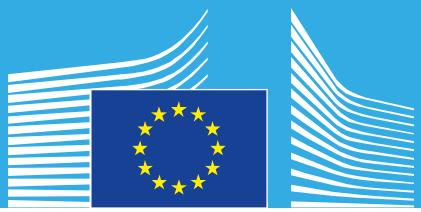

JRC TECHNICAL REPORT

Creativity – a transversal skill for lifelong learning. An overview of existing concepts and practices

Literature review report

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Editors: Kampylis, P. and Cachia, R.

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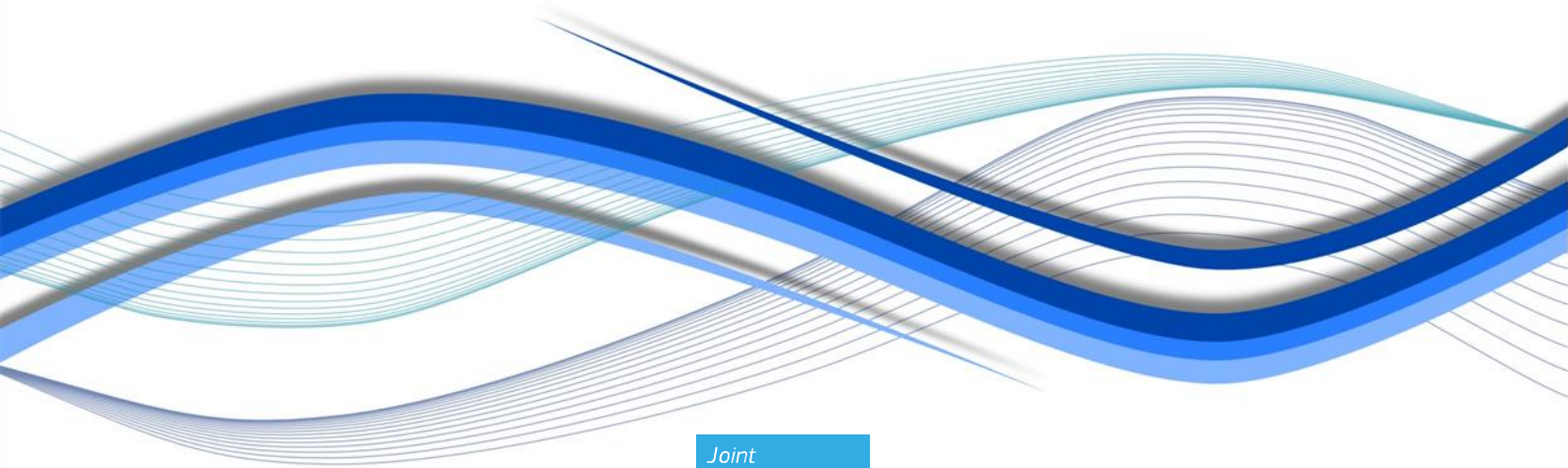

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Contents

1 Introduction

In the past several decades, in Europe and across the world there have been significant changes. The main trends include (World Economic Forum, 2013; Care, Anderson, & Kim, 2016; European Commission, 2018):

- The increasing complexity of problems such as climate change, global migration and growing resistance to life-saving drugs;
- The ubiquity of data;
- The proliferation of knowledge sources from the Internet and wider digital world;
- The increasing interconnectedness and global nature of our relationships;
- The potential of automation via Artificial Intelligence and its impact, often contested, on life and work;
- Increased self-employment;
- Global population growth;
- Economic and social inequities;
- Growing recognition of the importance of lifelong learning;
- An ageing society.

To this list can be added the likelihood of further global pandemics and their implications for society.

Such challenges have heightened the need for all individuals to develop capabilities, competences and dispositions that go beyond foundational skills such as literacy and numeracy (Pellegrino & Hilton, 2012; Lamb et al., 2018; Lucas, 2019). In recognition of this, in public and academic discourse, the focus has shifted towards problem-solving, critical thinking, ability to cooperate, creativity, computational thinking, self-regulation, adaptability, communication and learning to learn.

Among other skills, creativity is widely acknowledged as vital for progress in knowledge societies and innovation-driven economies (OECD, 2018). It is also increasingly valued in relation to individual and collective identity, mobility, and wellbeing (Durham Commission on Creativity and Education, 2019). At the individual level, creativity is thought to embrace curiosity and intellectual restlessness, a tolerance for uncertainty, risk, and ambiguity, and the capacity to be adaptable and flexible. These dispositions facilitate higher learning, long-term employability, and upward social mobility. Creativity can also benefit physical fitness, emotional resilience, mental health, confidence, agency, and engender a sense of empowerment. At the collective level, creativity, in the main, helps to promote social engagement, community identity and cohesion, stimulates economic growth and supports the good functioning of democratic societies. That said, it is important to acknowledge that creativity, like any human activity, can be misused. There is, it has been argued, a 'dark side' to creativity (Gino & Ariely, 2012) meaning that the search for novelty and problem-solving can also lead to dishonesty or to the creation of ideas which are harmful.

Given growing evidence of the many benefits of creativity it is hardly surprising that, across continents, it is central to the discourse on the key competences and core life skills needed today (Collard & Looney, 2014). This makes it timely to review how creativity has been framed, conceptualised, and defined as well as reflecting on the links between it and other competences and skills are. The findings of this literature review are an important aspect of the larger research project, *Creativity - a transversal skill for lifelong learning. An overview of existing concepts and practices.*

2 Methodology

The purpose of this literature review is to summarise, juxtapose and reflect upon existing concepts, definitions and frameworks of creativity as these are proposed, described and discussed in the academic literature, applied research reports, policy documents, curricula, and guidelines.

A number of research questions have shaped our inquiry and these can be clustered into three groups:

Framing creativity

- What are the frameworks capturing creativity as a transversal competence/skill/skill set for lifelong learning?
- What are the types (superordinate concepts) of creativity as a transversal competence/skill/skill set for lifelong learning?
- How does the language used to describe frameworks and their constituent elements influence one's understanding of them?

Defining creativity

- What are the definitions of creativity as a transversal competence/skill/skill set for lifelong learning?
- What are the models of creativity, including components, elements, and dimensions of creativity as a competence/skill/skill set?
- What are the differences and commonalities among the identified concepts (including types, definitions, and models) of creativity as a transversal competence/skill/skill set for lifelong learning?

Linking creativity with other competences/skills

- What are the links between creativity and the eight key competences outlined in the European Reference Framework?
- What are the links between creativity and other competences and core life/21st century skills as described in literature and learning frameworks?

To prepare this report, we have screened 175 academic articles/books. For this exercise, we used EBSCO Discovery Service. EBSCO offers access to more than 200 databases (those of EBSCO and partner organisations such as JSTOR), and content provided by publishers such as Elsevier, Wiley, Springer, Taylor & Francis, Sage, Nature Publishing, ACM, Oxford, and Cambridge. We used Boolean operators and searched for relevant literature in two rounds:

- First, we used the keywords creativity AND transversal skill AND lifelong learning resulting in 43 matches.
- Second, we used the keywords (creativity OR creative thinking OR creative ability) AND (transversal skill OR transversal competence) resulting in 132 matches.

The fields searched by default vary across databases, but most often include authors, subjects, keywords, title information and abstracts. If an abstract is not available, the first 1,500 characters of the HTML full text are searched. We also searched for the keywords within the full text of the articles/books. The parameters that we applied were the following: peer-reviewed, full text available and published from 1 January 2009. We searched for items in English only.

Having screened the titles and abstracts of the 175 articles and books found, we selected the most relevant ones for further review. We then searched for the definitions of creativity, creative thinking, or creative ability in the full texts of these, extracted relevant data, and compiled it into an Excel spreadsheet.

In addition to a semi-systematic academic literature search, we have reviewed grey literature (e.g. reports, policy documents, curricula, and guidelines). Using a snow-balling approach, we have identified 51 learning frameworks which either explicitly or implicitly refer to creativity as a competence/skill/skill set. These include policy-driven approaches at the international, European, national, and state levels, as well as research-based frameworks. We have also detected eight publications that focus specifically on creativity and provide elaborate

definitions or models of it as a competence/skill/skill set. In total, we have mapped 59 frameworks and selected 46 of them to be included into the report.

In the sections below, we provide a brief history of creativity in education and remarks on the language of skills. We also explore how creativity is conceptualised and defined within international, European, national, state, and research-based frameworks, and comment on how creativity links to other competences and skills. In the end, we discuss the differences and commonalities among the approaches identified and suggest possible future steps.

The report is not without limitations. First, most data were collected in English. This may have resulted in the overrepresentation of conceptualisation examples from the English-speaking world. Second, only 4 out of 175 articles/books examined as part of the literature review contained a definition of creativity, creative thinking, or creative ability. Thus, the report is heavily focused on frameworks. This inevitably limits the variety and depth of the definitions presented.

3 Understanding creativity in lifelong learning

3.1 A brief history of creativity in lifelong learning

Deciding what 'kind of a thing' creativity is in education and lifelong learning has interested many people ever since the concept of creativity first became a subject of serious study some 70 years ago (Guilford, 1950). This very brief introduction outlines a few of the key developments in thinking and mentions a small number of important thinkers.

Guilford (1950) suggested that there are two kinds of thinking, convergent (coming up with one good idea) and divergent (generating multiple solutions). Divergent thinking, he argued, is at the heart of creativity. Guilford sub-divided divergent thinking into three components – fluency (quickly finding multiple solutions to a problem), flexibility (simultaneously considering a variety of alternatives) and originality (selecting ideas that differ from those of other people).

Torrance (1970) took the idea of divergent thinking and developed an additional element – elaboration (systematising and organising ideas in greater detail). Using these ingredients, he developed one of the best-known tests of creative thinking (see Torrance, 1974).

Torrance defined creativity as a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficulty; searching for solutions, making guesses, or formulating hypotheses about the deficiencies: testing and retesting these hypotheses and possibly modifying and retesting them; and finally communicating the results (Torrance, 1974, p. 8).

According to Sternberg (1996), creativity is closely related to intelligence in its interchange between the creative, analytical and practical aspects of the mind. It shares common elements with problem-solving and the various stages of idea generation, exploring, framing and solution development that this requires (Isaksen, Dorval, & Treffinger, 2011). Creativity is, by common consent, multi-faceted and multi-dimensional (Sternberg, 2005).

One way of understanding more about creativity is to look at what highly creative individuals do. Treffinger found 120 definitions of creativity in papers exploring the attributes that distinguished these individuals from their peers (Treffinger, Young, Selby, & Shepardson, 2002). He clustered them into four categories: generating ideas, digging deeper into ideas, openness and courage to explore ideas, and listening to one's 'inner voice.'

Creativity does not just happen inside a person's mind; it exists in the interaction between a person's thoughts and the socio-cultural context in which they are operating (Csikszentmihalyi, 1996) and is frequently to be found in a social context (Lave & Wenger, 1991).

For much of the second half of the last century, creativity was seen as a form of divergent thinking; creativity was associated with intelligence or ability or even an exceptional genius. Only in the last twenty years has creativity come to be more widely seen as part of formal education and, indeed, lifelong learning. Part of this shift is a result of an acceptance that creativity is ubiquitous and universal, something we can all develop throughout our lives. In this sense it is a kind of 'everyday creativity' or 'little c' creativity (Craft, 2001; Kaufman & Beghetto, 2009), the kind of creativity that all people can show and develop.

There is an ongoing debate about the degree to which creativity is domain-specific or domain-general, that is to say, whether, for example, being creative is different in maths or art, at school or in life. In an even-handed review of this debate, persuasive arguments are made on both sides (see Baer, 2010). In its simplest form those arguing for domain specificity point to the fact that creative people are not creative in all subjects or domains. Their opponents suggest that creative thinking skills can be learned in one domain and transferred to another with practice. The domain issue is an important one for any consideration of creativity as a transversal skill for lifelong learning given that by definition lifelong learning exists in many different contexts.

Thinking about what matters in education has also moved on considerably over the past 70 years, with learning increasingly seen as something of growing importance beyond formal settings. When the focus was almost exclusively on schools, the currency of learning was 'knowledge' or 'skill'. But over the last three decades, as European countries have developed an agenda for lifelong learning (UNESCO, 1996), the language has shifted. The move towards lifelong learning reminds us of how different non-formal and informal learning can be from statutory education. In schools, learning is organised by subjects, framed by single disciplines such as literacy

or geography, and it is largely formal and compulsory. In life, learning is animated by interests and needs, often inter-disciplinary, largely informal and optional.

Interestingly, while thinking about creativity has, for a number of years, recognised the social dimension and the importance of context (Amabile, 1983), in schools learning is still largely viewed as the activity of individuals. Student performance is assessed in the abstract and based on their own learning achievements rather than contribution to group work aimed at exploring a real-world challenge. By contrast, creativity in the contemporary workplace is increasingly seen as a collective act, often associated with teamwork, innovation, and entrepreneurship. Such trends are well exemplified in our recent overview of initiatives aimed at fostering creativity (European Commission, forthcoming). This research found that, although the focus is typically on individual rather than group creativity, many practitioners emphasise the importance of collaboration while developing and applying creative skills.

Thinking about creativity and lifelong learning, there is another important concept absent from schools – ageing. The relationship between creativity and ageing is complex. On the one hand, creativity declines with age, but at the same time, wisdom tends to increase as we grow older, bringing with it the potential for deeper creative thinking. Any decline would also seem to vary according to context; artists and scientists, for example, are capable of making increasingly significant creative contributions as they get older.

In the last few decades, the field of neuroscience in particular has begun to shed light on the inner workings of the brain when we are being creative (Vartanian, Bristol & Kaufman, 2016). Neuroscience is helping us to understand more about the role of emotions in learning and creativity, the ways in which brain networks work together (rather than an earlier notion that the right brain is the creative half) and how different attentional states influence our creativity.

As regards language, increasingly 'creative thinking' is being used as an alternative for creativity (OECD, 2019a). The Programme for International Student Assessment (PISA), for example, has chosen creative thinking as the name for its planned new test in 2021. While these two words have the benefit of combining the divergent and convergent thinking implied by 'creativity' and 'critical thinking', they bring a potential limitation too. Using the word 'thinking' can imply that creativity is a purely cerebral act rather than a more physical or embodied one, something that runs counter to many people's experience of creativity in their lives. Our overview of initiatives aimed at fostering creativity reveals that, while in formal settings (especially schools) creativity tends to have a focus on creative thinking, many practitioners see creativity as including not only coming up with ideas but also putting them into action as well (European Commission, forthcoming).

That creativity in schools is to be tested by PISA and that a state like Victoria in Australia is already embarked on testing it reminds us of another dilemma, that assessment systems are not good at recognising novelty or originality. Indeed, there are strong historical associations between creativity and rebelliousness, a characteristic not often rewarded in public examinations.

Overall, in Europe and beyond, discussions increasingly focus on terms such as 'competences', 'capabilities', 'twenty-first-century skills' or, as in this study, 'transversal skills'. Over the last two decades, a number of frameworks have been developed, which include creativity to a greater or lesser extent. The language used within them is presented in the section below, while specific examples provided in Section 4.1.

3.2 The language of skills and its implications for understanding creativity

Understanding creativity as a transversal skill for lifelong learning requires an understanding of how the choice of vocabulary can affect the meaning of the concept and its use in practice.

Reviewing the frameworks, we have explored various concepts, definitions and models. In doing so, we have thought of these key terms as follows:

— A **framework** outlines a set of concepts and their relationships to the whole (and sometimes to each other). Typically, those dealing with creativity are learning frameworks specifying the knowledge, skills and/or competences/competencies which are desirable. A curriculum is a kind of framework. So is a competence framework such as the EU Key Competences for Lifelong Learning. So, a competence framework is an 'organised conceptualisation of competences' (Ferrari, 2012). Competence frameworks

tend to exist at European level while curriculum frameworks tend to work at country level, though, increasingly, thinking about education transcends borders.

- A **model** seeks to show how one aspect or concept from a larger framework is made up and/or how it works. The model could relate to a particular cross-cutting concept (such as creativity) or focus on a particular knowledge discipline (such as geography) or on a skill (such as divergent thinking).
- A **concept** is an idea. It can be large in size (such as justice) or much smaller (such as a leg). A concept might be communicated visually or graphically, or both.
- A **construct** is broader than an idea. Typically, it can be an idea or theory with different conceptual elements not necessarily yet grounded in empirical evidence.
- A **definition** is a description in words of the essential aspects of a concept (such as creativity or lifelong learning).

There is currently no international consensus as to the meanings of skills, competences, capabilities or the various synonyms and near synonyms for these. Skills, for example, are sometimes seen as a component of a 'competence', sometimes as being on a similar level. Meanwhile, competencies and transversal skills are often used interchangeably.

A brief overview of some of the terms used in describing and defining creativity makes these tensions clearer and may help develop an understanding of creativity as a transversal skill.

Ability – still widely used to describe levels of knowledge or skills in school (as in 'mixed-ability class'); occasionally used in frameworks and, like a trait, can imply that skills levels are somehow fixed and not much influenceable by education.

Attitude – a source of motivation; the OECD (2018) sees attitudes and values along with knowledge and skills in action as the ingredients of competencies.

Attribute – a quality or characteristic of a learner such as resilience; the active ingredient of what it is to be an effective lifelong learner. The UAL Framework (University Arts London, n.d.), a university approach to cultivating creativity as a set of attributes, is an exemplar of this approach.

Capability – like a competence, suggests a dynamic blend of knowledge, skill and attitude in context and is widely used in New Zealand and Australia to describe transversal skills such as critical and creative thinking (Australian Curriculum, Assessment and Reporting Authority, n.d.).

Capacity – used almost interchangeably with capability, especially by the OECD (Dumont, Istance & Benavides, 2012).

Character – refers to the qualities individuals have which make them distinct; has acquired a broader meaning in education and lifelong learning to encompass a number of concepts, often also referred to as transversal skills, such as creativity, curiosity and persistence (Peterson & Seligman, 2004).

Cognitive skill – cognitive skills, often to distinguish them from non-cognitive skills, are defined by UNESCO: 'According to Pierre et al. (2014), cognitive skills involve the ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought' (Zhou, 2016).

Competence/competency – a dynamic combination of the knowledge, skills and attitudes learners need to thrive and participate throughout life in a complex digital world. UNESCO (2015) suggests that the term 'competencies' 'is often used interchangeably with the terms 'skills', 'attitudes', and 'values'. Not all commentators agree with the interchangeable use of these terms, typically arguing that competence focuses on *what* someone can do, on performance, while competency focuses on the *how*, on the behaviours involved in the process.

Core skill/competency - core competencies are defined by the OECD (n.d.) as 'personal attributes or underlining characteristics, which combined with technical or professional skills, enable the delivery of a role/job'.

Disposition – an active competence; a near synonym for a 'habit of mind' but implying not just a capability but also that it is regularly deployed. The OECD Working Paper exploring the assessment of creativity in schools, frames creativity as five dispositions or habits of mind, (Lucas, Claxton, & Spencer, 2013). According to UNESCO (2013), a disposition 'refers to the mindset progressively acquired through primary (family) and secondary (school) socialization. So, dispositions are both personal and socially shared'.

Habit of mind – similar in meaning to 'dispositions', habits of mind are 'the characteristics of what intelligent people do when they are confronted with problems, the resolutions to which are not immediately apparent' (Costa & Kallick, 2008); an approach to conceptualising learning that emerged from eminent American psychologist Lauren Resnick (1999).

Key competency/skill – a term popularised as part of the DeSeCo (Definition and Selection of Competencies) research programme (Rychen & Salganik, 2003) outlining three categories: interacting in socially heterogeneous groups, acting autonomously, and using tools interactively.

Knowledge – understanding of information about a subject is part of the effective deployment of transversal skills although this is not always clear; the UNICEF MENA conceptual framework (2017) explicitly groups creativity (along with critical thinking and problem-solving) under learning and describes them as part of a cognitive dimension or 'learning to know'.

Life skills – literally the skills which enable individuals to succeed in life, defined by UNESCO as 'psychosocial abilities for adaptive and positive behaviour that enable individuals to deal effectively with the demands and challenges of everyday life' (2013); tend to be grouped into categories such as cognitive, non-cognitive, personal and inter-personal skills. The LifeComp framework (European Commission, 2020) explores the idea of life skills in detail suggesting that life skills span personal, interpersonal, cognitive, metacognitive and reflective skills.

Meta-skill – used occasionally to describe skills which are both enduring and current; the term currently preferred in Scotland (Skills Development Scotland & Centre for Work-based Learning in Scotland , 2018).

Non-cognitive skill – non-cognitive skills are defined by UNESCO as the 'patterns of thought, feelings and behaviours (Borghans et al., 2008) that are socially determined and can be developed throughout the lifetime to produce value. Non-cognitive skills comprise personal traits, attitudes and motivations. Economists (Kautz et al., 2014) and educational researchers (Gutman & Schoon, 2013) alike often see creativity as one of a number of non-cognitive skills (UNESCO, 2016).

Skill – expertise or the ability to do something well; increasingly divided into categories such as basic or higher; or as 'behavioural and social', 'technical' or 'creativity and critical thinking'; or as 'academic' or 'vocational'.

Soft skill – skills which are largely non-cognitive and social such as creativity, problem-solving, critical thinking and held up as being different from 'hard' skills such as maths or languages or technical skills to do with a specific vocation; frequently used by employers as a near synonym for competencies or transversal skills, often with the implication that such skills are transferable.

Trait – an aspect of a personality or character; when used by psychologists, the term can easily suggest fixity, that it is something an individual is born with rather than learnable through life.

Transformative competency – a recent development of the idea of competence/competency included in the OECD's Learning Compass model; transformative competencies are 'the types of knowledge, skills, attitudes and values students need to transform society and shape the future for better lives' (OECD, 2019b).

Transferable skill – a skill learned in one context and then used in another; sometimes used almost synonymously with transversal but actually means something different. 'The term transversal skills has largely replaced the term transferable skills' (Cedefop, 2008).

Transversal skill – also referred to as 'transversal competencies' and used across the EU and in much of the work undertaken by UNESCO in the South Pacific region; encompasses a broad set of skills including critical and inventive thinking, interpersonal, intrapersonal skills and global citizenship. According to UNESCO, these are 'skills that are typically considered as not specifically related to a particular job, task, academic discipline or area of knowledge and that can be used in a wide variety of situations and work settings (for example, organisational skills)' (UNESCO International Bureau of Education, 2013).

Twenty-first century skill – a skill deemed to be somehow new and of particular relevance in today's world, often implying a digital connection. Much used in the USA (Pellegrino & Hilton, 2012), and often meaning much the same as transversal skills or competences or transferable skills, is undermined by the unbelievable notion that a skill which is relevant or essential in 2020 will necessarily be relevant in 2080 given a rapidly changing world.

Recently in 'The Future of Education and Skills' (2018, p. 4) the OECD sought to show some of the relationships between the various terms associated with learning, see Figure 1. Knowledge and skills are intertwined as if in a strand of learning DNA to produce competencies which in turn appear to provide the necessary support for a learner to navigate his or her way through uncertain times with the help of those around.

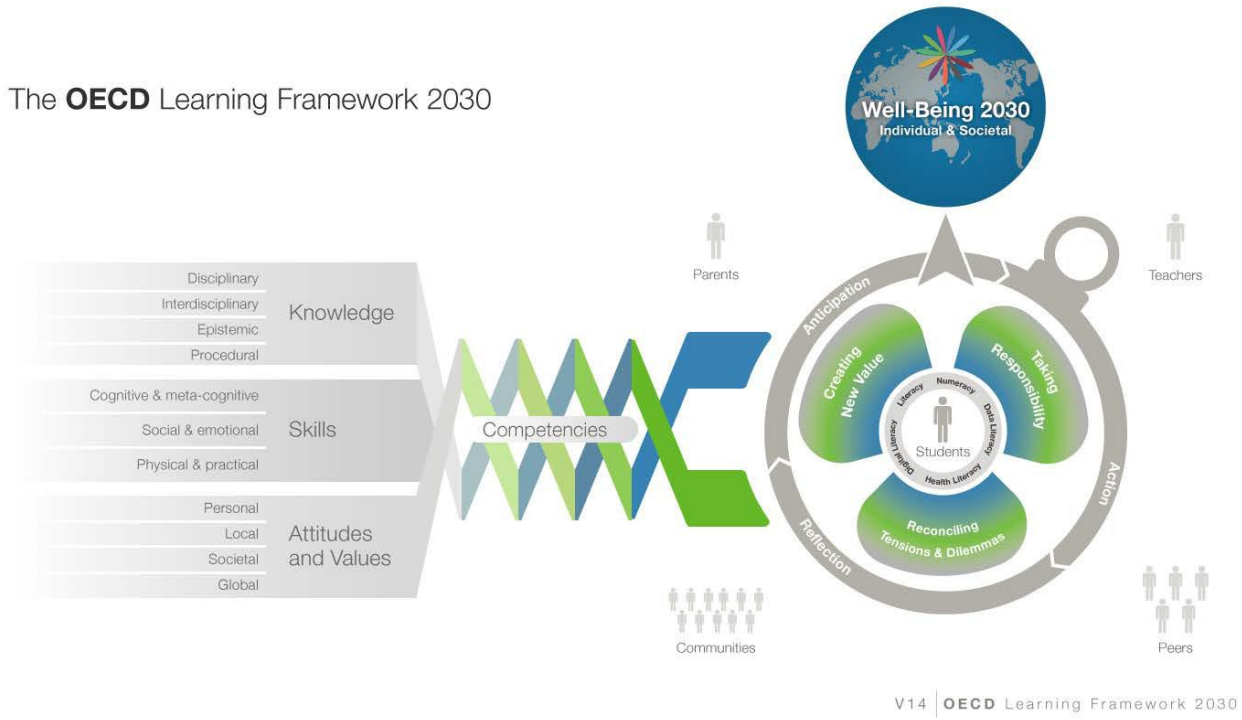

Figure 1. OECD Learning Framework 2030

Source: OECD. (2018). The Future of Education and Skills: Education 2030 - The future we want. OECD Publishing.

4 Reflecting on existing concepts of creativity as a transversal skill

4.1 Framing and defining creativity

In the six sections below, we explore how creativity is framed within international, European, national, state and research-based frameworks where it appears, considering its various conceptual and linguistic framings. In total, we analysed 46 frameworks and the visibility of creativity varies across them; Table 1 shows all 46 frameworks clustered into three groups to illustrate the degree of visibility of creativity within each one.

Table 1 Visibility of creativity in the frameworks reviewed

Low	Medium	High
OECD Definition and Selection of Competencies (DeSeCo)	OECD Learning Compass	UNESCO Intercultural Competences: Conceptual and Operational Framework
PISA 2018 Global Competence Framework	European Reference Framework: Key competences for lifelong learning	UNESCO/ERI-Net working definition of transversal competencies
UNESCO/Brookings Global Framework of Learning Domains	European Digital Competence Framework for Citizens	UNICEF Twelve core life skills for MENA
European Entrepreneurship Competence Framework	European Personal, Social and Learning to Learn Key Competence Framework	World Economic Forum 21st-century skills
European Framework for Digitally Competent Educational Organisations	National Core Curriculum for Basic Education in Finland	World Economic Forum Definition of core work-related skills
Reference Framework of Competences for Democratic Culture	Curriculum of the Netherlands	Definition of cultural awareness and expression key competences
European Framework for the Digital Competence of Educators	National Research Council preliminary classification of 21st century skills	Australian F-10 Curriculum
European Training Strategy II: Competences for Trainers Working at International Level	Assessment and Teaching of 21st Century Skills	Curriculum of Northern Ireland
Jubilee Centre Framework for Character Education	enGauge 21st Century Skills: Digital Literacies for a Digital Age	Meta-skills framework of Scotland
	Habits of Mind, Costa and Kallick	Alberta, Canada, K-12 Curriculum
	Non-cognitive skills model, Gutman and Schoon	Victoria, Australia, F-10 Curriculum
	P21 Learning Framework	Cambridge Life Competencies Framework
	VIA Character strengths	Center for Curriculum Redesign Competencies Framework
		CIRES Key Skills for the 21st Century
		New Pedagogies for Deep Learning
		Learning Dimensions of Making and Tinkering 2.0
		Creative Problem-Solving Framework
		Durham Commission on Creativity and Education

	Five-dimensional model of creativity, Lucas et al.
	Four C model of creativity, Kaufmann and Beghetto
	LEGO Foundation
	OECD Centre for Educational Research and Innovation
	PISA 2021 Creative Thinking
	Seven Critical Components of Creativity in Children, Bay Area Discovery Museum

Source: Compiled by the authors.

In general terms, those countries and states which have made creativity a policy priority have developed frameworks in which creativity is highly visible. By contrast, in all of the frameworks developed in Europe the visibility of creativity is low or medium.

In the tables below, the first cell in each row is coloured based on how visible creativity is in the framework, following the same colour guide as in Figure 1.

4.1.1 International approaches

With international frameworks, there is a great variety of concepts and language used to describe them, see Table 2.

Table 2. International frameworks including creativity and its framing within them

Title of framework	Framework content	How creativity is conceptualised/described
OECD Definition and Selection of Competencies (DeSeCo) **2003**	The DeSeCo framework specifies a set of specific competencies in three clusters: — Use tools interactively: the ability to use language, symbols and texts interactively, the ability to use knowledge and information interactively, the ability to use technology interactively — Interact in heterogeneous groups: the ability to relate well to others, the ability to co-operate and work in teams, the ability to manage and resolve conflicts — Act autonomously: the ability to act within the big picture, the ability to form and conduct life plans and personal projects, the ability to defend and assert rights, interests, limits and needs	The main emphasis of this framework is to argue for a move beyond taught knowledge and skills to competencies. Its main focus is to stress the value of reflectiveness which it sees as at the heart of these competences. **Conceptualisation**: Creativity is described as having currency as 'value is placed on flexibility, entrepreneurship and personal responsibility.' Not only are individuals expected to be adaptive, but also innovative, creative, self-directed and self-motivated. Interestingly creativity is framed as an 'ability'. Key competencies involve a mobilisation of cognitive and practical skills, creative abilities and other psychosocial resources such as attitudes, motivation and values. **Visibility**: The words 'creativity' and 'creative' are absent from the headline document. But in the Skills concept note, creativity is implicit, assumed to be important: 'Not only are individuals expected to be adaptive, but also innovative, creative, self-directed and self-motivated.'
OECD Learning Compass **2019**	The framework distinguishes between core foundations and transformative competencies that can be built on them. Knowledge, skills, attitudes and values: — Cognitive foundations — Health foundations — Social and emotional foundations Transformative competencies: — Creating new value (ability to innovate and act entrepreneurially) includes critical thinking and creativity — Reconciling tensions and dilemmas (ability to balance competing, contradictory or incompatible demands) — Taking responsibility (ability to consider the ethics of action)	The OECD Learning Compass describes itself as an 'evolving framework' with the metaphor of the compass indicating the increasing importance of learner agency in uncertain times. Its emphasis on the iterative learning process, Anticipation-Action-Reflection cycle, is strongly aligned to many creative design and making processes. **Conceptualisation**: Creativity is seen as an element of one of three transformative competences. In terms of skills it is seen as an aspect of 'cognitive and meta-cognitive skills' which include 'critical thinking, creative thinking, learning-to-learn and self-regulation'. **Visibility**: Creativity is identified as integral to the transformative competences of creating new value and reconciling tensions and dilemmas in a list including: sense of purpose, curiosity, open mindset, critical thinking, creativity, collaboration, agility, risk management and adaptability. But in the headline of the Learning Compass the words 'creativity' and 'creative' are not mentioned.
PISA 2018 Global Competence Framework	The framework specifies four dimensions of global competence: — Examine local, global and intercultural issues	Global competence is defined as a 'multidimensional, life-long learning goal. Globally competent individuals can examine local, global and intercultural issues, understand and appreciate different perspectives and worldviews, interact successfully and respectfully with others, and take responsible action toward

2018	— Understand and appreciate the perspectives and world views of others — Engage in open, appropriate and effective interactions across cultures — Take action for collective well-being and sustainable development The four dimensions are supported by necessary knowledge, skills, attitudes and values to convert these into action.	sustainability and collective well-being.' Given this, the focus is on critical thinking rather than creativity. **Conceptualisation**: Critical thinking skills associated with creativity are seen as part of the 'four dimensions' of global competence, which in turn are supported by four inseparable factors: knowledge, skills, attitudes and values. **Visibility**: The framework does not use the words creativity, creative or create. However, some of the listed skills and attitudes, e.g. adaptability and openness, may be treated as related to it.
UNESCO Intercultural Competences: Conceptual and Operational Framework **2013**	The framework specifies some key concepts related to intercultural competences: intercultural responsibility, intercultural literacy, resilience, cultural shifting, intercultural citizenship, conviviality, reflexivity, creativity, liquidity, contextualization cues, transvaluation, Ubuntu, semantic availability, warm ideas, skills, Uchi Soto, multilingualism, disposition, emotions, knowledge, translation, intercultural communicative competence.	The framework defines creativity as 'a constant process, supporting, amplifying and regenerating cultural diversity across time and space, so that it may continue to instill expressions with new meanings for our time and for our future generations.' **Conceptualisation**: The framework pictures intercultural competence as a tree with many leaves, one of which is creativity. The competences tree metaphor suggests that intercultural competence is an organic system of concepts. **Visibility**: Creativity is highly visible. The framework makes a number of powerful statements about creativity: 'Intercultural dialogue encourages readiness to question well established value-based certainties by bringing reason, emotion and creativity into play in order to find new shared understandings.' Also, 'Creativity is the most evenly distributed resource in the world' and 'Creativity becomes the wellspring of cultural diversity.'
UNESCO/Brookings Global Framework of Learning Domains **2013**	The framework specifies seven learning domains, each with three subdomains (early childhood, primary and post-primary): — Physical well-being — Social and emotional — Culture and the arts — Literacy and communication — Learning approaches and cognition — Numeracy and mathematics — Science and technology	This framework reads as a manifesto for the future of learning in formal education. It adopts a largely discipline-based approach to creativity locating it mainly in Culture and the arts. At the early childhood level, creativity involves 'the ability to go beyond the techniques normally used to approach a problem and generate innovative solutions'. Creativity can also be demonstrated in how children communicate their ideas, such as through the creative arts (visual arts, music, dance, dramatic play). At the post-primary level, creativity is the 'capacity to view circumstances in unexpected ways and find ways to reach satisfactory outcomes, including aesthetic and pragmatic considerations.' **Conceptualisation**: Creativity sits within one of the seven learning domains, Learning approaches and cognition, along with curiosity and engagement, persistence and attention, autonomy and initiative, cooperation, reasoning and problem-solving, early critical thinking skills and symbolic representation.

		Visibility: Creativity is visible (in the sense that it is mentioned throughout) but in ways that suggest that it is an aspect of a bigger, normally disciplinary idea.
UNESCO/ERI-Net working definition of transversal competencies **2015**	Transversal competencies are specified in six domains: — Critical and innovative thinking — Interpersonal skills — Intrapersonal skills — Global citizenship — Media and information literacy — Others	Aimed at teachers, this framework sees creativity as part of the Critical and innovative thinking domain, along with entrepreneurship, resourcefulness, application skills, reflective thinking and reasoned decision-making. The framework emerged from a study of systems and teachers across ten countries. 'The essential skills and characteristics identified by teachers as being necessary for facilitating the learning of transversal competencies were: (i) communication skills; (ii) creativity (iii) organizational skills; (iv) assessment skills and (iv) a passion for teaching.' **Conceptualisation**: Seen as an aspect of a transversal competency, which itself refers to the 'skills, competencies, values and attitudes such as critical thinking, collaboration, creativity, self-discipline, resourcefulness and respect for the environment.' Categories are not always clear as competencies are both the top-level category and also, as in the quotation above, at the same level as skills, values and attitudes. **Visibility**: Creativity and creative thinking are highly visible throughout this framework.
UNICEF Twelve core life skills for MENA **2017**	To emphasize their dynamic nature, the framework specifies twelve core life skills organised in clusters within four dimensions of learning. — Cognitive Dimension or 'Learning to know'. Skills for learning: creativity, critical thinking, problem-solving — Instrumental Dimension or 'Learning to do'. Skills for employability: cooperation, negotiation, decision-making — Individual Dimension or 'Learning to be'. Skills for personal empowerment: communication, resilience, self-management — Social Dimension or 'Learning to live together'. Skills for active citizenship: participation, empathy, respect for diversity	Draws on thinking in the Delors Report (UNESCO, 1996), repositioning its pillars of education as dimensions of learning. Creativity is one of a number of skills for learning along with critical thinking and problem-solving. These skills are seen as potentially being embedded in all subject areas. Related skills include innovative thinking, divergent thinking, articulating ideas, analysis and synthesis. **Conceptualisation**: The big idea in this framework is that it 'is the proposition of a rights-based and transformative vision of education that fosters successful individuals in the context of the workplace while fulfilling education's role to enhance academic and personal development as well as social cohesion.' Creativity is one of twelve core life skills along with critical thinking, problem-solving, cooperation, negotiation, decision-making, self-management, resilience, communication, respect for diversity, empathy and participation. Creativity also sits in the Cognitive Dimension of learning or 'learning to know'. **Visibility**: Creativity is strongly present throughout this framework both as one of twelve core skills and as an aspect of the four dimensions. It is mentioned 163 times. In the report, it is argued that 'creativity is relevant to each of the four dimensions of learning as it helps to sharpen learning processes and outcomes,

		prepare children for success in a fast-changing world and enhance enjoyment and relevance of learning.'
World Economic Forum 21st-century skills **2015**	The framework specifies 21st-century skills in three clusters: — Foundational literacies (how students apply core skills to everyday tasks): literacy, numeracy, scientific literacy, ICT literacy, financial literacy, cultural and civic literacy — Competencies (how students approach complex challenges): critical thinking/problem-solving, creativity, communication, collaboration — Character qualities (how students approach their changing environment): curiosity, initiative, persistence/grit, adaptability, leadership, social and cultural awareness	Creativity is defined as 'the ability to imagine and devise innovative new ways of addressing problems, answering questions or expressing meaning through the application, synthesis or repurposing of knowledge.' **Conceptualisation**: Creativity is framed as (1) a 21st-century competence (along with communication, persistence and collaboration). A further category, character qualities, includes some aspects typically associated with creativity such as curiosity and persistence. **Visibility**: Creativity is highly visible throughout the framework.
World Economic Forum Definition of core work-related skills **2016**	The framework uses three categories – abilities, basic skills and cross-functional skills: — Abilities: Cognitive abilities and physical abilities — Basic skills: Content skills and process skills — Cross-functional skills: Complex problem-solving skills, resource management skills, social skills, systems skills, technical skills	Creativity is defined as 'the ability to come up with unusual or clever ideas about a given topic or situation, or to develop creative ways to solve a problem.' **Conceptualisation**: This framework drawing on the O*NET model, makes some relatively unusual decisions about its sub-categories. So, for example, creativity is seen as a cognitive ability, critical thinking as a basic skill and complex problem-solving as a cross-functional skill. **Visibility**: Creativity is highly visible throughout.

The nine international frameworks each includes creativity either explicitly or implicitly, but there is no common approach. Three bodies have contributed most to our understanding of the field – the OECD, UNESCO and the World Economic Forum (WEF). The OECD tends to maintain a broad view, with UNESCO and UNICEF often closer to the supply side of education, and the WEF more attuned to demand-side issues, what it perceives employers need from education systems.

The original DeSeCo work by OECD was foundational in signalling a move away from knowledge and skills towards competencies. But it has little to offer in terms of an understanding of creativity. Curiously, it sees creativity as an 'ability' and as a resource to 'mobilise' a competency. The OECD's recent work in envisaging education in 2030, its Learning Compass (see Figure 1) seems set on loosening the language it is using. It describes itself as an 'evolving framework'. Creativity, along with critical thinking, is an 'element' of one of three 'transformative competencies'. It is as if the language needs to be different, fresher and more ambitious to ensure that this new thinking can cut through the noise of more familiar terms.

OECD's international testing arm, PISA, boldly sought to define Global Competence in its 2018 test. Creativity is at the most implicit (there is no mention of either creativity or creative throughout), while critical thinking is seen as the more useful set of skills in developing an understanding of global issues. This tension between creativity and critical thinking is something that is increasingly being seen in many of the frameworks we analysed.

By contrast UNESCO's Intercultural Competence Framework puts creativity at its heart with numerous mentions of its various contributions to cultural understanding. It uses a visual metaphor to conceptualise creativity as one of the leaves on the tree of intercultural competence.

UNESCO's Global Framework of Learning Domains, a collaboration with the Brookings Institution, is more a manifesto than a framework. For a future-orientated document, it is surprisingly traditional in its choice of subject disciplines within its learning domains and in the way creativity is located – largely within the creative arts.

The UNESCO/ERI-Net framework tries to help teachers understand the idea of transversal competencies and how these can be applied. It has the merit of being an empirical study across ten countries and it also reflects the inevitably different ways in which countries perceive transversal competencies. So, for example, creativity is seen both as part of a transversal competence and as a transversal competency. As we observed on page 9, such interchangeability of terms is not always helpful.

UNICEF's twelve core life skills framework helpfully takes thinking from the Delors Report (UNESCO, 1996) to reposition its pillars of education as four dimensions of learning. Creativity is central and is mentioned 163 times. It is positioned both as a core life skill and as an aspect of the four dimensions. At the level of graphic communication and clarity of intent, see Figure 3.

Figure 2. Core life skills listed by UNICEF

Source: UNICEF-MENA Regional Office. (2017). Reimagining Life Skills and Citizenship Education in the Middle East and North Africa. A Four-Dimensional and Systems Approach to 21st Century Skills: Conceptual and Programmatic Framework. UNICEF.

The WEF framework for 21st century skills has been widely noted in the literature of policy, research and practice. Of particular interest is its clustering of skills into three categories – Foundational literacies, Competencies and Character qualities. Creativity is listed as a competence next to critical thinking/problem-solving, communication and collaboration. Attributes associated with creativity, such as curiosity and persistence/grit, are seen as character qualities.

The WEF definition of core work-related skills has clearly been conceived by different thinkers. Albeit drawing on the O*NET model, it makes some relatively unusual decisions about its sub-categories. So, for example, creativity is seen as a cognitive ability, critical thinking as a basic skill and complex problem-solving as a cross-functional skill.

4.1.2 European approaches

Some key EU/European frameworks are listed below. Table 3 reveals how creativity is conceptualised/described in each.

The nine EU/European frameworks in Table 3 each includes creativity either explicitly or implicitly, but there is no common approach. In framing creativity, there is no consistency with regard to superordinate concepts. The frameworks take their cue from the European Reference Framework and default to the language of competence or competence framework, informed by their focus – entrepreneurial, digital, democratic and learning. Those organised primarily for educators, rather than as an overview of a concept, inevitably seem further away from the concept in which we are interested, creativity.

Table 3. EU/European frameworks including creativity and its framing within them

Title of framework	Framework content in brief	How creativity is conceptualised/described
European Reference Framework: Key competences for lifelong learning **2006 and 2018**	The framework specifies eight key competences: — Communication in the mother tongue — Communication in foreign languages — Mathematical competence and basic competences in science and technology — Digital competence — Learning to learn — Social and civic competences — Sense of initiative and entrepreneurship — Cultural awareness and expression	Creativity is seen as being made up of a number of skills and embedded throughout the key competences. **Conceptualisation**: Creativity, along with critical thinking and others is seen as one of seven 'themes that are applied throughout the Reference Framework' – a blend of skills which themselves sit within key competences. Specifically, creativity is positioned as a sub-set of Sense of initiative and entrepreneurship along with 'innovation and risk-taking, as well as the ability to plan and manage projects in order to achieve objectives'. **Visibility**: Creativity is explicitly mentioned as a cross-cutting theme, but its importance is underplayed by being treated as a relatively small sub-set of one competence.
European Entrepreneurship Competence Framework **2016**	The framework specifies 3 competence areas: — Ideas and opportunities — Resources — Into action Each area contains 5 competences, and together these make up the 15 competences that individuals use to discover and act upon opportunities and ideas. The framework specifies 8 progression levels (from foundation to intermediate, advanced, and expert levels).	Creativity is defined as 'Developing ideas and opportunities to create value, including better solutions to existing and new challenges; exploring and experimenting with innovative approaches; combining knowledge and resources to achieve valuable effects.' **Conceptualisation**: Creativity is seen as a sub-set of an Entrepreneurship competence, Ideas and opportunities area (along with spotting opportunities, vision, valuing ideas, ethical and sustainable thinking). **Visibility**: Creativity is explicitly mentioned but as a small element of a larger competence. It is also implicit in many of the other competences such as coping with ambiguity, uncertainty & risk, taking the initiative and mobilising others.
European Digital Competence Framework for Citizens **2013**	The framework specifies five digital competence areas broken down unevenly into 21 further competences: — Information and data literacy — Communication and collaboration — Digital content creation — Safety	'To use digital technology creatively is to use digital tools and technologies to create knowledge and to innovate processes and products; to engage individually and collectively in cognitive processing to understand and resolve conceptual problems and problem situations in digital environments.' **Conceptualisation**: Creativity is seen through the lens of digital activity. **Visibility**: Creativity is explicitly part of Problem-solving (creatively using digital technologies) but implicitly part of Communication and collaboration and Digital content creation.

	— Problem-solving	
European Framework for Digitally Competent Educational Organisations **2015**	The framework specifies 7 cross-sector thematic elements: Leadership and governance practices, Teaching and learning practices, Professional development, Assessment practices, Content and curricula, Collaboration and networking, Infrastructure	Digital competence is broadly defined as the confident, critical and creative use of ICT to achieve goals related to work, employability, learning, leisure, inclusion and/or participation in society. **Conceptualisation**: While creativity is identified as integral to the digital competence, it is effectively seen as an indicator that critical thinking is taking place. **Visibility**: Creativity is largely tangential to this framework although there are a few specific mentions including: 'Students and staff are encouraged to explore and diversify their creative practices by using digital technologies as enablers of creativity and creative expression.'
European Personal, Social and Learning to Learn Key Competence Framework **2020**	The competences are clustered by area: — Personal competence: self-regulation, flexibility and wellbeing — Social competence: empathy, communication and collaboration — Learning to learn competence: growth mind-set, critical thinking and managing learning	The definition of creativity draws on the five-dimensional model (Lucas et al., 2013): Creativity enables individuals to question assumptions, reevaluate problems considering different variables and to take sensible risks. Being persistent, collaborative, and disciplined sustain creativity.' p. 67) The framework links creativity with critical thinking and with flexibility. **Conceptualisation**: Creativity is seen both as a 'higher-order skill crucially related to learning dispositions or attitudes to learning that can be taught or stimulated' (p. 64) and as a 'transversal skill that anyone can develop to generate outcomes that are both original and of value, and is as well a driver for innovation.' (p. 67). **Visibility**: While creativity is visible, it is not given the prominence of the nine sub-areas of this Competence Framework.
Definition of cultural awareness and expression key competences **2016**	Cultural awareness and expression is considered a key competence, comprising certain knowledge, skills and attitudes: — Knowledge of the learner: basic knowledge of facts, ideas and emotions related to expressions of arts, applied arts, heritage/history/tradition, popular culture, subcultures, media, and diversity (cultural and linguistic) — Skills of the learner: ability to perceive, enjoy, appreciate, analyse and criticise cultural artefacts and processes; capacity for cultural expression in a range of media — Attitudes of the learner: confidence and motivation to cultivate cultural capacities; open attitude to and interest in cultural expression (self and other); respect for the cultural expressions, identities and views of others	This approach to the development of the competency takes a five-dimensional model of creativity (Lucas et al., 2013) as its definition of creativity (see p. 34). **Conceptualisation**: Framed as a set of general skills alongside critical thinking, initiative, problem-solving, risk assessment, decision making and constructive management of feelings. Very much seen through an arts and culture lens: 'A positive attitude also covers creativity and the willingness to cultivate aesthetic capacity through artistic self-expression and participation in cultural life.' **Visibility**: Creativity is highly visible with 41 explicit mentions of the word in this document and strong statements such as: 'In recent decades, we have also seen the rise of another school of thought, dominated by economic reasoning and highlighting the importance of creativity and innovation.' Also, 'Sustainable development in the broad as well as in the narrow sense 17 is, like intercultural awareness and dialogue and creativity, one of the most relevant and urgent challenges of the 21st century.'

Reference Framework of Competences for Democratic Culture **2018**	The framework offers a comprehensive conceptual model of competences that individuals require in order to function as democratically and interculturally competent citizens. The 20 competences are organised under four headings: — Values — Attitudes — Skills — Knowledge and critical understanding	In general terms this framework, with its interest in democracy, treats creativity as an aspect of critical understanding necessary for citizens, for example, to evaluate 'different ideas and positions based on a variety of arguments.' **Conceptualisation**: The overarching big idea of this framework is the 'values of the Council of Europe: human rights, democracy and the rule of law'. Within such values, creativity tends to be positioned as an element of critical understanding – 'the comprehension and appreciation of meanings'. It is stated that 'Critical understanding is demonstrated by the ability not just to reproduce knowledge but to apply it in new contexts and in creative ways.' **Visibility**: Creativity has low visibility in this framework. It is implicit in the attitude 'Tolerance of ambiguity', as an aspect of 'Knowledge and critical understanding', and under skills in Analytical and critical thinking skills, Empathy and Co-operation skills.
European Framework for the Digital Competence of Educators **2017**	The framework specifies 22 educator-specific digital competences across three areas: — Educators' professional competences — Educators' pedagogic competences — Learners' competences	This framework operates at one remove from the topic of creativity as it focuses on the professional and pedagogic needs of educators seeking to develop digital competence. **Conceptualisation**: Creativity is seen as a means to an end or as a mode of learning. **Visibility**: Creativity is implicitly part of this framework as in statements like: 'As role models, educators need to be able to clearly demonstrate their digital competence to learners and to pass on their creative and critical use of digital technologies.' Also 'To use digital technologies within pedagogic strategies that foster learners' transversal skills, deep thinking and creative expression.'
European Training Strategy II: Competences for Trainers Working at International Level **2014**	The competence model is divided into six competence areas, each with own criteria and indicators: — Learning to learn — Designing educational programmes — Cooperating successfully in teams — Communicating meaningfully with others — Intercultural competence Being civically engaged	Creativity is effectively given a de facto definition as finding creative ways to use the environment. **Conceptualisation**: Creativity is an element of one or more competences of relevance to trainers. **Visibility**: Creativity is implicitly part of this framework. Specifically, it is seen as an element of Understanding and facilitating individual and group learning processes ('promoting creativity, problem-solving and out-of-the-box thinking') and, in its wider sense, part of Cooperating successfully in teams ('encouraging and involving other team members, learning with and from others') and Intercultural competence ('acceptance of ambiguity and change…critically reflecting and distancing oneself from one's own perceptions, biases and stereotypical constructions of reality').

Even while using the language of competence, there is a huge discrepancy as to the scale or scope of the competence. It can, for example, be a large part of an idea (such as the three competence areas making up EntreComp) and, at the same time, refer to the fifteen competences which make up the whole framework. On one occasion this apparent inconsistency is recognised by the use of the word 'elemental' to describe the 22 'sub' competences of the European Framework for the Digital Competence of Educators, implying that these competences exist at a lower level.

Perhaps not surprisingly given its breadth, the Personal, Social and Learning to Learn key competence Framework makes connections with both the idea of competences, referring to itself as a transversal competence and to the notion of creativity as a 'higher-order thinking skill'. There is a similar challenge for the Framework for Digitally Competent Educational Organisations which takes as its superordinate concept 7 thematic elements common to all education sectors. The framework relating to democratic culture is more amorphous still, with the superordinate concept being the values of the Council of Europe.

Work on developing the Cultural awareness and expression competence makes a feature of creativity. It takes a five-dimensional model of creativity (Lucas et al., 2013) as its definition of creativity (European Union, 2016, p. 34) and frames creativity as a set of general skills alongside critical thinking, initiative, problem-solving, risk assessment, decision making and constructive management of feelings. Creativity (or the lack of opportunity for it) is effectively placed on the same level as climate change as a current imperative: 'Sustainable development in the broad as well as in the narrow sense is, like intercultural awareness and dialogue and creativity, one of the most relevant and urgent challenges of the 21st century' (European Union, 2016, p. 32).

That there will be a number of different levels of analysis is to be expected when broad concepts such as lifelong learning or education or democracy are concerned. It is also noteworthy that there are similar challenges when dealing with relatively more bounded concepts such as digital or entrepreneurial.

Transversal is used with both competence and skill almost interchangeably and rarely with any explanation. Indeed, the language used to describe the elements of the frameworks is very varied. From the list in Section 3.2 the following terms are used in these European frameworks – attitude, character, cognitive skills, competence, competency, habit of mind, knowledge, life skill, non-cognitive skill, transferable skill, transversal skill, transversal competence and twenty-first century skill. As earlier discussed, each term comes freighted with different meanings and associations.

To add to this linguistic variety, various visual representations of concepts are used including, for example, an orange tree (LifeComp) and a swimmer in a digital ocean (DigComp).

At first sight, such a variety of approaches and conceptualisations might seem strange, a criticism of those who have developed these frameworks. But actually, the task at hand is extremely complex. It requires not just factor analysis but also a series of common-sense trade-offs in terms of the selection of concepts and language to arrive at sub-categories which are of similar size, stature and importance and which are sufficiently distinct from others. Most frameworks have a title, an internal organisational structure – sub-elements, themes, clusters – to make the concept manageable, and an operational level in which there is enough detail for it to be practically useful.

With the European frameworks, there is an overall conceptual unity derived, albeit post hoc, from the European Reference Framework. Whether talking conceptually of transversal skills or transversal competences it is reasonably clear what is meant. What is less clear is how best to highlight the role of creativity when it is, at least at the key competences level, invisible.

4.1.3 National approaches

A significant number of national education systems are now including creativity and associated broader skills in their curricula. The Brookings Institution (Care, Anderson, & Kim, 2016) suggests that 36 countries have them in their vision/mission statements, 76 identify relevant skills, 51 have embedded such skills in the curriculum and 11 have specified skills progression in creativity and the like.

In Table 4, we review five contrasting examples.

Table 4. National frameworks including creativity and its framing within them

Title of framework	Framework content	How creativity is conceptualised/described
Australian F-10 Curriculum **2015**	The curriculum places seven general capabilities and cross-curriculum priorities alongside eight learning areas (disciplinary knowledge, skills and understanding) and three cross-curricular themes: — General capabilities: Literacy, Numeracy, Information and Communication Technology (ICT) Capability, Critical and Creative Thinking, Personal and Social Capability, Ethical Understanding, and Intercultural Understanding — Learning areas: English, Mathematics, Science, Health and Physical Education, Humanities and Social Sciences, the Arts, Technologies and Languages — Cross-curricular themes: Aboriginal and Torres Strait Islander Histories and Cultures, Asia and Australia's Engagement with Asia, and Sustainability	Creativity is termed Critical and Creative Thinking (CCT). 'Students develop capability in critical and creative thinking as they learn to generate and evaluate knowledge, clarify concepts and ideas, seek possibilities, consider alternatives and solve problems. Critical and creative thinking involves students thinking broadly and deeply using skills, behaviours and dispositions such as reason, logic, resourcefulness, imagination and innovation in all learning areas at school and in their lives beyond school'. **Conceptualisation**: CCT is one of seven general capabilities, a close synonym for competencies or transversal skills. As well as the idea of capability Australia sees a symbiotic relationship with certain dispositions which both cultivate CCT and which CCT enhances: 'Dispositions such as inquisitiveness, reasonableness, intellectual flexibility, open- and fair-mindedness, a readiness to try new ways of doing things and consider alternatives, and persistence promote and are enhanced by critical and creative thinking'. Figure 3 shows how the whole curriculum is conceived as a three-dimensional cube. **Visibility**: Creativity as CCT is highly visible and, like the other general capabilities, has a detailed continuum document showing how it can be developed throughout formal education.
National Core Curriculum for Basic Education in Finland **2014/2016**	The core curriculum describes seven transversal competence areas: — Thinking and learning to learn — Cultural competence, interaction and expression — Taking care of oneself, managing daily life — Multiliteracy — ICT competence — Working life competence and entrepreneurship — Participation, involvement and building a sustainable future	Finland's national curriculum is highly unusual in that it was co-created by the government, educational bodies, employers and its citizens. Its radically different approach moves the curriculum away from disciplinary subjects and towards a project of real-world interest. One innovative development is the decision to require Finnish schools to teach at least one module a year which is inter-disciplinary. This simple strategy both requires and enables teachers to work in ways which are likely to foster creativity. **Conceptualisation**: Creativity is seen as part of the seven transversal competence areas. **Visibility**: Creativity is implicit rather than explicit. The words 'creativity and 'creative' are absent in the overview curriculum documents, but they clearly sit within three of the transversal competences, namely Thinking and Learning to learn, Cultural competence, interaction and expression, and Working life competence and entrepreneurship.
Curriculum of the Netherlands	Recently re-organised to focus on three clusters of general skills to be delivered through a range of subjects:	Creativity is defined as 'The ability to produce new and/or unusual but practically applicable ideas.' There is a high level of freedom for schools to teach as they wish and to position themselves as having an interest in specific areas such as creativity.

Forthcoming	— Thinking and acting: creative thinking and practice, problem-solving and practice, and critical thinking — Dealing with others: communication, collaboration, and social and cultural skills — Knowing yourself: self-regulation, orientation (yourself and career), and entrepreneurship	**Conceptualisation**: Creativity is seen as part of a cluster of general skills under the heading of 'Thinking and acting'. **Visibility**: Creativity is visible both as a skill and in the phrase 'creative expression' where it refers to largely arts subjects as compulsory.
Curriculum of Northern Ireland **2007**	The curriculum is set out in areas of learning. It emphasises the development of the following whole curriculum skills and capabilities for lifelong learning and contributing effectively to society: — Cross-curricular skills: Communication, Using Mathematics, Using Information and Communications Technology — Thinking skills and personal capabilities: Managing Information, Thinking, Problem-Solving and Decision-Making, Being Creative, Working with Others and Self-Management	Northern Ireland has a longstanding commitment to the development of creative thinking. Being creative is defined comprehensively as being made up of 'discovering how to seek out questions to explore and problems to solve, experiment with ideas and questions, make new connections between ideas/information, learn from and value other people's ideas, make ideas real by experimenting with different designs, actions, and outcomes, challenge the routine method, value the unexpected or surprising, see opportunities in mistakes and failures, and take risks for learning'. The curriculum emphasises the benefits of developing positive 'attitudes and dispositions' towards learning including a number associated with creativity – determination, openness to new ideas, optimism and curiosity. **Conceptualisation**: Creativity, along with critical thinking, is framed as one of a number of important core thinking skills and personal capabilities. **Visibility**: Creativity is highly visible under the heading of 'Be Creative'. The curriculum focuses explicitly on developing pupils' personal and interpersonal skills, capabilities and dispositions and ability to think both creatively and critically.
Meta-skills framework of Scotland **2018**	Skills for the future are defined as twelve meta-skills and classified under three headings: — Self-management (manage the now): Focusing, Integrity, Adapting, Initiative — Social intelligence (connect with the world): Communicating, Feeling, Collaborating, Leading — Innovation (create our own change): Curiosity, Creativity, Sense making, Critical thinking	The meta-skills framework is primarily aimed at work-based learning and has not yet impacted on school curricula. Creativity is defined as 'the ability to imagine and think of new ways of addressing problems, answering questions or expressing meaning.' It is seen as being made up of: Imagination (the ability to explore ideas of things that are not in our present environment, or perhaps not even real), Idea generation (proficiency at thinking and coming up with solutions and responses beyond that which is rote or rule-based), Visualising (translating information and thought into accessible expressions, readable and recognisable images), Maker mentality (the ability to explore, through tinkering and making, in order to arrive at new ideas and solutions). **Conceptualisation**: Creativity is conceived of as one of a number of meta-skills 'skills for the future…higher order skills that create adaptive learners and promote success in whatever context the future brings.' **Visibility**: Creativity, along with critical thinking and curiosity, is highly visible.

Of these exemplars, Northern Ireland and Australia have, in different ways, demonstrated a longstanding commitment to the development of creative thinking.

Northern Ireland defines being creative as being made up of: discovering how to seek out questions to explore and problems to solve, experiment with ideas and questions, make new connections between ideas/information, learn from and value other people's ideas, make ideas real by experimenting with different designs, actions, and outcomes, challenge the routine method, value the unexpected or surprising, see opportunities in mistakes and failures, and take risks for learning (Partnership Management Board, 2007).

The curriculum emphasises the benefits of developing positive 'attitudes and dispositions' towards learning, including a number associated with creativity – determination, openness to new ideas, optimism and curiosity. Creativity, along with critical thinking, is framed as one of a number of important core thinking skills and personal capabilities.

Since the Melbourne Declaration (2008), Australia has been seeking to put into action one of its aims, that all young people should become successful learners, confident and creative individuals, and active and informed citizens (Ministerial Council on Education Employment Training and Youth Affairs, 2008). In the curriculum, creativity is seen as a broad concept and called Critical and Creative Thinking (CCT). CCT is one of seven general capabilities, a close synonym for competencies or transversal skills which all young people are required to develop. As well as the idea of capability Australia sees a symbiotic relationship with certain dispositions which both cultivate CCT and which CCT enhances - inquisitiveness, reasonableness, intellectual flexibility, open- and fair-mindedness, a readiness to try new ways of doing things and consider alternatives, and persistence. Figure 3 shows the relationship between capabilities and learning areas, how they intersect.

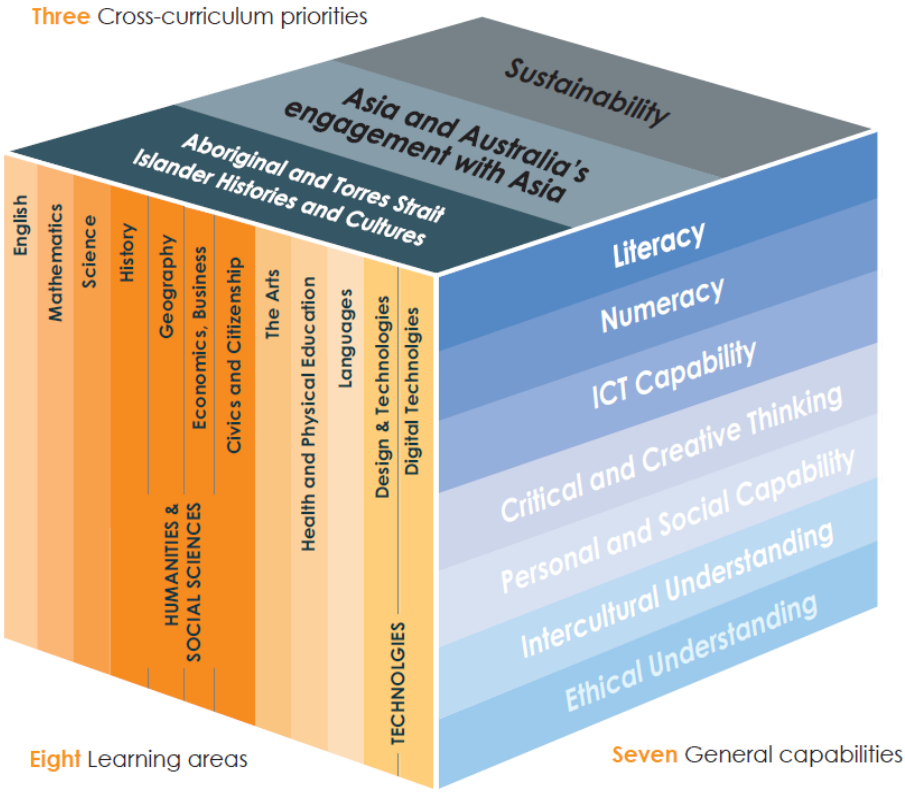

Figure 3. The interaction between general capabilities, learning areas and cross-curricular priorities in the Australian Curriculum

Source: Australian Government. (2018). *Through Growth to Achievement: Report of the Review to Achieve Educational Excellence in Australian Schools.* Retrieved from https://docs.education.gov.au/system/files/doc/other/662684_tgta_accessible_final_0.pdf

Finland, Scotland and the Netherlands are examples of three countries exploring with their curricula. Finland and the Netherlands have adopted a consultative, decentralised model of curriculum reform while Scotland has chosen to be more radical in its model of meta-skills.

Issues for countries to consider include:

- How broadly or narrowly creativity is defined;
- Whether its definition seems to speak to an education, wellbeing or employability agenda (or all three);
- Demonstrating to schools and their leaders ways in which creativity can be embedded in all disciplines;
- Understanding the ways in which creativity has its own knowledge and skills to be learned;
- Ensuring that there are clear connections between schools, vocational colleges and lifelong learning more widely across different levels and phases;
- Ensuring that assessment and accountability systems are aligned with the definition of creativity and the value attached to it.

4.1.4 State-wide approaches

In countries where education policy is a matter for states to decide it can be a simpler proposition to turn political will into action in education systems. Alberta in Canada and Victoria in Australia are good examples, see Table 5.

Table 5. State-wide frameworks including creativity and its framing within them

Title of framework	Framework content	How creativity is conceptualised/described
Alberta, Canada, K-12 Curriculum **2016**	Alberta's curriculum promotes the development of eight competencies: — Critical thinking — Problem-solving — Managing information — Creativity and innovation — Communication — Collaboration — Cultural and global citizenship — Personal growth and well-being	Creativity is paired with innovation and defined as 'recognizing opportunities and imagining possibilities to apply ideas in new ways; exploring or playing with ideas, materials or processes to create something new; evaluating and adapting ideas, materials or processes in response to feedback or emerging conditions; demonstrating initiative, resourcefulness and perseverance when transforming ideas into actions, products or services'. **Conceptualisation**: The central idea in Alberta's curriculum is the development of competencies both as standalone entities and how they appear within each subject of the curriculum. Competencies are defined as 'combinations of attitudes, skills and knowledge that students develop and apply for successful learning, living and working'. In addition to Creativity and Innovation, much of Critical thinking and Problem-solving could be seen as part of creativity. **Visibility**: Creativity (with innovation) is one of eight competencies.

Victoria, Australia, F-10 Curriculum **2015**	Victoria has simplified the Australian National Curriculum with respect to its general capabilities. Critical and Creative Thinking has three strands which at year 9-10 include — Questions and Possibilities: Investigate the characteristics of effective questions in different contexts to examine information and test possibilities; Suspend judgements to allow new possibilities to emerge and investigate how this can broaden ideas and solutions; Challenge previously held assumptions and create new links, proposals and artefacts by investigating ideas that provoke shifts in perspectives and cross boundaries to generate ideas and solutions — Reasoning: Examine a range of rhetorical devices and reasoning errors, including false dichotomies and begging the question; Examine how to identify and analyse suppressed premises and assumptions; Investigate the nature and use of counter examples structured as arguments; Consider ambiguity and equivocation and how they affect the strength of arguments; Investigate the use of additional or refined criteria when application of original criteria does not produce a clear conclusion — Meta-Cognition: Critically examine their own and others thinking processes and discuss factors that influence thinking, including cognitive biases; Investigate how the use of a range of learning strategies can be monitored, evaluated and re-directed as necessary; Investigate the kind of criteria that can be used to rationally evaluate the quality of ideas and proposals, including the qualities of viability and workability	As well as simplifying the Australian curriculum, Victoria has also produced a scope and sequence document for critical and creative thinking specifying achievement standards and progression from Foundation to Year 10. **Conceptualisation**: As with the Australian curriculum, creativity is seen as a general capability, critical and creative thinking. **Visibility**: Creativity is highly visible especially as the State of Victoria was the first educational administration in the world to develop and then implement annual sample tests of student critical and creative thinking from 2016 onwards).

Alberta has oriented its whole curriculum towards the development of eight competencies. The central idea in Alberta's curriculum is the development of competencies both as standalone entities and as how they appear within each subject of the curriculum. Competencies are defined as 'combinations of attitudes, skills and knowledge that students develop and apply for successful learning, living and working'. In addition to Creativity and Innovation much of Critical thinking and Problem-solving could be seen as part of creativity. Figure 4 shows clearly how the competency has sub-elements, how these might be developed and some indicators of progress.

Victoria, like the Australian Curriculum, conceives creativity as critical and creative thinking (CCT), one of a number of general capabilities. But Victoria has recognised that the national definition is potentially off-putting to teachers by dint of its large scope. Consequently it has reduced the content to three strands - Questions and Possibilities, developing students' imaginative and intuitive capacities as well as fostering a curious and speculative disposition, Reasoning strand, focusing on the development of knowledge and tools to construct and evaluate ideas and arguments that may be unfamiliar, and Meta-Cognition, defining the knowledge and skills that enable students to better identify, describe, understand, practice, develop and manage their own learning processes.

Victoria is unique in the world in that it not only specifies the development of creativity across all phases of formal education offering practical resources for teachers to embed CCT it also assesses 15 year olds annually using a carefully validated online test.

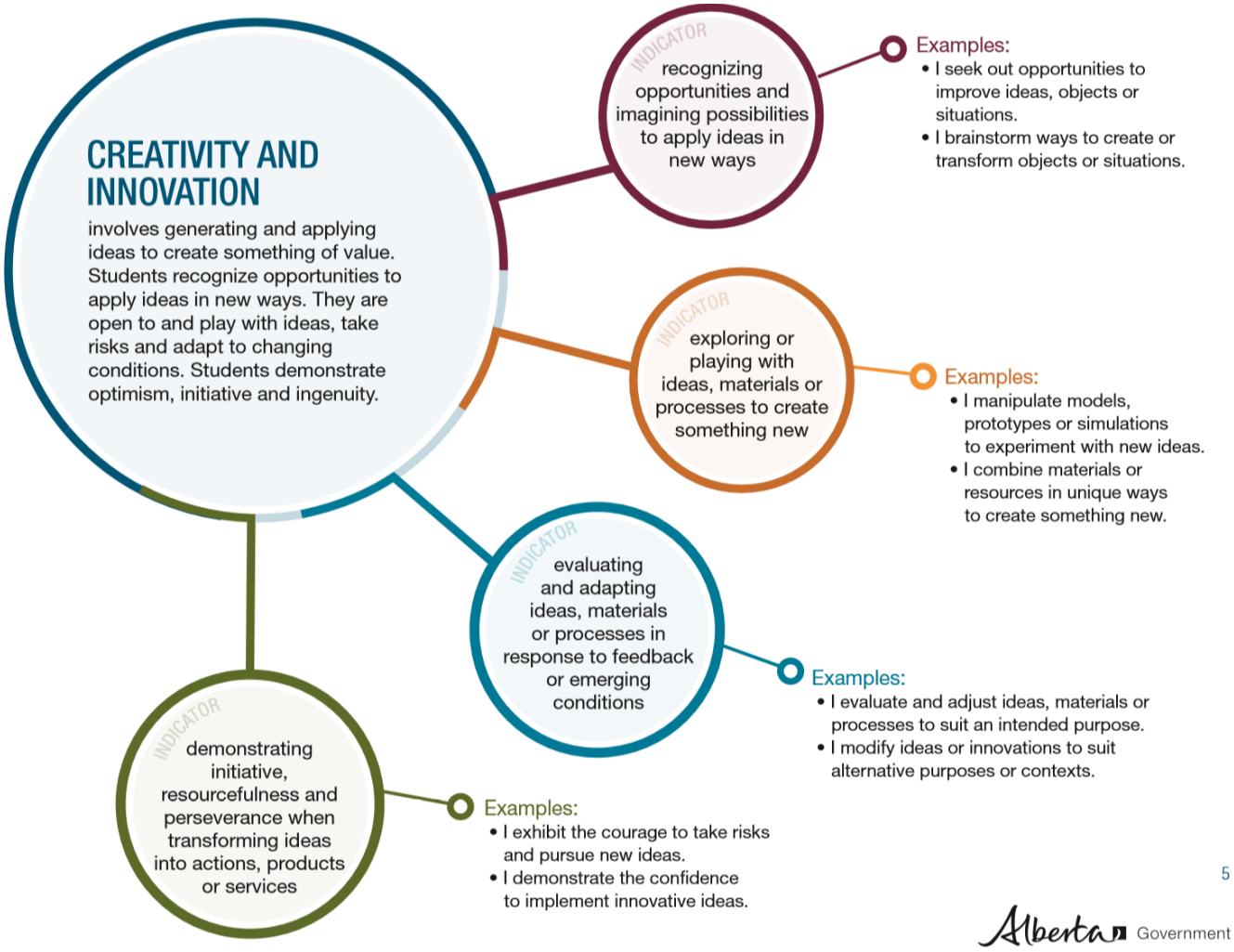

Figure 4. Competency, description, indicators and examples of creativity and innovation in the Albertan Curriculum

Source: Alberta Education. (n.d.). *Descriptions & Indicators*. Retrieved from https://education.alberta.ca/competencies/descriptions-indicators/everyone/print-versions/?searchMode=3

4.1.5 Research-based frameworks

As part of our research, we sought out frameworks for education and lifelong learning with a significant element of creativity which were developed based on a thorough literature research and/or empirical trialling, see Table 6.

Table 6. Research-based learning frameworks including creativity

Title of framework	Framework content	How creativity is conceptualised/described
A preliminary classification of 21st century skills **National Research Council** **USA** **2012**	21st century competencies are specified in three domains, clustered and linked with terms used for 21st century skills, O*NET skills and main ability/personality factors. Cognitive competences: — Cognitive processes and strategies — Knowledge — Creativity Intra-personal competencies: — Intellectual openness — Work ethic/conscientiousness — Positive core self-evaluation Interpersonal competencies — Teamwork and collaboration — Leadership	This is a significant overview of the field with a breadth of research expertise. It is interesting for its focus on learning transfer as being critically important: 'We view 21st century skills as knowledge that can be transferred or applied in new situations' (see p.23). Deeper learning is the phrase used to describe the kinds of pedagogies likely to cultivate more effective transfer of knowledge. **Conceptualisation**: Creativity is seen as a cognitive competency. **Visibility**: While it is named, it attracts less attention than critical thinking.
Assessment and Teaching of 21st Century Skills (ATC21S) **Australia** **2012**	The framework specifies 10 skills grouped in four clusters: — Ways of thinking: creativity and innovation; critical thinking, problem-solving, decision making; learning to learn, and metacognition — Ways of working: communication; collaboration (teamwork) — Tools for working: information literacy; ICT literacy — Living in the world: citizenship - local and global; life and career; personal and social responsibility - including cultural awareness and competence	The thinking behind ATC21S was significant in informing the PISA 2015 Test of Collaborative Problem-solving. Creativity is defined in terms of knowledge, skills and attitudes. **Conceptualisation**: Creativity (with innovation) and alongside critical thinking is seen as one of a number of 21st century skills. Creativity and innovation are grouped together, but it is suggested that the concepts originate from two different traditional schools of thought. 'Creativity is most often the concern of cognitive psychologists. Innovation, on the other hand, is more closely related to economics where the goal is to improve, advance, and implement new products and ideas.' **Visibility**: Within the list of 21st century skills creativity is specifically identified.

Cambridge Life Competencies Framework **UK** **2019**	The framework specifies six life competences: — Creative thinking — Critical thinking — Learning to learn — Communication — Collaboration — Social responsibilities These are supported by three underpinning foundations including emotional development, digital literacy and discipline knowledge.	Creativity is defined as 'the tendency or ability to generate multiple original and innovative ideas, alternatives, or possibilities rapidly and elaborate on them.' **Conceptualisation**: Creativity is seen as a key life competency. Creative thinking and critical thinking are described separately. Creative thinking: participating in creative activities, creating new content from own ideas or other resources, using newly created content to solve problems and make decisions. Critical thinking: understanding and analysing links between ideas, evaluating ideas, arguments and options, synthesising ideas and information. **Visibility**: Creativity is highly visible; it makes up about a third of the Life Competencies framework.
Center for Curriculum Redesign Competencies Framework **USA** **2019**	The framework specifies competencies and sub-competencies in three dimensions. Skills (how we use what we know): — Creativity — Critical thinking — Communication — Collaboration Character (how we behave and engage in the world - agency, attitudes, behaviours, dispositions, mindsets, personality, temperament, values, social and emotional skills, non-cognitive skills, and soft skills): — Mindfulness — Curiosity — Courage — Resilience — Ethics — Leadership Meta-learning (how we reflect and adapt and learn how to learn): — Metacognition	Now part of a wider Ed21 network, the 4Cs model was an early attempt to reconceptualise the kinds of learning necessary to thrive in a digital age. The framework has subsequently been revised to encompass Character and Meta-learning. **Conceptualisation**: Creativity is seen as an applied skill, along with critical thinking, communication and collaboration. Aspects of Character also feature in many definitions of creativity. **Visibility**: Creativity was highly visible when the framework contained 4Cs of which it was one C (two if Critical thinking is also included). Subsequently it has become less central.

	— Growth mindset	
enGauge 21st Century Skills: Digital Literacies for a Digital Age **North Central Regional Educational Laboratory (NCREL)** **USA** **2002**	Digital-age literacy: basic, scientific, and technological literacies; visual and information literacies; cultural literacy and global awareness Inventive thinking: adaptability/ability to manage complexity; curiosity, creativity and risk-taking; higher-order thinking and sound reasoning Effective communication: teaming, collaboration, and interpersonal skills; personal and social responsibility; interactive communication High productivity: ability to prioritize, plan, and manage for results; effective use of real-world tools; relevant, high-quality products	One of the earliest frameworks seeking to define 21st century skills for a digital age. Creativity is defined as 'using the imagination to develop new and original things.' **Conceptualisation**: Creativity is part of inventive thinking, itself a twenty-first century skill. The report also talks of such skills, especially digital, as a 'literacy'. **Visibility**: Creativity is explicitly mentioned and defined but sits within the category Inventive thinking.
Key Skills for the 21st Century **Centre for International Research on Education Systems (CIRES)** **Australia** **2017**	Nine concepts/key skills are seen as important: — Critical thinking — Creativity — Metacognition — Problem-solving — Collaboration — Motivation — Self-efficacy — Conscientiousness — Grit or perseverance	This 'framework' or list of the key skills most likely to be future proof was developed after a thorough evidence-based review, with particular focus on the Australian curriculum. The review is reluctant to define creativity saying only that most researchers 'argue that it entails the production of something recognised as novel or useful in a given social context…that an output must be socially recognised as valuable (in addition to being original) to be considered as creative.' The review contains thoughtful analyses of issues of pedagogy and assessment relating to the skills. Creativity is also seen as closely related with other cognitive skills such as problem identification, idea generation, and problem-solving. **Conceptualisation**: Creativity is closely linked with critical thinking and seen as a key skill for the future. **Visibility**: As with the wider Australian curriculum, creativity (with critical thinking) is highly visible.
Habits of Mind **Costa and Kallick** **USA** **2000**	Sixteen habits of mind: — Persisting — Managing impulsivity — Listening to others with understanding and empathy — Thinking flexibly — Thinking about thinking (metacognition)	Developed over many decades, habits of mind seek to better define what learners do when they behave intelligently. Creativity is an individual habit, Creating, imagining and innovating, and identified as integral to thinking flexibly, questioning and posing problems, finding humour, and learning continuously. **Conceptualisation**: Central to this framework is the idea that Habits of Mind (HofM) are a 'composite of many skills, attitudes, cues, past experiences and proclivities.' They seek to describe those habits of mind which are effective for people when confronted with real-world problems. 'Attribute' is also used as a synonym for HofM.

	— Striving for accuracy and precision — Questioning and posing problems — Applying past knowledge to new situations — Thinking and communicating with clarity and precision — Gathering data through all senses — Creating, imagining and innovating — Responding with wonderment and awe — Taking responsible risks — Finding humour — Thinking interdependently — Learning continuously	**Visibility**: Creativity is both an explicit HofM and also an element of other HofMs.
Jubilee Centre Framework for Character Education **UK** **2017**	The framework describes four types of virtues and their associated character traits: — Intellectual virtues — Moral virtues — Civic virtues — Performance virtues These virtues feed into an integrative virtue, practical wisdom, developed through experience and critical reflection, and enabling us to perceive, know, desire and act with good sense.	The Jubilee model reaches back to Aristotle, taking his notion of phronesis or practical wisdom as a meta-virtue integrating the four types of virtue, intellectual, moral, civic and performance. **Conceptualisation**: Creativity is an aspect of the different types of virtues which make up character. Critical thinking, and curiosity are seen as intellectual virtues. Determination, motivation, perseverance, resilience and teamwork as performance virtues. **Visibility**: Creativity is implicitly part of this overview of character.
New Pedagogies for Deep Learning (NPDL) **Canada** **2014**	Core learning outcomes are defined as the six Cs of deep learning: — Character — Citizenship — Collaboration — Communication — Creativity — Critical thinking	NPDL was conceived by Michael Fullan (Fullan & Scott, 2014) and the framework along with its associated pedagogical guidance and continua for each of the 6Cs is used across the world. Creativity is defined as 'having an 'entrepreneurial eye' for economic and social opportunities, asking the right questions to generate novel ideas, and demonstrating leadership to pursue those ideas into practice.' Critical thinking is defined as 'critically evaluating information and arguments, seeing patterns and connections, construction meaningful knowledge and applying it in the real world.'

		NPDL maintains a distinction between creativity and critical thinking. **Conceptualisation**: Creativity is framed as an aspect of deep learning. Importantly NPDL argues that digital is an aspect of all of the competences or capabilities which are particularly relevant to learners today. It sees progression in regard to creativity at school level as having four stages - limited, emerging, accelerating, advanced – and that the use of digital, methods is increasing integral to these, referred to as 'leveraging digital'. **Visibility**: Creativity is very prominent in this framework.
Non-cognitive skills model **Gutman and Schoon** **UK** **2013**	The study identified eight non-cognitive skills: — Self-Perceptions — Motivation — Perseverance — Self-Control — Metacognitive Strategies — Social Competencies — Resilience and Coping — Creativity	The focus of this rapid review of the literature was achieving a better understanding of the impact of non-cognitive skills on life outcomes. Creativity is defined as 'the production of novel and useful ideas.' The researchers found no evidence of its impact on wider life outcomes. **Conceptualisation**: Creativity is one of eight non-cognitive skills for which there is only limited evidence of wider life outcomes. **Visibility**: Creativity is visible, but the research team were of the belief that progress in understanding its impact was hampered' lack of consensus concerning its definition and measurement', something which there has been significant progress with since the report was written.
P21 Learning Framework **USA** **2019**	The framework specifies key subjects, 21st century themes and three blocks of skills. Key subjects: English, reading, or language arts, world languages; arts; mathematics, economics; science; geography; history; government; and civics 21st century interdisciplinary themes: global awareness, financial, economic, business and entrepreneurial literacy, civic literacy, health literacy, and environmental literacy Skills: — Learning and innovation skills: creativity and innovation, critical thinking and problem solving, communication, and collaboration — Information, media and technology skills: information literacy, media literacy, and ICT literacy	Creativity is seen as having three elements: Thinking creatively: using a wide range of idea-creation techniques, creating new and worthwhile ideas and elaborating, refining, analysing, and evaluating ideas in order to improve and maximize creative efforts Working creatively with others: Developing, implementing and communicating new ideas, being open and responsive to new and diverse perspectives, incorporating group input and feedback, demonstrating originality and inventiveness in work and understanding the real-world limits to adopting new ideas, viewing failure as an opportunity to learn and understanding that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes Implementing innovations: Acting on creative ideas to make a tangible and useful contribution to the field in which the innovation will occur.

	— Life and career skills: flexibility and adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, and leadership and responsibility	Now part of Battelle for Kids in the USA, P21 shares the 4Cs of the Center for Curriculum Redesign and links these with other aspects of the curriculum. **Conceptualisation**: Creativity, paired with innovation, is seen as a learning and innovation skill. **Visibility**: Creativity is clearly visible but, in this version of the Learning Framework increasingly subsumed in many other concepts.
VIA Character strengths **VIA Institute on Character** **USA** **n.d.**	The framework specifies 24 character strengths by type/virtue: — Wisdom: creativity, curiosity, judgement, love of learning and perspective — Courage: bravery, honesty, perseverance and zest — Humanity: kindness, love and social intelligence — Justice: fairness, leadership and teamwork — Temperance: forgiveness, humility, prudence and self-regulation — Transcendence: appreciation of beauty and excellence, gratitude, hope, humor and spirituality	This framework draws on the work of Peterson, and Seligman (2004), broadly speaking in the area of positive psychology. **Conceptualisation**: Creativity is seen as part of Wisdom, a character strength. **Visibility**: Creativity has a distinct contribution along with curiosity to the development of wisdom.
Learning Dimensions of Making and Tinkering 2.0 **Exploratorium** **USA** **2017**	The framework sets five dimensions of making and tinkering: — Initiative and intentionality — Problem solving and critical thinking — Conceptual understanding — Creativity and self-expression — Social and emotional engagement	Developed by educators from the Exploratorium Tinkering Studio and the Lighthouse Community Charter School (Oakland), the framework is built on results of a study on an afterschool tinkering programme at the school. **Conceptualisation**: Together with self-expression, creativity is treated as a dimension of learning. Indicators that tinkerers are exercising and developing their creativity include responding aesthetically to materials and phenomena, connecting projects to personal interests and experiences, playfully exploring, expressing joy and delight, and using materials in novel ways. **Visibility**: Creativity is clearly visible and described as being at the heart of tinkering.

These 13 research-based models adopt a large variety of different approaches. As with the European frameworks where the focus of the framework and its proximity to the idea of creativity suggests a likely approach to the role and status of creativity within it, so with these research-based frameworks **the attitude of the researchers or the organisations for which they are working guides the approaches adopted**. Indeed, a number of these organisations, P21 and the Center for Curriculum Redesign, are advocacy bodies recruiting researchers, educators and politicans to their cause.

Those, for example, adopting a 21st century skills/life skills approach, tend to see creativity as important and current, whereas those with longer histories, the two-character frameworks, for example, see creativity as something much older, potentially an element of human virtues such as wisdom.

Similarly, the perspective of non-cognitive skills not only reminds us of life after school, how certain skills help an individual to flourish beyond school, but also of the role of perseverance, metacognitive strategies and social competencies alongside creativity.

One framework, Habits of Mind, has its roots in psychology and takes a view of intelligence which sees the real world beyond school as centrally important. For two decades the sixteen habits have been used in schools across the world, increasingly embedded in every subject of the curriculum[1].

Another key theme is the importance of understanding about context and the transfer of learning along with an interest in meta-learning and meta-cognition.

Reflecting on these frameworks, Cambridge Life Competencies and New Pedagogies for Deeper Learning are just two examples of frameworks in use across the world, it is noteworthy how curriculum development is now a global issue.

We have considered these research-based frameworks as a separate category from those in earlier tables, in other words, organised frameworks by their evidential credentials. But the truth is that the frameworks in Tables 1-4 have almost always relied on evidence too. The difference is that, whereas it is clear where a centre advocating 21st century skills sits in terms of educational policy, it is sometimes less clear when political decisions are made in international, European, national or state administrations.

The breadth of approaches along with the gathering research interest in creativity in education and lifelong learning internationally suggests both the complexity and importance of the topic.

4.1.6 Research-based creativity frameworks

Finally, we turn to eight frameworks drawn from research which focus exclusively on creativity. In each case, we have prioritised those which are currently used in formal education or non-formal learning, or selected reports which make evidence-based proposals for education.

[1] See, for example, the Habits of Mind Institute, available at https://www.habitsofmindinstitute.org/what-are-habits-of-mind2/

Table 7. Research-based creativity frameworks and their definitions and models

Title of framework	Definition of creativity	Comments
Creative Problem-Solving (CPS) Framework **Center for Creative Learning, Inc. and Creative Problem Solving Group, Inc** **USA** **2000**	The CPS framework sees creativity as the function of combining knowledge, imagination and evaluation, all of which are tempered by 'attitude' This definition is sometimes represented as a symbolic equation - C = fa(K,I,E). CPS has four stages with six steps.: — Clarify: (1) explore the vision, (2) gather data, and (3) formulate challenges — Ideate: explore ideas — Develop: formulate solutions — Implement: formulate a plan	The CPS framework has evolved over several decades from the original thinking of Alex Osborn and Sid Parnes, and it was developed and refined by, in particular, by Isaksen, Dorval, & Treffinger (2000). CPS is currently in its sixth iteration. While CPS might seem to be more a process of problem-solving than a creativity framework it is included as one a very small number of research-based frameworks widely used in the workplace which also brings with it a clear definition of creativity. CPS assumes that everyone is creative and that creativity can be learned. Three underlying principles inform the CPS view of creativity; that it is a careful blend of divergent and convergent thinking, that idea generation works best when judgment is suspended and that the choice of language is significant (for example the word 'but' when used in the creative process almost always hinders creativity).
Durham Commission on Creativity and Education **UK** **2019**	Creativity is defined as 'the capacity to imagine, conceive, express, or make something that was not there before'. Creative thinking is 'a process through which knowledge, intuition and skills are applied to imagine, express or make something novel or individual in its contexts. Creative thinking is present in all areas of life. It may appear spontaneous, but it can be underpinned by perseverance, experimentation, critical thinking and collaboration.'	The National Advisory Committee on Creative and Cultural Education in the UK (1999.defined creativity as 'imaginative activity fashioned so as to produce outcomes that are both original and of value.' Ever since this seminal report teachers have wondered about the degree to which their students' work is original and what is meant by value. This report represents an evolution of thinking by viewing creativity as a capacity and critical thinking, the phrase adopted for the PISA 2021 Test of Creative Thinking, as the process by which creativity is realised. The report also seeks explicitly to decouple creativity from its association with the arts arguing that it is ubiquitous, present in every subject discipline and every aspect of life.
Five-dimensional model of creativity **Centre for Real-World Learning** **UK**	The model describes five core dispositions/habits of the creative mind, each with three sub-elements: — Inquisitive: wondering and questioning, exploring and investigating, challenging assumptions — Imaginative: playing with possibilities, making connections, using intuition	The model was developed after a combination of literature review and two field trials exploring its usability and potential to enable teachers track the progress of their students against the framework, the model was published by the OECD as a working paper (Lucas et al, 2013). It was subsequently used as the protocol for an eleven country study coordinated by the OECD Centre for Educational Research and Innovation and was influential in the decision by PISA to make Creative

2013	— Persistent: sticking with difficulty, daring to be different, tolerating uncertainty — Collaborative: sharing the product, giving and receiving feedback, cooperating appropriately — Disciplined: developing techniques, reflecting critically, crafting and improving	Thinking the focus of its Innovative Domain test in 2021. The model is used in schools across the world in more than twenty countries. Creativity is seen as a componential model with the inclusion of three dimensions – persistent, collaborative and disciplined, offering a holistic definition that encompasses traditions of thought associated both with creativity and with critical thinking.
Four C model of creativity **Kaufmann and Beghetto** **USA** **2009**	Four categories of creativity: — Mini-c. This new category takes away any need for comparison with others. It focuses on individual learning and meaning-making, the 'novel and personally meaningful interpretation of experiences, actions, and events'. — Little-c. This is the mundane, everyday version of creativity which requires domain-specific skills and various personal attributes. It might include decorating a bedroom, finding efficient ways to pack for a vacation, combining articles of clothing into a brand new outfit, cooking a meal with a limited range of ingredients available. — Pro-c. Pro is for professional. It refers to creativity that has evolved, with practice, over many years and which can impact on a wider a field or domain. It might be exercised by a wide range of professionals such as a dancer, a professor, a surgeon or historian. — Big-c. This is associated with an elite few transforming, revolutionary individuals. Typically these might be ground-breaking artists, scientists, mathematicians or world leaders.	This is an important attempt to recognise the continuum of creative activity from very small to very big. Originally stimulated by the idea of little c creativity (Craft, 2001), it has been expanded helpfully to show the different levels which make up creativity and dispel the myth that it is only something for exceptionally talented individuals. The model is used in the European Creative Schools projects2.
LEGO Foundation **Denmark** **2020**	Creativity is defined as 'the iterative process of connecting, exploring, and transforming the world in both new and meaningful ways. Creative process is a dynamic process that includes three interwoven experiences - connecting, exploring, and transforming - based in the three types of creativity.'	Developed by a panel of expert researcher from across the world, this model is aimed primarily at those working with children, both at school and less formally in a range of play-based settings. Its main focus is on 'min-c' creativity, creativity that is of value to the individual. Key terms are defined as follows: — Iteration is 'is a process of trying out different possibilities, revising hypotheses in response to new information, and discovering new questions.'

[2] More information is available at https://creativeschools.eu/hu/articles/37/1/the-four-c-model-of-creativity

		— Meaningful: 'processes that are meaningful, first and foremost, for the one creating'. — Connecting: 'being motivated and curious to investigate the world around you'. — Exploring: 'experimenting with, testing, and trying out new things.' — Transforming, 'communicating, reflecting, and sharing ideas with other'. The LEGO Foundation, the not for profit arm of LEGO, is increasingly seeking to influence policy and has moved away from a focus on play to pone on creativity.
OECD Centre for Educational Research and Innovation (CERI) **France** **2019**	CERI developed rubrics for creativity and critical thinking with four dimensions. Creativity (coming up with new ideas and solutions): — Inquiring: Make connections to other concepts and knowledge from the same of from other disciplines — Imagining: Generate and play with unusual and radical ideas — Doing: Produce, perform or envision a meaningful output that is personally novel — Reflecting: Reflect on the novelty of the solution and of its possible consequences Critical thinking (questioning and evaluating ideas and solutions): — Inquiring: Identify and question assumptions and generally accepted ideas or practices — Imagining: Consider several perspectives on a problem based on different assumptions — Doing: Explain both strengths and limitations of a product, a solution or a theory justified on logical, ethical or aesthetic criteria — Reflecting: Reflect on the chosen solution/position relative to possible alternatives	Taking the five-dimensional model of creativity (Lucas et al, 2013) as its starting point, CERI brought together teachers, researchers and education policymakers in 11 countries to develop and trial a set of pedagogical resources that exemplify what it means to teach, learn and make progress in creativity and critical thinking in primary and secondary education. Creativity and critical thinking in this framework are seen as complementary element of the creative process. CERI focuses especially on the development of rubrics which were accessible to both teachers and students in an attempt to develop a common language for critical thinking and creativity and so to make teaching and learning more effective.
PISA 2021 Creative Thinking **France**	Creative thinking in PISA 2021 is defined as 'the competence to engage productively in the generation, evaluation and improvement of ideas, that can result in original and effective solutions, advances in knowledge and impactful expressions of imagination.'	The PISA definition of creative thinking highlights the fact that 'students in all contexts and across all levels of education need to learn how to engage productively in the practice of generating ideas, how to reflect upon ideas by

2019		valuing both their relevance and novelty, and how to iterate upon ideas until they reach a satisfactory outcome.' The focus of the PISA 2021 test will be on tasks related to 'little c' creativity 'in order to minimise the importance of innate talent for performance and to put a stronger focus on the malleable capacity of individuals to engage in creative thinking.' PISA 2021 has chosen to combine the concepts of creativity and critical thinking into one concept. Given its influence on education policymakers this approach may be of interest to countries across the world.
Seven Critical Components of Creativity in Children **Bay Area Discovery Museum** **USA** **2015**	Seven components of creativity organised by three developmental domains. Cognitive: — Imagination and originality (imagine and explore original ideas) — Flexibility (maintain openness to unique and novel experiences) — Decision making (make thoughtful choices that support creative efforts) Social and emotional: — Communication and self-expression (communicate ideas and true self with confidence) — Motivation (demonstrate internal motivation to achieve a meaningful goal) — Collaboration (develop social skills that foster creative teamwork) Physical: — Action and movement (boost creative potential through physical activity)	Early on this quotation lays out the researchers beliefs: 'Creativity is not a fixed quantity, but rather a renewable resource that can be improved and nurtured by optimizing the environment that allows an individual's creative potential to blossom.' This framework is one a relatively small number which focus on an informal learning environment such as a children's museum. Creativity is seen as a componential concept made up of a number of aspects drawn from cognitive, social/emotional and physical domains.

One striking thing about Table 7 is the very small number of evidence-based frameworks which are widely used in schools and in lifelong learning. This is not to suggest that there are few models or frameworks of creativity in existence; there are many. In terms of schools, the Centre for Real-World Learning model (Lucas, Claxton, & Spencer, 2013), for example, is used across the world. Figure 5 shows an example from a school in Sydney, Australia, which has been applying it for five years, exploring the implications for pedagogy, thinking routines and language.

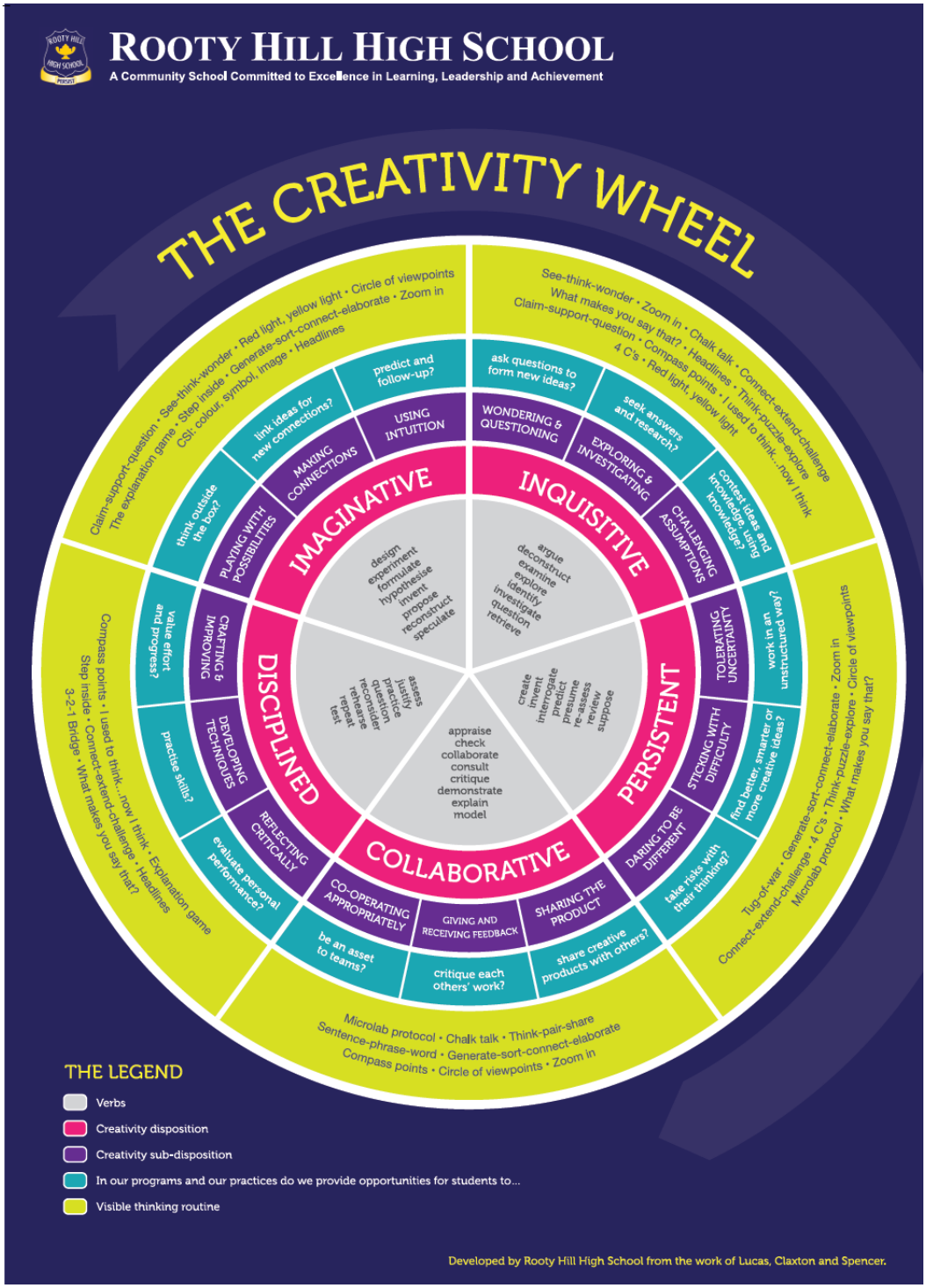

Figure 5. Rooty Hill High School in Sydney and its application of the Centre for Real-World Learning's five-dimensional model of creativity in and beyond its formal curriculum

Source: Lucas, B.(2016). A Five-Dimensional Model of Creativity and its Assessment in Schools, *Applied Measurement in Education*, 29(4), 278-290.

The Kaufmann and Beghetto model has been particularly influential in and beyond school in enabling the world to move away from seeing creativity as eccentric and rare and view it, instead, as everyday. Mini-c, Little-c and Pro-c all have resonance for formal and informal educators.

Two initiatives from the OECD are of undoubted significance. The first, a four-year study across eleven countries into ways of fostering students' creativity and critical thinking (Vincent-Lancrin et al., 2019), provides evidence for how this can be done in a variety of school and country contexts. The second is the PISA test of Creative Thinking planned for 2021, which, like earlier PISA tests, is likely to raise the status of creativity.

4.2 Linking creativity with other competences/skills

With a clearer sense of the range of existing concepts, models and frameworks which include creativity, we now turn to reflect on these two questions:

- What are the links between creativity and the eight key competences outlined in the European Reference Framework?
- What are the links between creativity and other competences and core life/21st century skills as described in literature and learning frameworks?

Creativity is linked with almost every term currently in use in describing educational frameworks (see section 3.2) and, along the way we have seen how it has been framed in terms of learning, character and employability, and that it is just now being considered for assessment in secondary schools.

In terms of the second question, we now draw together some of the links (and a lack of connection) between creativity and the eight Key Competences for Lifelong Learning in the European Reference Framework.

Since their first introduction in 2006, the Key Competences for Lifelong Learning have been an important reference document for the development of competence-oriented education, training and learning. Over the intervening period, as the world has developed, competences have been revised and new ones introduced, most recently in 2019 as a result of the Council Recommendation of 22 May 2018. The current competences are:

- Literacy competence
- Multilingual competence
- Mathematical competence and competence in science, technology and engineering
- Digital competence
- Personal, social and learning to learn competence
- Citizenship competence
- Entrepreneurship competence
- Cultural awareness and expression competence

Appendix 1 summarises the competences using the text of the Council Recommendation of 22 May 2018 on key competences for lifelong learning.

In the same Council recommendation, we are reminded that:

Key competences are those which all individuals need for personal fulfilment and development, employability, social inclusion, sustainable lifestyle, successful life in peaceful societies, health-conscious life management and active citizenship. They are developed in a lifelong learning perspective, from early childhood throughout adult life, and through formal, non-formal and informal learning in all contexts, including family, school, workplace, neighbourhood and other communities.

The key competences are all considered equally important; each of them contributes to a successful life in society. Competences can be applied in many different contexts and in a variety of combinations. They overlap and interlock; aspects essential to one domain will support competence in another. Skills such as critical thinking, problem solving, team work, communication and negotiation skills, analytical skills, creativity, and intercultural skills are embedded throughout the key competences.

In the last of these sentences, creativity, along with other items, is described as a skill which is embedded throughout the key competences. While it is eminently sensible to seek to embed some aspects of key competences across all competences it inevitably raises questions too:

- Is creativity a skill? The evidence would seem to suggest that creative thinking is a cluster of skills, but that creativity is a multi-dimensional concept best described in words such as competency, competence, attribute, and disposition.
- How best does any framework such as the Key Competences for Lifelong Learning recognise something as important as creativity? If it is simply left to individual competence developers, this runs the risk of confusing understanding of creativity.
- How best can the complexity of a concept such as creativity be recognised so that it can be better developed across Europe? If creativity is set in a list alongside teamwork or problem-solving then it is being implicitly compared with smaller, different ideas.

We have looked at four out of eight competences listed in the European Reference Framework. These include digital, entrepreneurship, personal, social and learning to learn competence as well as cultural awareness and expression, and seem to overlap with the idea of creativity the most. In the context of lifelong learning, the JRC has developed frameworks for individuals for the first three of these, whereas cultural awareness and expression have been explored through the open method of coordination by a working group of the EU Member States' experts in 2016[3], but as of September 2020, no common framework has been produced.

Digital: Creativity is seen through the lens of digital activity. Creativity is explicitly part of Problem-solving (Creatively using digital technologies) but implicitly part of Communication and collaboration and Digital content creation.

Personal, Social and Learning: According to this Framework, creativity 'enables individuals to question assumptions, reevaluate problems considering different variables and to take sensible risks. Being persistent, collaborative, and disciplined sustain creativity.' P. 67. and 'While creativity is visible, it sits among many other concepts within this framework.

Entrepreneurship: Creativity is defined as 'developing ideas and opportunities to create value, including better solutions to existing and new challenges; exploring and experimenting with innovative approaches; combining knowledge and resources to achieve valuable effects.' Creativity is seen as a sub-set of an Entrepreneurship competence, Ideas and opportunities (along with spotting opportunities, vision, valuing ideas, ethical and sustainable thinking). Creativity is explicitly mentioned but as a small element of a larger competence. Creativity is also implicit in many of the other competences/sub-competences such as coping with ambiguity, uncertainty & risk, taking the initiative and mobilising others. While creativity and entrepreneurship share common features such as the generation of original ideas, entrepreneurship is an applied version of creativity where the emphasis is on creating value or profit.

[3] The report is available at https://op.europa.eu/en/publication-detail/-/publication/6066c082-e68a-11e5-8a50-01aa75ed71a1

Cultural awareness and expression competence: The description of this competence is full of powerful expressions of the value of creativity, albeit and understandably framed by its interest in culture and the arts. Its model of creativity is the five-dimensional one published by the OECD (Lucas et al., 2013).

While creativity features the most in the descriptions of the four competences listed above, there are clearly opportunities for recognising the role of this transversal skill more explicitly in Literacy, Mathematical competence and competence in science, technology and engineering and Citizenship. These possible connections are indicated by extracts from the framework as presented in the Council Recommendation of 22 May 2018 (see Appendix 1).

<table>
<tr><td>Literacy</td><td>…a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficulty; searching for solutions, making guesses, or formulating hypotheses about the deficiencies: testing and retesting these hypotheses and possibly modifying and retesting them; and finally communicating the results (Torrance, 1974, p. 8).</td></tr>
<tr><td>Competence in science refers to the ability and willingness to explain the natural world by making use of the body of knowledge and methodology employed, including observation and experimentation, in order to identify questions and to draw evidence-based conclusions.</td><td>Mathematical competence and competence in science, technology and engineering</td></tr>
<tr><td>Citizenship</td><td>Skills for citizenship competence relate to the ability to engage effectively with others in common or public interest, including the sustainable development of society. This involves critical thinking and integrated problem-solving skills…</td></tr>
</table>

We did not find any obvious connections between creativity and the multilingual competence.

4.3 Discussing commonalities and differences

Creativity, as we have seen, is a concept which is gaining importance in education, lifelong learning and employment. The World Economic Forum (2015) consistently ranks it as one of the most important competencies wanted by employers. In 2021 PISA will, for the first time, test it (as Creative Thinking). While many people enjoy debating the precise definition of creativity, there is substantial agreement as to its core components.

While the importance of creativity is widely recognised throughout life, the main focus of research and policy development has been on formal education, albeit with the intention of reimagining schools as places where life skills are developed. In parallel, employers' organisations and a number of advocacy bodies across the world are arguing for the status of creativity to be enhanced suggesting that it is, for example, a core 21st century skill or even a literacy on a level with numeracy and the more conventional interpretation of the idea of literacy.

While there are many commonalities in the treatment of creativity in the frameworks we have reviewed, there are also many differences.

4.3.1 Points in common

The frameworks we reviewed are in broad agreement in a number of areas:

- They increasingly refer to creativity as being an important human attribute.
- A common core of concepts occurs in definitions of creativity including originality, novelty, value, experimentation and problem-solving.
- Creativity is conceived as both a product and a process.
- Most frameworks focus on schools, even if the term lifelong learning is used.
- Most frameworks conceive of creativity as multi-dimensional.
- It is clear that the main focus of interest is on the 'everyday creativity' that we can all show throughout our lives rather than on the exceptional outputs of a genius.

4.3.2 Areas of difference

The frameworks take different views too:

- The degree of status and visibility accorded to creativity varies from framework to framework. In some, it is highly visible while in others, it is just a tiny aspect. This variety often reflects the perspective from which the framework has been written, demand versus supply, academic versus applied, school-deep versus lifelong, well-being versus employability, for the purposes of learning versus in order to be assessed.
- There is a tension between two 'ends' of the scale when defining creativity, broadly those who see it as divergent thinking and those who value convergent thinking. This tension is expressed through the deliberate co-existence of creativity (classically associated with divergent thinking) and critical thinking (normally seen as convergent). The amalgamated term 'creative thinking' is increasingly being used.
- Notwithstanding a consensus as to the core elements of creativity, there is much variety about the many terms associated with it - inventiveness, innovation, entrepreneurship, persistence, grit and curiosity.
- Some frameworks explicitly define creativity, others do not, preferring to leave it implicit.
- While many frameworks specify the importance of collaboration, almost none of the frameworks considers the implications of creativity as a social phenomenon.
- Almost all frameworks consider creativity to be ubiquitous, all disciplines, all ages, though a few still hold to a historic association with the arts.

The framing of creativity and the language used to describe it varies astonishingly. It is by turns an ability, an attitude, an attribute, a capability, a capacity, an element of character, a cognitive skill, a competence or competency, a disposition, a habit of mind, a key competence or skill, a life skill, a meta-skill, a non-cognitive skill, a skill, a soft skill, a transformative competency, a transferable skill, a transversal skill or competency or a 21st century skill.

5 Conclusions

Creativity is growing in importance as a valuable transversal skill or competence for lifelong learning. Although it is a large and complex concept, it does not appear as one of the eight European Competences for Lifelong Learning.

5.1 Reflecting on research questions

In terms of our research questions, we can say in summary that:

In frameworks across the world creativity appears in many different guises, sometimes as a transversal competence or skill for lifelong learning, sometimes conceived in any number of the other ways listed on the previous page and in the six tables in section 4.1.

Creativity sometimes stands on its own as a robust concept and sometimes sits alongside other related ideas including critical thinking, inventiveness, innovation, entrepreneurship, persistence, grit and curiosity. Metaphorically, creativity is pictured as a petal of a daisy or a leaf on tree as helping to power a swimmer through the digital ocean of life and as an ingredient in a learner compass.

Each different word used to describe creativity come freighted with semantic associations. Virtue and character suggest its timeless humanity. 21st century skills suggest an urgency, also a contradiction; for who would predict that the same skills needed now will be needed in eighty years' time and for some, as we saw earlier, creativity can have a 'dark' side, too.

The 'building blocks' of creativity are also widely different in different frameworks – ability, attitude, capacity, cluster, element, knowledge, skill, theme, process and value, for example. As one reads each new framework, there is the strong sense that each new framework developer (understandably) seeks to choose slightly different terminologies and build a new vocabulary that will help the framework seem distinctive and novel. The effect of this is attractive to those who enjoy linguistic experimentation but confusing to those looking for clarity and changes to policy and practice.

Creativity is mainly connected to four of the eight key competences – Digital, Personal, Social and Learning to learn, Entrepreneurship, and Cultural awareness and expression as outlined in 4.2. It is possible also to see connections with Mathematical competence and competence in science, technology and engineering and Citizenship, which could be further developed.

While it is helpful that creativity has a place as a cross-cutting theme in the eight competences there is nevertheless a risk that it is overlooked and undervalued. That within the eight frameworks, there is such a diversity of definitions and conceptualisations also runs the risk of creating confusion or at the very least tensions which may or may not be creative tensions.

A selection of definitions of creativity identified as part of this review is listed in Appendix 2.

5.2 Some possible next steps

The attempt to coordinate the various competences which make up lifelong learning, begun in 2006 in the European Reference Framework and ongoing today, is a powerful statement of the personal, economic, social and technological value of learning.

When the endeavour began, the world was a much different place, with the full impact of the digital age only beginning to be recognised. The challenge of a climate emergency and the pressing need for more sustainable development were similarly only in their relative infancy.

In the last decade and a half the role of human creativity has begun to be more acknowledged; the decision to make creative thinking the focus of PISA in 2021 is just one indicator as are the powerful voices of the World Economic Forum, UNESCO and UNICEF. The growing interest in creativity is such that, were competences for lifelong learning being created now in 2020 rather than in 2006 it is at least possible that creativity or creative thinking might have been one of them.

With this mind there would appear to be three possible next steps: do nothing and hope that the concept of creativity somehow grows in prominence, create a guide or overview exploring the ways creativity currently appears in European Frameworks or create a new European Framework.

Of these ideas, the second would seem to have merit and avoid the inevitable disruption of adding an extra framework. For the development of a guide to creative thinking in lifelong learning, developing a common

language to describe creativity – what it is, why it matters, and how it fits into each of the eight competences – would act as a catalyst for conceptual and linguistic clarification as well as bolstering the importance of creativity across all domains. In parallel with this, it might be helpful to produce a comprehensive map of creativity across the eight competence frameworks.

As frameworks reach a point of revision or at any stage when they are being developed there may be an opportunity to make creativity and creative thinking more prominent and better understood. In some cases, this will be a simple matter of building on what is already there; in others it may require deeper dialogue when frameworks are revised, or guidance materials are developed.

If there were to be a creative spirit of adventure present it would of course be possible to consider the development of a whole new competence framework, Creative Thinking, which might be added to the existing eight.

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Annex 1. European Reference Framework

The European Reference Framework (2018) sets out eight key competences.

1. Literacy competence

Literacy is the ability to identify, understand, express, create, and interpret concepts, feelings, facts and opinions in both oral and written forms, using visual, sound/audio and digital materials across disciplines and contexts. It implies the ability to communicate and connect effectively with others, in an appropriate and creative way.

Development of literacy forms the basis for further learning and further linguistic interaction. Depending on the context, literacy competence can be developed in the mother tongue, the language of schooling and/or the official language in a country or region.

Essential knowledge, skills and attitudes related to this competence

This competence involves the knowledge of reading and writing and a sound understanding of written information and thus requires an individual to have knowledge of vocabulary, functional grammar and the functions of language. It includes an awareness of the main types of verbal interaction, a range of literary and non-literary texts, and the main features of different styles and registers of language.

Individuals should have the skills to communicate both orally and in writing in a variety of situations and to monitor and adapt their own communication to the requirements of the situation. This competence also includes the abilities to distinguish and use different types of sources, to search for, collect and process information, to use aids, and to formulate and express one's oral and written arguments in a convincing way appropriate to the context. It encompasses critical thinking and ability to assess and work with information.

A positive attitude towards literacy involves a disposition to critical and constructive dialogue, an appreciation of aesthetic qualities and an interest in interaction with others. This implies an awareness of the impact of language on others and a need to understand and use language in a positive and socially responsible manner.

2. Multilingual competence

This competence defines the ability to use different languages appropriately and effectively for communication. It broadly shares the main skill dimensions of literacy: it is based on the ability to understand, express and interpret concepts, thoughts, feelings, facts and opinions in both oral and written form (listening, speaking, reading and writing) in an appropriate range of societal and cultural contexts according to one's wants or needs. Languages competences integrate a historical dimension and intercultural competences. It relies on the ability to mediate between different languages and media, as outlined in the Common European Framework of Reference. As appropriate, it can include maintaining and further developing mother tongue competences, as well as the acquisition of a country's official language(s).

Essential knowledge, skills and attitudes related to this competence

This competence requires knowledge of vocabulary and functional grammar of different languages and an awareness of the main types of verbal interaction and registers of languages. Knowledge of societal conventions, and the cultural aspect and variability of languages is important.

Essential skills for this competence consist of the ability to understand spoken messages, to initiate, sustain and conclude conversations and to read, understand and draft texts, with different levels of proficiency in different languages, according to the individual's needs. Individuals should be able to use tools appropriately and learn languages formally, non-formally and informally throughout life.

A positive attitude involves the appreciation of cultural diversity, an interest and curiosity about different languages and intercultural communication. It also involves respect for each person's individual linguistic profile, including both respect for the mother tongue of persons belonging to minorities and/or with a migrant background and appreciation for a country's official language(s) as a common framework for interaction.

3. Mathematical competence and competence in science, technology, engineering

A. Mathematical competence is the ability to develop and apply mathematical thinking and insight in order to solve a range of problems in everyday situations. Building on a sound mastery of numeracy, the emphasis is on process and activity, as well as knowledge. Mathematical competence involves, to different degrees, the ability and willingness to use mathematical modes of thought and presentation (formulas, models, constructs, graphs, charts).

B. Competence in science refers to the ability and willingness to explain the natural world by making use of the body of knowledge and methodology employed, including observation and experimentation, in order to identify questions and to draw evidence-based conclusions. Competences in technology and engineering are applications of that knowledge and methodology in response to perceived human wants or needs. Competence in science, technology and engineering involves an understanding of the changes caused by human activity and responsibility as an individual citizen.

Essential knowledge, skills and attitudes related to this competence

A. Necessary knowledge in mathematics includes a sound knowledge of numbers, measures and structures, basic operations and basic mathematical presentations, an understanding of mathematical terms and concepts, and an awareness of the questions to which mathematics can offer answers.

   An individual should have the skills to apply basic mathematical principles and processes in everyday contexts at home and work (e.g. financial skills), and to follow and assess chains of arguments. An individual should be able to reason mathematically, understand mathematical proof and communicate in mathematical language, and to use appropriate aids including statistical data and graphs and to understand the mathematical aspects of digitalisation.

   A positive attitude in mathematics is based on the respect for truth and a willingness to look for reasons and to assess their validity.

B. For science, technology and engineering, essential knowledge comprises the basic principles of the natural world, fundamental scientific concepts, theories, principles and methods, technology and technological products and processes, as well as an understanding of the impact of science, technology, engineering and human activity in general on the natural world. These competences should enable individuals to better understand the advances, limitations and risks of scientific theories, applications and technology in societies at large (in relation to decision-making, values, moral questions, culture, etc.).

   Skills include the understanding of science as a process for the investigation through specific methodologies, including observations and controlled experiments, the ability to use logical and rational thought to verify a hypothesis and the readiness to discard one's own convictions when they contradict new experimental findings. It includes the ability to use and handle technological tools and machines as well as scientific data to achieve a goal or to reach an evidence-based decision or conclusion. Individuals should also be able to recognise the essential features of scientific inquiry and have the ability to communicate the conclusions and reasoning that led to them.

   Competence includes an attitude of critical appreciation and curiosity, a concern for ethical issues and support for both safety and environmental sustainability, in particular as regards scientific and technological progress in relation to oneself, family, community, and global issues.

4. Digital competence

Digital competence involves the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property related questions, problem-solving and critical thinking.

Essential knowledge, skills and attitudes related to this competence

Individuals should understand how digital technologies can support communication, creativity and innovation, and be aware of their opportunities, limitations, effects and risks. They should understand the general principles, mechanisms and logic underlying evolving digital technologies and know the basic function and use of different devices, software, and networks. Individuals should take a critical approach to the validity, reliability and impact of information and data made available by digital means and be aware of the legal and ethical principles involved in engaging with digital technologies.

Individuals should be able to use digital technologies to support their active citizenship and social inclusion, collaboration with others, and creativity towards personal, social or commercial goals. Skills include the ability to use, access, filter, evaluate, create, program and share digital content. Individuals should be able to manage

and protect information, content, data, and digital identities, as well as recognise and effectively engage with software, devices, artificial intelligence or robots.

Engagement with digital technologies and content requires a reflective and critical, yet curious, open-minded and forward-looking attitude to their evolution. It also requires an ethical, safe and responsible approach to the use of these tools.

5. Personal, social and learning to learn competence

Personal, social and learning to learn competence is the ability to reflect upon oneself, effectively manage time and information, work with others in a constructive way, remain resilient and manage one's own learning and career. It includes the ability to cope with uncertainty and complexity, learn to learn, support one's physical and emotional well-being, to maintain physical and mental health, and to be able to lead a health-conscious, future-oriented life, empathize and manage conflict in an inclusive and supportive context.

Essential knowledge, skills and attitudes related to this competence

For successful interpersonal relations and social participation it is essential to understand the codes of conduct and rules of communication generally accepted in different societies and environments. Personal, social and learning to learn competence requires also knowledge of the components of a healthy mind, body and lifestyle. It involves knowing one's preferred learning strategies, knowing one's competence development needs and various ways to develop competences and search for the education, training and career opportunities and guidance or support available.

Skills include the ability to identify one's capacities, focus, deal with complexity, critically reflect and make decisions. This includes the ability to learn and work both collaboratively and autonomously and to organise and persevere with one's learning, evaluate and share it, seek support when appropriate and effectively manage one's career and social interactions. Individuals should be resilient and able to cope with uncertainty and stress. They should be able to communicate constructively in different environments, collaborate in teams and negotiate. This includes showing tolerance, expressing and understanding different viewpoints, as well as the ability to create confidence and feel empathy.

The competence is based on a positive attitude toward one's personal, social and physical well-being and learning throughout one's life. It is based on an attitude of collaboration, assertiveness and integrity. This includes respecting diversity of others and their needs and being prepared both to overcome prejudices and to compromise. Individuals should be able to identify and set goals, motivate themselves, and develop resilience and confidence to pursue and succeed at learning throughout their lives. A problem-solving attitude supports both the learning process and the individual's ability to handle obstacles and change. It includes the desire to apply prior learning and life experiences and the curiosity to look for opportunities to learn and develop in a variety of life contexts.

6. Citizenship competence

Citizenship competence is the ability to act as responsible citizens and to fully participate in civic and social life, based on understanding of social, economic, legal and political concepts and structures, as well as global developments and sustainability.

Essential knowledge, skills and attitudes related to this competence

Citizenship competence is based on knowledge of basic concepts and phenomena relating to individuals, groups, work organisations, society, economy and culture. This involves an understanding of the European common values, as expressed in Article 2 of the Treaty on European Union and the Charter of Fundamental Rights of the European Union. It includes knowledge of contemporary events, as well as a critical understanding of the main developments in national, European and world history. In addition, it includes an awareness of the aims, values and policies of social and political movements, as well as of sustainable systems, in particular climate and demographic change at the global level and their underlying causes. Knowledge of European integration as well as an awareness of diversity and cultural identities in Europe and the world is essential. This includes an understanding of the multi-cultural and socioeconomic dimensions of European societies, and how national cultural identity contributes to the European identity.

Skills for citizenship competence relate to the ability to engage effectively with others in common or public interest, including the sustainable development of society. This involves critical thinking and integrated problem-solving skills, as well as skills to develop arguments and constructive participation in community activities, as well as in decision-making at all levels, from local and national to the European and international level. This

also involves the ability to access, have a critical understanding of, and interact with both traditional and new forms of media and understand the role and functions of media in democratic societies.

Respect for human rights as a basis for democracy lays the foundations for a responsible and constructive attitude. Constructive participation involves willingness to participate in democratic decision-making at all levels and civic activities. It includes support for social and cultural diversity, gender equality and social cohesion, sustainable lifestyles, promotion of culture of peace and non-violence, a readiness to respect the privacy of others, and to take responsibility for the environment. Interest in political and socioeconomic developments, humanities and intercultural communication is needed to be prepared both to overcome prejudices and to compromise where necessary and to ensure social justice and fairness.

7. Entrepreneurship competence

Entrepreneurship competence refers to the capacity to act upon opportunities and ideas, and to transform them into values for others. It is founded upon creativity, critical thinking and problem-solving, taking initiative and perseverance and the ability to work collaboratively in order to plan and manage projects that are of cultural, social or financial value.

Essential knowledge, skills and attitudes related to this competence

Entrepreneurship competence requires knowing that there are different contexts and opportunities for turning ideas into action in personal, social and professional activities, and an understanding of how these arise. Individuals should know and understand approaches to planning and management of projects, which include both processes and resources. They should have an understanding of economics and the social and economic opportunities and challenges facing an employer, organisation or society. They should also be aware of ethical principles and challenges of sustainable development and have self-awareness of their own strengths and weaknesses.

Entrepreneurial skills are founded on creativity which includes imagination, strategic thinking and problem-solving, and critical and constructive reflection within evolving creative processes and innovation. They include the ability to work both as an individual and collaboratively in teams, to mobilize resources (people and things) and to sustain activity. This includes the ability to make financial decisions relating to cost and value. The ability to effectively communicate and negotiate with others, and to cope with uncertainty, ambiguity and risk as part of making informed decisions is essential.

An entrepreneurial attitude is characterised by a sense of initiative and agency, pro-activity, being forward-looking, courage and perseverance in achieving objectives. It includes a desire to motivate others and value their ideas, empathy and taking care of people and the world, and accepting responsibility taking ethical approaches throughout the process.

8. Cultural awareness and expression competence

Competence in cultural awareness and expression involves having an understanding of and respect for how ideas and meaning are creatively expressed and communicated in different cultures and through a range of arts and other cultural forms. It involves being engaged in understanding, developing and expressing one's own ideas and sense of place or role in society in a variety of ways and contexts.

Essential knowledge, skills and attitudes related to this competence

This competence requires knowledge of local, national, regional, European and global cultures and expressions, including their languages, heritage and traditions, and cultural products, and an understanding of how these expressions can influence each other as well as the ideas of the individual. It includes understanding the different ways of communicating ideas between creator, participant and audience within written, printed and digital texts, theatre, film, dance, games, art and design, music, rituals, and architecture, as well as hybrid forms. It requires an understanding of one's own developing identity and cultural heritage within a world of cultural diversity and how arts and other cultural forms can be a way to both view and shape the world.

Skills include the ability to express and interpret figurative and abstract ideas, experiences and emotions with empathy, and the ability to do so in a range of arts and other cultural forms. Skills also include the ability to identify and realise opportunities for personal, social or commercial value through the arts and other cultural forms and the ability to engage in creative processes, both as an individual and collectively.

It is important to have an open attitude towards, and respect for, diversity of cultural expression together with an ethical and responsible approach to intellectual and cultural ownership. A positive attitude also includes a

curiosity about the world, an openness to imagine new possibilities, and a willingness to participate in cultural experiences.

Annex 2. Some definitions of creativity

Developing ideas and opportunities to create value, including better solutions to existing and new challenges; exploring and experimenting with innovative approaches; combining knowledge and resources to achieve valuable effects.

Entrepreneurship Framework

The cognitive potential and ability to produce work that is both novel and appropriate.

Personal, Social and Learning to Learn Key Competence Framework

The ability to imagine and devise innovative new ways of addressing problems, answering questions or expressing meaning through the application, synthesis or repurposing of knowledge.

World Economic Forum (1)

The ability to come up with unusual or clever ideas about a given topic or situation, or to develop creative ways to solve a problem.

World Economic Forum (2)

A constant process, supporting, amplifying and regenerating cultural diversity across time and space, so that it may continue to instil expressions with new meanings for our time and for our future generations.

UNESCO Intercultural Competences: Conceptual and Operational Framework

The ability to produce new and/or unusual but practically applicable ideas.

Netherlands Curriculum

Discovering how to seek out questions to explore and problems to solve, experiment with ideas and questions, make new connections between ideas/information, learn from and value other people's ideas, make ideas real by experimenting with different designs, actions, and outcomes, challenge the routine method, value the unexpected or surprising, see opportunities in mistakes and failures, and take risks for learning.

Northern Ireland Curriculum

The ability to imagine and think of new ways of addressing problems, answering questions or expressing meaning.

Scotland meta-skills

Recognizing opportunities and imagining possibilities to apply ideas in new ways; exploring or playing with ideas, materials or processes to create something new; evaluating and adapting ideas, materials or processes in response to feedback or emerging conditions; demonstrating initiative, resourcefulness and perseverance when transforming ideas into actions, products or services.

Albertan Curriculum

The tendency or ability to generate multiple original and innovative ideas, alternatives, or possibilities rapidly and elaborate on them.

Cambridge Life Competencies Framework

Having an 'entrepreneurial eye' for economic and social opportunities, asking the right questions to generate novel ideas, and demonstrating leadership to pursue those ideas into practice.

New Pedagogies for Deeper Learning

The production of novel and useful ideas.

Gutman & Schoon

The capacity to imagine, conceive, express, or make something that was not there before. Creative thinking is a process through which knowledge, intuition and skills are applied to imagine, express or make something novel or individual in its contexts. Creative thinking is present in all areas of life. It may appear spontaneous, but it can be underpinned by perseverance, experimentation, critical thinking and collaboration.

Durham Commission on Creativity and Education

Being inquisitive (wondering and questioning, exploring and investigating, challenging assumptions), imaginative (playing with possibilities, making connections, using intuition), persistent (sticking with difficulty, daring to be different, tolerating uncertainty), collaborative (sharing the product, giving and receiving feedback, cooperating appropriately) and disciplined (developing techniques, reflecting critically, crafting and improving).

Lucas, Claxton & Spencer

The iterative process of connecting, exploring, and transforming the world in both new and meaningful ways. Creative process is a dynamic process that includes three interwoven experiences - connecting, exploring, and transforming - based in the three types of creativity.

LEGO Foundation

Creative thinking is the competence to engage productively in the generation, evaluation and improvement of ideas, that can result in original and effective solutions, advances in knowledge and impactful expressions of imagination.

PISA 2021 Test of Creative Thinking

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