of things; artificial intelligence; neuro- and nanotechnologies; advanced storage technologies; synthetic biology; and blockchain will shape the economic, social, cultural, and personal context and affect the way we live, work, and interact with others and the natural environment. Digital transformation and the increased worldwide connectivity enable new forms of relations, interactions, collaboration, and production.

DeSeCo's key competency *using technology interactively* is particular relevant in light of the technological trends. It involves more than technological proficiency. Although the ability to adapt to technologies is an important aspect of technological competence, its full power is only realized with an awareness of the new forms of action and interaction made possible by technology and the ability to take advantage of that potential in daily life.

At the same time emerging technologies like robotics or artificial intelligence may also have disruptive impacts, for example, on the labor market potentially creating increased unemployment. The Agenda 2030 for Sustainable Development has set the aim for 2030 to encourage sustained economic growth by achieving higher levels of productivity and through technological innovation. Development-oriented policies are to be promoted to *support productive activities, decent job creation, entrepreneurship, creativity and innovation*.

Entrepreneurship is often put forward as an advantage in light of disruptive changes. – In the European Commission's recent publication *EntreComp: the Entrepreneurship Competence Framework* (2016) entrepreneurship is defined as the capacity to **turn ideas into action, to create value for others**. The creation of values for others should be understood in a broad sense, not limited to economic value. The notion of entrepreneurship and its educational relevance needs to be explored also in the light of the technological advancements and their potential societal impact.

The so-called Fourth Industrial Revolution or industry 4.0 *«will change not only what we do but also who we are. It will affect our identity and all the issues associated with it: our sense of privacy, our notions of ownership, our consumption patterns, the time we devote to work and leisure, and how we develop our careers, cultivate our skills, meet people, and nurture relationships. (...) In its most pessimistic, dehumanized form, the Fourth Industrial Revolution may indeed have the potential to*

⁶ See in particular, WEF (2016) *The Fourth Industrial Revolution: what it means, how to respond*
<https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/>

“robotize” humanity and thus to deprive us of our heart and soul. But as a complement to the best parts of human nature—creativity, empathy, stewardship—it can also lift humanity into a new collective and moral consciousness based on a shared sense of destiny» (Schwab, 2016).

2.2.2 Globalization, the changing landscape and substantial global inequalities

The global landscape is changing with the center of power shifting from West to East and from North to South. New global state and non-state actors have entered the arena and participate in the global agenda setting. Globalization and greater connectivity enhanced through international trade, movements in capital, people and information and coupled with digitalization have led to the emergence of a multipolar world.

Globalization does not only produce winners. The gap between rich and poor, in particular within countries, has substantially increased. Inequalities and disparities in opportunities and affluence leaving millions behind with little or no perspectives risk destabilizing societies and undermining peace and prosperity.

Addressing issues related to inequalities and fair distribution of gains and opportunities between rich and poor countries, and between different groups within countries will be central to enhance social cohesion, peace and prosperity for all. Reducing inequality is one of the Sustainable Development Goals set for 2030. At the same time, at the individual level, it will be crucial to enhance the competencies that enable individuals to **navigate and participate effectively in and across multiple social fields**, such as the economic sector, political life, social relations and the family, public and private interpersonal relations, and the health field. In a world where individuals’ rights, interests, and needs continually come into conflict with those of others, where individuals face increased responsibility for many important decisions and functions, and where the rules that govern these conflicts, decisions, and functions are increasingly complex *defending and asserting one’s rights, interests, limits and needs* (one of key competencies put forward in the DeSeCo framework) lies at the very heart of **responsible and autonomous action**. It means that individuals capably put themselves forward as a subject, of whom account has to be taken, and adeptly assume their responsibilities and choices as a citizen, family member, consumer, and worker in a world of different cultures, interests, values, and beliefs.

2.2.3 Diversity through increased mobility and population movements

Social and cultural diversity is further enhanced through increased population dynamics – be it by choice or caused by conflicts and wars. According to the UN⁷ the number of international migrants reached 244 million in 2015, a 41 per cent increase compared to 2000. Increased mobility and migration affect the demographic patterns of countries, cities, communities, and institutions, including schools. Societies have become more diverse and heterogeneous. Cultural and social diversity can be seen as an asset and source of **creativity and value creation** but if it equates with inequalities within and among countries and groups it could become a source of anxiety and conflict.

In DeSeCo there was a consensus among experts that in pluralistic, multicultural societies, in a world of different cultures, interests, values, and beliefs, it is necessary that individuals learn to join and interact in groups and social context whose members are from diverse backgrounds, and that they successfully deal with differences and contradictions.

In the light of increasing individual and social diversity and uncertainty, strengthening social cohesion and developing a sense of social awareness and responsibility matter. Thus, for enhancing effective interaction in socially heterogeneous groups DeSeCo emphasized three key competencies, namely *relating well to others* (respecting others; valuing diversity in line with global societal goals;

⁷ <http://www.un.org/sustainabledevelopment/blog/2016/01/244-million-international-migrants-living-abroad-worldwide-new-un-statistics-reveal/>

empathy as *«the ethical move par excellence»* (Canto-Sperber & Dupuy, 2001); *cooperating*; and *managing and resolving conflicts with others* because of different interests, needs, goals, or values.

2.2.4 Conflicts, democratic disengagement and new forms of violence

Changes and shifts in power and substantial socio-economic inequalities have the potential for increased conflicts and instability within and among states and regions. Some 1.5 billion people in an estimated 40 countries live in an environment affected by conflict and violence. Key issues include fragility of context, ungoverned spaces, tensions and contestation, insecurity.

Available data suggest also a decrease of trust in government across OECD countries (OECD, 2014) and social and civic disengagement in democratic processes (OECD, 2013).

Discriminatory and extremist ideologies and radicalization go hand in hand with new forms of violence, some with a global reach. Such developments challenge peace and prosperity and undermine democratic core values and institutions.

The recent Global Education Monitoring report (UNESCO, 2016) provides examples of the importance of education for political participation, non-violent civil actions, peace and access to justice.

An emphasis is placed on strengthening citizenship. For instance, UNESCO's Global Citizenship Education⁸ program aims to *«empower learners to assume active roles to face and resolve global challenges and to become proactive contributors to a more peaceful, tolerant, inclusive and secure world»*. This echoes with OECD's focus on global competency (2016d) in the 2018 Programme for International Student Assessment (PISA).

Tackling socio-economic inequalities will be crucial for reducing insecurity, conflicts and crises and enhancing peace. However, culture and values matter too. Drawing on data from governments, NGOs, and the World Values Survey Miguel Basáñez (2016), for instance, argues *«that a country's developmental path is profoundly influenced by its people's values and culture, as crystallized through its formal and informal governing institutions. Culture is passed down over generations through families, schools, the media, religious institutions, leadership, and the law. Although culture and values are in a permanent state of evolution, leaders and policymakers can also push cultural change in order to promote desirable goals such as economic growth, democratization, and equality»*.

Common shared values cannot be taken for granted once and for all. Developing a personal identity (including a value system) in terms of a responsible *autonomous actor* that can decide, choose, and play an active role in a given context and **(re-)creating narratives** regarding the self, the other, the nature, the tools and the (virtual and real) world to give meaning and purpose to life will be essential for well-being in a changing, often disruptive and uncertain environment.

2.2.5 The planet at risk

Climate change due to carbon and resource intensive development paths and unsustainable patterns of production, consumption, and mobility is a fact. The Nobel Laureates state in the Stockholm Memorandum (2011) that *«evidence is growing that human pressures are starting to overwhelm the Earth's buffering capacity (...). Humans are now the most significant driver of global change»*.

According to the Global Footprint Network⁹ currently the equivalent of 1.6 planets would be necessary to provide the resources we use and absorb our waste and by the 2030 the equivalent of two Earths would be needed to support our way of life.

⁸ <http://en.unesco.org/gced>

⁹ http://www.footprintnetwork.org/en/index.php/GFN/page/world_footprint/

Thus, a growing population coupled with unsustainable economic growth and overexploitation of natural resources will place unbearable pressure on the nature, the planet. Climate change has become a critical global risk.

A paradigm shift is needed: Human activity needs to respect the Earth's *planetary boundaries*¹⁰ in order to avoid reaching a point of no return.

Future Earth¹¹, an international research platform, identifies eight key challenges to global sustainability:

1. delivery of water, energy, and food for all, and management of the synergies and trade-offs;
2. decarbonizing socio-economic systems to stabilize the climate;
3. safeguard of the terrestrial, freshwater and marine natural assets underpinning human well-being;
4. building healthy, resilient and productive cities since the majority of the world population will live in city;
5. promotion of sustainable rural futures to feed rising and more affluent populations during changes in biodiversity, resources and climate;
6. improvement human health by elucidating, and finding responses to, the complex interactions amongst environmental change, pollution, pathogens, disease vectors, ecosystem services, and people's livelihoods, nutrition and well-being;
7. encouragement of sustainable and equitable consumption and production patterns;
8. increasing social resilience to future threats.

Climate change mitigation will require substantial reduction in greenhouse gas emission¹², implying a major shift towards a low-carbon economy. The turn-around calls for long-term structural adaptations changing values, institutions, and policy frameworks and coherent collective actions involving international organizations, governments, and institutions. Technological innovation is an important agent of change. However, without a major mind-shift human action may «trigger tipping points, risking abrupt and irreversible consequences for human communities and ecological systems» (Stockholm memorandum). Education for sustainable development and the development of relevant competencies as proposed by DeSeCo will be a key factor for a societal transformation towards global sustainability.

2.2.6 Addressing imbalances between economic, social and environmental development

For dealing with the complexity of sustainability the Institute for the Future (IFF¹³), for instance, refers to a *world of dilemmas, which demand patience, sense-making and an engagement with uncertainty*. Such modern strategic dilemmas are characterized as unsolvable; complex and often messy; threatening; enigmatic and confusing; and two or more puzzling choices with decisions required.

The way the world towards 2030 will look like depends ultimately upon the way societies and individuals manage to respond to the challenges of an increasingly *volatile, uncertain, complex and ambiguous* (VUCA) world and to contribute to shaping the future for the better. Thus, acting within the big picture (a DeSeCo key competence) with an **orientation towards the future and anticipation** (thinking about the future in the short-term as well as in the long-term) will be critical for dealing with the complexity of sustainability and for turning uncertainties and risks into opportunities.

¹⁰<http://www.stockholmresilience.org/research/planetary-boundaries/planetary-boundaries/about-the-research/the-nine-planetary-boundaries.html>

¹¹ <http://www.futureearth.org>

¹² UN Framework Convention on Climate Change: Adoption of the Paris Agreement (2015)
<http://unfccc.int/resource/docs/2015/cop21/eng/109r01.pdf>

¹³ <http://www.iff.org>

The Universal Human Rights Declaration and the recent the Agenda 2030 for Sustainable Development and the Paris Agreement on climate change give point and direction for *the future we want*.

Today's socio-economic and political choices and actions at the global, regional, national, and institutional level will be decisive for how the future will play out. At the same time individual decisions, behavior and actions matter. Education and training, therefore, play a key role in forming and developing the necessary competencies because «*sustainable development and social cohesion depend critically on the competencies for all of our population – with competencies understood to cover knowledge, skills, attitudes and values*» (Communiqué, OECD Education Ministers, 2001).

3. Implications for demand-oriented competencies for shaping the future

This sections first looks at the adequacy of three different *models of the competent human* discussed in *Defining and Selecting Key Competencies* (Haste, 2001) in relation to the competencies needed for the 21st century. The second part highlights some critical (mental) demands individuals are confronted with implying the development of a critical stance and reflective and future-oriented practice (action), which is at the heart of DeSeCo's competence framework.

3.1. Models of the «competent human»

Complexity, uncertainty, fuzziness, ambiguity are characteristics of many challenges of the 21st century. Societies and individuals therefore need to be able to deal with tensions, dilemmas, nexus, trade-offs, non-simultaneity, and non-linear processes in a constructive, future-oriented way. Taking a long-term perspective, going beyond the either-or, and at times thinking out of the box will be critical in the future.

The three models of the «competent human» – the *puzzle solver*, the *story teller*, the *tool user* – reflecting different underlying theoretical emphases in psychology (Haste, 2001) take on a particular meaning in relation to the competencies needed for a VUCA world and for the transformation towards global sustainability.

The following text elements are mostly reproduced from Haste's contribution entitled *Ambiguity, Autonomy, and Agency: Psychological Challenges to new Competence* (2001).

3.1.1 The puzzle is not the solution

DeSeCo dismissed the *puzzle solver* model as a useful approach because it emphasizes too much the individual cognitive functioning and suggests that there is one right answer that can be arrived at by linear logical processes. «*This model is implicitly uncomfortable with the kind of problems in which there are several routes to solutions, where for example, feedback loops and multiplex iteration are involved, and where there are a number of possible – and equally useful – outcomes. It is inherently intolerant of ambiguity, uncertainty, and the kind of model associated, in control-theory terms, with 'closed loop-open solution problems, or with fuzzy loci'*» (Mc Neill & Freiburger, 1993, in Haste, 2001, p. 95).

According to Haste the problem solver model tends to induce anxieties about ambiguity and uncertainty because it is about finding the right answer. In the pursuit of simplicity it tends to cut through diversity and complexity.

Hence, this approach is inadequate when it comes to deal with a messy world and fuzzy boundaries and complex issues that young people and adults are facing.

3.1.2 New narratives to make sense - storytelling

The *storyteller* model emphasizes social and linguistic processes. Narrative, sign, symbol and rhetoric are the core features of cultural transmission and meaning making. The model focuses on the mechanisms by which language, social interaction, and cultural behaviors enact and reproduce expectations and norms.

Narrative skills and **story telling** might not have been sufficiently highlighted in DeSeCo's set of key competencies. Sense and meaning making and the need for **new narratives** seem to move to the forefront in light of many of the expected social and technological changes. As an example, *the revolutions occurring in biotechnology and AI, which are redefining what it means to be human by pushing back the current thresholds of life span, health, cognition, and capabilities, will compel us to not only redefine our moral and ethical boundaries but also relation to others, the environment*. (Schwab, 2016)

3.1.3 Using tools interactively and crafting to access creativity

DeSeCo's category *using tools interactively* relies heavily on the tool user model. The central idea is that we encounter our world actively through our tools, and these encounters shape how we make sense of, and become competent in interaction with our world. The adverb *interactively* was introduced to reflect this iterative dynamic. The tool is, thus, not a passive mediator but part of an active dialogue between the individual and the environment. The idea is that having a new tool does not only make it possible to complete more successfully a task already attempted or planned; it opens up new ways of transforming our relationship with the world.

Understanding the tool as a *prosthesis* or amplifier for the human body and mind, and not just a mediating aid resonates with the options and opportunities provided by the current technological advancements. A bionic hand controlled by an iPhone, robotic arms moved with the mind, reading glasses connected to the internet are just a few examples.

An important aspect was highlighted by Haste and maybe not been sufficiently reflected in the DeSeCo framework in the face of increasing digitalization and the call for creativity and innovation is the **relevance of practical skills and a certain craft logic**. Through understanding of how something is done, or made, we will be able to adapt such knowledge to other domains. The 'do-it-yourself industry' is given as an example of people's willingness to get involved in the hands-on creation of their immediate environment. The assumption to be further explored is that **through craft one can access creativity**, making an impact on the physical world, in ways that high-tech interaction does not.

The importance of hands-on creation, the craft logic and practical involvement in relation to creativity and innovation should be further explored and then potentially be integrated when taking the DeSeCo framework forward.

3.2. Reflective and future-oriented action in light of the complex demands

A second element that is critical for the comprehension of the competencies needed in 2030 in light of complex demands is the required level of competence in terms of a reflective practice implying **reflection, anticipation and action** enabling individuals to act in a competent and responsible manner.

What is expected of individuals in terms of competencies goes well beyond recalling accumulated knowledge and basic cognitive skills. In relation to the challenges of a *VUCA world*, a *world of dilemmas*, the *4th industrial revolution*, or a *planet at risks* the following requirements are often emphasized: *creativity, empathy, dealing with ambiguity, engagement with uncertainty, stewardship, patience, sense-making, mind-shift, adaptation in the face of disruptive change, long-term thinking and anticipation* and so on.

The issue of complexity and uncertainty as one of the consequences of a complex world was mirrored like a leading theme in various contributions to DeSeCo on competencies and education goals. For instance, Carlo Callieri (2001) stated: «*Indeed the problem is a world in which uncertainty is growing as situations become increasingly complex.... Societies must equip themselves with tools that enable them to tackle complexity in a manageable way that conquers uncertainty. In this new perspective, the individual takes on an absolutely crucial function, **creating the tools** with which to manage uncertainty and turn it to his or her own advantage*».

In most OECD countries individuals are expected to be adaptive and flexible, innovative, creative, open-minded, tolerant, self-directed, and self-motivated, and able to take responsibility for their decisions, behavior, and actions as lifelong learners, parent, partner, employee or employer, citizen, student, or consumer.

Many scholars and experts agree that coping in a responsible way with many of the complex demands as they manifest in and across multiple social field requires the development of – what psychologists call – a higher level of mental complexity. In DeSeCo the notion of reflectiveness/reflectivity or a reflective practice in reference to the action competence model was introduced. A reflective practice – a transversal feature of key competencies – implies the use of metacognitive skills, creative abilities and taking a critical stance when deciding, choosing and acting. It is about the ability to step back from the assumed, known, apparent, and accepted and to reflect upon a given situation from other, different perspectives, to look beyond the immediate situation to the long-term and indirect effects of one's decisions and actions. This competence level requires individuals to reach a level of social maturity that allows them to adopt different perspectives, make independent judgments and take responsibility for their decisions and actions.

In DeSeCo's final report (2003) three illustrations – navigating in social space; dealing with differences and contradictions; and taking responsibility – are presented to elucidate the meaning and importance of a reflective practice as the required competence level of key competencies. They exemplify the nature of demands shaped by the challenges of the 21st century. However, as simple illustrations they do not do justice to their relevance. In Chapter 4 and the progress report a reconceptualization is therefore being suggested.

3.2.1 Navigating in social space and time

The importance of flexibility and mobility in space and in mind in the global economy and the information society was a theme that ran throughout many of the contributions to DeSeCo. Kegan (2001) summarized these views: «*The adult of the 21st century will need to be able to travel across a wide variety of contexts*».

The notion that context is an integral element of competent performance and action raises the question of whether an individual who is competent to meet a demand in one context or situation would be able to meet a similar demand in another context. The disparity between existing competencies and competencies needed to meet new demands is resolved through adaptation (Oates, 2003). This understanding is consistent with Piaget's assertion that effective performance is a function of the dialectical interaction between existing competencies of the individual and the demands of the new situation or context. In cases where competencies are applied in different domains of life, adaptation entails actively and reflectively using the knowledge, skills, attitudes and values developed in one social field, analyzing the new fields and translating and adapting the original knowledge, skills, attitudes and values to the demands of the new situation.

To navigate in an uncertain, at multiple speed changing world thinking about the future and developing a long-term vision will be an asset and necessity. Navigation across fields and flexible adaptation to unfamiliar contexts and situations implies recognizing patterns already encountered in

past experiences, establishing analogies between previously experienced situations and new ones, using patterns to guide activity in the world (Canto-Sperber & Dupuy, 2001).

3.2.2 Dealing with dilemmas, contradictions, and ambiguities

In the light of cultural and social diversity and the existence of social, economic and ecological imbalances, dealing in constructive way with differences, contradictions, and ambiguities is another frequently mentioned requirement. A world of dilemmas demands that we not rush to a single answer, to an either-or solution, but rather deal with tensions and trade-offs – for instance, between equity and freedom; autonomy and solidarity; efficiency and democratic processes; ecology and economic logic; diversity and universality; and innovation and continuity – by integrating seemingly contradictory or incompatible goals as aspects of the same reality. For example, the concept of sustainable development is one possible answer to the tension between economic growth, ecological constraints, and social cohesion, recognizing their complex and dynamic interplay instead of treating them as separate and unrelated, if not mutually exclusive issues.

An integrated, holistic approach is most likely the best answer to the often complex, intractable, dynamic, and multifaceted problems posed by the challenges of the 21st century. Dealing with ambiguous or contradictory positions and actions is not, in itself, challenging. The challenge, which must be reflected in key competencies, is dealing reflectively with multiple, dynamic and often conflicting aspects and recognizing that there may be more than one solution or solution method. As Haste (2001) argues, *«as we recognize the need for a more complex picture of the world, the competence required is the ability to manage diversity and dissonance in a creative and coping way, and avoid premature closure or dissolution into relativism»* or absolutism.

To be prepared for the future individual have to learn to think and act in a more integrated way, taking into account the manifold interconnections and interrelations between – at times, only superficially and in the short-term – contradictory or incompatible ideas, logics, and positions. This implies nurturing the future in the short term.

3.2.3 Ethics and value orientation – taking responsibility

Throughout many of the contributions to DeSeCo appears the notion that individuals are expected not to simply follow what they have been taught or told. Many scholars and experts agree that dealing with novelty, change, diversity, ambiguity and uncertainty, and coping in a responsible way with important challenges, assumes that individuals can ‘think for themselves’ as an expression of moral and intellectual maturity and reflect upon and evaluate their actions in the light of their experiences and personal and societal goals; what they have been taught and told; and what is right or wrong (e.g. Canto-Sperber & Dupuy, 2001; Haste, 2001).

The perception and assessment of what is right or wrong, good and bad in a specific situation is about ethics. It implies asking questions related to norms, values, meanings, and limits such as: What should I do? Was I right to do that? Where are the limits? Knowing the consequences of what I did, should I have done it? Critical thinking is the cognitive process by which we evaluate and choose among alternatives consistent with ethical principles. This assumes an overall understanding of the meaning of things, actions, events, experiences and critical values. The process of creating, extending, and applying meaning, knowledge, rules, and values in a reflective manner is an underlying mental assumption of many complex demands.

The importance of value orientation has been widely recognized. For instance, with regard to the risks and opportunities of industry 4.0 Schwab (2016) emphasizes that *«we must develop a comprehensive and globally shared view of how technology is affecting our lives and reshaping our economic, social, cultural, and human environments. In the end, it all comes down to people and values»*.

3.4. DeSeCo's framework in light of the demands shaped by change

Critical issues and challenges of the 21st century that shape the demands are well integrated in the DeSeCo competence framework, in particular, the articulation of the three categories of key competencies: *interacting in socially heterogeneous groups*, *acting autonomously* and *using tools interactively* and the required competence level in terms of a *reflective practice*.

This said, reflective practice, which is at the heart of DeSeCo's competence framework can be articulated in terms of a continuous learning cycle of **reflection, anticipation and action**.

In addition, a number of demands shaped by global trends and challenges are crystallizing as priorities that will need particular attention in the Education 2030 project including dealing with dilemmas, contradictions and ambiguities; tackling interfaces, nexus, and trade-offs; valuing diversity in line with global societal goals; adapting to change; anticipating, thinking about the future in the short-term to cope with uncertainties and risks and to adapt to change; navigating in time and social space; developing new narratives (story telling) and re-defining the relation with the other, the nature, the planet; creating value (for others); creating tools, crafting and hands-on creation.

A preliminary mapping in the DeSeCo framework was drafted as a starting point for further reflection. The listed priorities are conceptually speaking at different levels. For instance, navigating in social space and time could be seen as an umbrella concept. Other priorities depending on the focus could be conceived either as a specificity of a DeSeCo key competency (e.g. valuing diversity under relating well to others) or take the form of a cross-cutting competency transcending all key competencies (e.g. taking responsibility or dealing with dilemmas, contradictions, and ambiguities).

Preliminary mapping of priorities for 2030 some of which could be conceived as competencies that transcend the three DeSeCo categories

<p>DeSeCo – 21st century (transversal) key competencies</p>		<p>SUGGESTED PRIORITIES FOR EDUCATION 2030</p>	
<p>REFLECTIVITY / Reflective practice (competence level)</p>	<p>ACTING AUTONOMOUSLY (compatible with a value system that promotes autonomy as an aspiration and basis for personal identity)</p>	<p>NAVIGATING IN TIME AND SOCIAL SPACE (as an umbrella concept)</p>	
	<p><i>Acting within the big picture</i></p> <p>(i.e. the larger normative, socioeconomic, historical context including a longer-term perspective).</p> <p><i>Understanding and considering how the larger context functions, one's position in it, the issues at stake, and the long-term and indirect consequences of one's action, and taking these factors into account when acting.</i></p>	<ul style="list-style-type: none"> • Anticipating and thinking about the future in the short-term) to adapt to (disruptive) change and cope with uncertainties and risks <i>(integrated as part the competence development cycle for shaping the future)</i> • Dealing with dilemmas, contradictions, and ambiguities 	
		<p>ETHICS & VALUE ORIENTATION and REFLECTION – ANTICIPATION – ACTION</p>	

<p>Forming and conducting life plans and personal projects</p> <p>(in relation to obligations, goals, and dreams)</p> <p><i>Interpretation of life as an organized narrative in a changing environment, implying an orientation towards the future, implying both optimism and potential, but also a firm grounding within the realm of the feasible.</i></p>	<ul style="list-style-type: none"> • Developing new narratives (story telling to make sense of life and future) and re-defining the relation with nature, the other, the planet. • Creating value for others, for instance, in economic, social and/or cultural terms (in the economic sector it echoes with the notion of entrepreneurship broadly understood). <p><i>Note: Value creation would be an extension of the current key competency, which focuses rather on life plans and personal projects or a cross cutting area.</i></p>
<p>Asserting rights, interests, limits and needs</p> <p><i>For individuals to be/become actors rather than spectators or victims in light of the manifold complex challenges of the 21st century this key competency contributes to individual empowerment.</i></p>	<ul style="list-style-type: none"> • Taking responsibility vis-à-vis the other, the nature and the planet <p><i>Note: This competency needs to be nuanced in relation to and interaction with the other, the nature and the earth system. Defending and asserting rights, interests, limits that respect the Earth's «planetary boundaries» defined as a safe operating space for human activity. Awareness and responsibility in line with global societal goals.</i></p>
<p>USING TOOLS INTERACTIVELY</p> <p><i>Tool is used in the broadest sense including physical and socio-cultural tools (e.g. language, but also culture and art). Interactively assumes a familiarity with the tool and an understanding of how it changes the way one can interact with the world. The tool is a figurative and literal extension of the human body and mind.</i></p>	<ul style="list-style-type: none"> • Creating tools and hands-on creation, practical exposure, crafting as a way to access creativity has not sufficiently been addressed in DeSeCo.

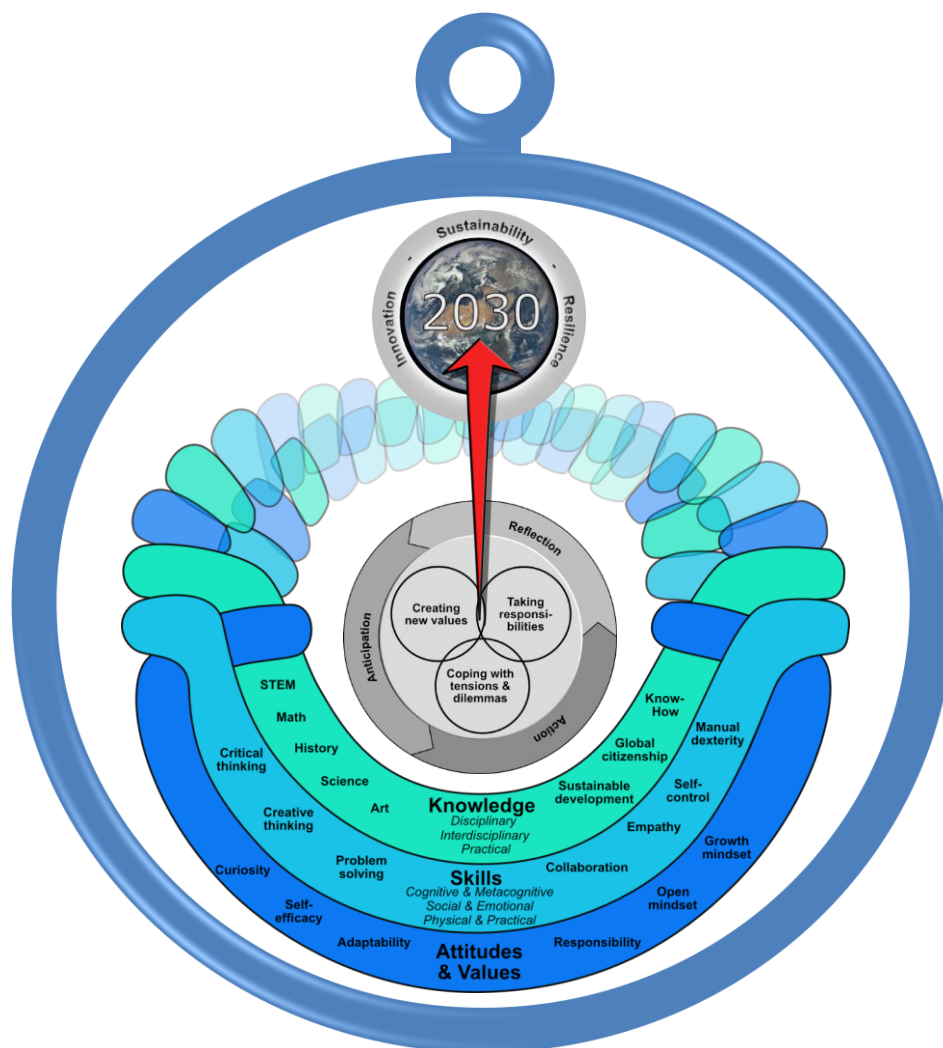
<p><i>Using language, symbols and texts interactively</i></p>	<p><i>Note: Basic foundation skills (reading, writing, and computing) for all are and remain critical today and in the future.</i></p>
<p><i>Using knowledge and information interactively</i></p>	<ul style="list-style-type: none"> • Tackling interfaces, nexus, and trade-offs in the face of conflicting issues. • Relevance of interdisciplinary and interconnected approaches, based on foundation knowledge within disciplines.
<p><i>Using technology interactively</i></p>	<p>Tool are us (tools as extension of the human body and mind)</p> <p><i>Note: Important to take account of the potential opportunities and risks provided by the emerging new technological advances (4th industrial revolution)</i></p>
<p>INTERACTING IN SOCIALLY HETEROGENEOUS GROUPS (Development of social bonds and coexistence with people whose backgrounds differ) <i>In light of fragmentation and increasing diversity and uncertainty, strengthening social cohesion and developing a sense of social awareness and responsibility.</i></p>	<p><i>Note: DeSeCo focused on key competencies required for individuals to learn, live and work with others in and across sectors and borders. These competencies are critical for enhancing global citizenship.</i></p>
<p>Relating well to others <i>(empathy and management of emotions are prerequisites)</i></p>	<ul style="list-style-type: none"> • Valuing diversity in line with societal goals, respecting others and the other, empathy as «the ethical move par excellence»
<p>Cooperating, working in teams</p>	<p><i>Note: Mode and speed of interaction change due to rapid technological innovation</i></p>
<p>Managing and resolving conflicts Negotiating conflicting interests, generating options for resolving conflict in a constructive manner.</p>	

4. The way forward

The OECD's Future of Education and Skills 2030 was first presented at the Education and Policy Committee in April 2015, where the Committee agreed on the needs for stepping back, to explore the bigger picture and the longer-term challenges facing education, and to contribute to making the process of curriculum design and development a more evidence-based and systematic process. Since then, the project has progressed with two main activities, 1) conceptual framework development for 2030 competencies and 2) curriculum analysis for 2030 competency development. Thus, this paper intends to serve as a preliminary conceptual input paper to further the thinking in these two activities.

4.1 Reconceptualization of competencies for 2030

Through the revisit of the DeSeCo framework in the context towards 2030, the author and the OECD Secretariat have attempted to re-conceptualize the key competencies for 2030 based on the preliminary mapping exercise mentioned above, the stakeholder consultations, and the preliminary findings of curriculum analysis and other experts' papers. Three directions are crystallizing as relevant for Education 2030: EDU/EDPC(2016)23.



4.1.1 Navigating in time and space – an umbrella concept

In DeSeCo's final report (2003) navigating in space along with dealing with differences and contradictions and taking responsibility were presented as three conceptual illustrations of reflectivity / a reflective practice. Yet, **navigation in time** (past, today, future) **and in space** (family, community, region, nation, earth and universe) is suggested as a useful umbrella concept for guiding competence-oriented education reforms in response to the challenges and trends of the 21st century.

4.1.2 Reflection-anticipation-action: competency development cycle

A second element that is critical for the comprehension of the competencies needed in 2030 in light of complex demands is the required level of competence in terms of a reflective practice implying **reflection, anticipation and action** enabling individuals to act in a competent and responsible manner.

4.1.3 Cross-cutting competencies transcending DeSeCo's categories of key competencies

Against the backdrop of the global trends and challenges ahead that affect the demands placed on individuals it seems valuable to re-conceptualize some of the suggested priorities for Education 2030 as cross-cutting competencies including:

- Dealing with trade-offs, dilemmas, contradictions, and ambiguities.
- Taking responsibility
- Creating new values / new narratives.

As a next step the priorities and issues suggested here and in the table above need to be broadly discussed and further refined.

4.2 Operationalization of competencies for 2030

Difficulties in translating competencies into everyday classrooms, along with DeSeCo competencies, are reported by countries, schools and teachers. Thus, for a competence framework to be actionable, concrete and relevant in the school context each of the competencies identified as relevant for 2030 needs to be operationalized in terms of the necessary knowledge base, the skills, attitudes and values that young people need to develop throughout life. For this, substantial collaborative interdisciplinary expert work and stakeholder involvement will be needed.

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