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

Final report

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Abstract

Creativity is now central to discussions about the key competences and core life skills needed today. It is relevant in all subjects of the curriculum and all aspects of life. Attempts have been made to teach and assess creativity, mainly in compulsory school but also in higher, vocational, and non-formal education and training. In 2020, although creativity is taught in some countries in Europe, it is not fostered systematically across the continent yet. In this context, the JRC undertook a study to provide a comprehensive overview of existing concepts and practices for the development of creativity as a transversal skill for lifelong learning. This publication features final research results. It is tailored to policymakers, experts and educators looking for ways to define, teach, assess and mainstream creativity as a transversal skill. Building on existing knowledge, the publication allows the reader to take stock of the variety of approaches, make use of the lessons learned and choose the direction for further work in the area of developing creativity as a transversal skill.

Foreword

In 2010, we released a study on "Creativity and Innovation in Education in the EU Member States" in which we argued that creativity is a transversal skill, which everyone can develop, and that creativity can be thought, fostered and assessed.[1] We also claimed that although there is general consensus that creativity is somehow present in education discourses in Europe, more needed to be done to make it concrete, for instance in curricula, to define and conceptualise it explicitly, and to provide guidelines on how to teach creativity in a systematic and consistent way.

Ten years later, creativity remains on the educational agenda, also, in the context of lifelong learning. The current study provides evidence, based on literature review, case studies and expert consultations that progress is being made and that creativity appears prominently in many frameworks and educational practices. However, in 2020, creativity is still not taught or fostered systematically in most countries and more work is needed to ensure creativity becomes firmly part of the 21st century skills needed for everyone. This report provides evidence and avenues to take this challenge further.

One avenue could be to further work on linking creativity and related transversal skills more explicitly to the key competence frameworks. At the European level, the 2018 Council Recommendation on key competences for lifelong learning mentions skills such as critical thinking, problem solving, teamwork, communication and negotiation skills, analytical skills, creativity, and intercultural skills as embedded throughout the key competences. Creativity is one among a long list of relevant throughout skills.

It is probably impossible and maybe not needed to bring all these together in a consistent and superordinate all-encompassing competence framework. The diversity that exists between the different competence frameworks has a certain logic, as each framework has its focus, purpose and context. To take the frameworks developed by the European Commission, **DigComp** targets digital skills for all, **EntreComp** looks at entrepreneurial skills for all, while **LifeComp** details personal, social and learning to learn competences for all. In addition, there is the digital competence framework for educators (**DigcompEdu**) as well as the one for educational organisations (**DigCompOrg**). They all refer to creativity and creative thinking, in their own way, among many other skills. As long as everyone, in one way or another acquires these transversal key competences and would, as a result, become more empowered to participate in our digital society and economy, they would all have contributed to this achievement. Progress could still be made, however, to do this more consistently.

These competence frameworks and related studies on "Learning and Skills for the Digital Era" are part of JRC research since 2005. More than 30 major studies have been undertaken, resulting in more than 140 publications. More information on all our studies can be found on the JRC Science hub:

https://ec.europa.eu/jrc/en/research-topic/learning-and-skills

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[1] https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/creative-learning-and-innovative-teaching-final-report-study-creativity-and-innovation

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Contents

List of abbreviations

CPSI	Creative problem-solving institute
CCT	Critical and creative thinking
DeSeCo	Definition and selection of competencies
DigComp	The European Digital Competence Framework for Citizens
ECEC	Early childhood education and care
EntreComp	The European Entrepreneurship Competence Framework
ERI-Net	Asia-Pacific Education Research Institutes Networks
EU	European union
ICT	Information and communication technology
JRC	Joint Research Centre
HE	Higher education
LifeComp	The European Framework for the Personal, Social, and Learning to Learn Key Competence
MENA	Middle East and North-Africa
MOOC	Massive open online course
NGO	Non-governmental organisation
OECD	Organisation for Economic Co-operation and Development
O*NET	Occupational Information Network
P21	Partnership for the 21st Century Learning
PISA	Programme for International Student Assessment
STEM	Science, technology, engineering and mathematics
TTCT	Torrance tests of creative thinking
UNICEF	United Nations Children's Fund
UNESCO	United Nations Educational, Scientific and Cultural Organization
VET	Vocational education and training
WEF	World Economic Forum

Executive summary

Introduction

In the past several decades, in Europe and across the world, there have been significant changes that have fuelled the recognition of the importance of lifelong learning and heightened the need for all individuals to develop capabilities, competences and dispositions that go beyond foundational skills (Pellegrino & Hilton, 2012; Lamb et al., 2018; Lucas, 2019). These changes have also influenced the existing concepts and practices for the development of creativity as a transversal skill.

Employers and educationalists alike share a view that creativity is relevant in all subjects of the curriculum and all aspects of life. Attempts have been made to teach and assess it mainly in compulsory school but also in higher, vocational, and non-formal education and training. However, in 2020, creativity is not taught or otherwise fostered systematically in most countries.

In this context, the JRC undertook a study to provide a comprehensive overview of existing concepts and practices for the development of creativity as a transversal skill (or set of skills) for lifelong learning. It aims to summarise, juxtapose and reflect upon the existing concepts, definitions, and frameworks of creativity, compile an inventory of existing initiatives aimed at fostering creativity, and study eight cases in depth. The research focuses on the vocational education and training, higher education and non-formal learning which have not been much explored yet but also covers compulsory school education, which has already been more extensively researched.

Research methodology

The study followed a qualitative approach, applying recognised research methods such as:

- Literature review to summarise, juxtapose and reflect upon existing concepts, definitions, and frameworks of creativity as a transversal skill for lifelong learning. In total, 175 academic articles/books and 59 frameworks of learning and creativity were reviewed;
- Inventory to reveal practices that had been used to promote creativity as a transversal skill. In total, 34 initiatives, including well-documented policy and grass-root actions, most of which have been adopted since 2010 and implemented in Europe, were reviewed;
- Case studies to reveal how creativity is conceptualised, translated into learning objectives, taught, and assessed. In total, eight initiatives of large scope, high degree of maturity, and observable impact were examined in depth;
- Validation events to verify the indicative literature review, inventory, and case study findings. In total, four events, including a webinar for the policymakers, experts, and education practitioners, two workshops for experts, and a seminar for the officials of the European Commission, were conducted.

Conceptualisation of creativity

Creativity is often featured in learning frameworks, including international, European, national, and state-wide ones. It also appears in some research-based classifications and frameworks exclusively focused on laying down the components of creativity as a competence, competency, or skill.

A comparison of different frameworks suggests that:

- Each includes creativity, either explicitly or implicitly, but there is no standard approach;
- Creativity is increasingly recognised as an important human attribute, but the degree of status and visibility accorded to it varies from framework to framework;
- Almost all frameworks consider creativity to be ubiquitous, concerning all disciplines and ages, though a few still hold to a historical association between creativity and the arts;
- In most cases, creativity is understood as both a product and process, but the focus is on 'everyday creativity' that all people can show rather than on the exceptional outputs of a genius;
- The language used to describe creativity varies. 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 a twenty-first-century skill;

- No one widely used definition exists, but there is an agreement that creativity involves novel or original thinking and the generation of value, considered in relation to context and environment;
- 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;
- Most frameworks conceive creativity as multi-dimensional, but the 'building blocks' of it are presented as different;
- Concerning key competences, creativity is mainly connected to four – Digital; Entrepreneurship; Personal, social and learning to learn; and Cultural awareness and expression.

Development of creativity

Given a move-away from single discipline to transversal skills, promotion of competence- rather than discipline-based learning, and growing evidence of the benefits of creativity, many attempts have been made to help learners develop this skill. They all build on the premise that individuals can be creative but differ by source of initiative, level of implementation, focus, target group, sectors and settings covered, objectives, and scope. Ways in which creativity is conceptualised, taught, and assessed vary as well and such proliferation of approaches, though this reflects the breadth of the notion, it makes it difficult to mainstream creativity in education and training.

More specifically, inventory findings reveal that:

- For many, fostering creativity is a means to address real-world problems, and almost always, it feeds into broader goals, for example, employability, educational, company innovation, or personal development;
- Explicit mentions of creativity in objectives are often, however, robust, elaborate definitions in practice are rare;
- The conceptualisation of creativity is, in many cases, fragmented, and this translates into fragmented approaches to developing it where only one or a few components of creativity are addressed;
- While some conceptualisations of creativity focus on cognition (creative thinking), others emphasise the importance of taking action, and, in this way, addressing real-world challenges of today;
- Creativity is often linked to other competences and skills, such as problem-solving and innovation;
- It is treated as a discrete skill or a component of others, for example, entrepreneurship;
- The mechanisms that would explain how creativity is developed are not always clear;
- Pedagogical approaches differ, but the most popular ones help create learning environments that mimic the real world and include problem-based, game-based, experiential, and project-based learning;
- Even if creativity is defined, learning objectives, outcomes, and achievement standards are rarely clear;
- Systematic assessment of learning outcomes is almost non-existent. Designing appropriate assessments requires competence frameworks featuring creativity which also show progression, but currently do not exist in most education and training systems.
- While some educators find it challenging to assess creativity robustly, others, especially in non-formal settings, do not find it necessary at all.

Eight cases in focus

Eight case studies illustrate the variety of innovative approaches in the development of creativity as a skill. Some have been adopted for system innovation, others tailored to drive change in a limited number of organisations. A middle course also exists, for example, specific initiatives heavily focus on the professional development of educators.

More specifically, a cross-case analysis reveals that:

- System innovation does not necessarily mean a broad geographical scope.
- While funding may influence the scope of actions and scale of effect, it is insignificant for achieving objectives and claiming success.
- Creativity is a driving force behind change, and developing it helps to respond to environmental, social, and economic challenges of today.

- There is no one-size-fits-all solution to teaching and learning creativity.
- Development of creativity is typically framed within higher objectives and often feature approaches such as problem-based and inquiry-based learning.
- Most focus on individual rather than group creativity but emphasise collaboration while learning – developing and applying creative skills.
- Resources, tools and learning environments are important for the promotion of creativity as a skill.
- Outcomes by level, if any, are rarely defined. Approaches adopted are typically informal, featuring observation, reflection, and self-assessment rather than verified creativity tests.

Overall, there is an increasing consensus as to the core elements of creativity and a growing evidence base on the pedagogies and learning approaches that facilitate the development of it. Moreover, the study reveals several factors that drive the success of initiatives aimed at fostering creativity as a transversal skill. These include political will and buy-in at different levels; capacity, commitment and collaboration of all partners involved; explicit attention to creativity; clear definition of it; framing the development of creativity within higher objectives; highlighting the importance of it for employability and business outcomes; novelty and potential of promoted pedagogies and robust methodologies; engaging students and teachers together; and providing educator support. On the other hand, several factors hinder the promotion of creativity as a transversal skill. These include the perception of creativity as a fuzzy concept learnable by osmosis with no explicit teaching; lack of understanding the value of creativity; focus on talking about rather than developing creativity as a skill; shortness of efforts; lack of ready-to-use assessment tools; the existence of few good examples to learn from; and limited coordination of different actions adopted towards the same goal. Nevertheless, the reality of lifelong learning is more complex, hence:

- While explicit attention to creativity is central, it is not enough; setting a clear definition of creativity, linking it with learning outcomes, adopting tried-and-tested pedagogies and providing educator support help to turn the goal of developing creativity into practice.
- The more comprehensive the definition of creativity is, the better it can be embedded into teaching and learning; this helps to ensure that the componential nature of creativity is considered and most if not all dimensions of creativity are addressed.
- Successful teaching and learning of creativity require the mechanisms of it to be clear; this can be achieved by linking the definition of creativity with activities, learning settings and results that are expected to be achieved.
- To allow for assessment, the definition of creativity has to be linked with learning objectives and outcomes, ideally, by level of progression.

Résumé analytique

Introduction

Des changements importants se sont produits ces dernières décennies, en Europe et dans le monde. Ces changements ont contribué à faire reconnaître l'importance de l'apprentissage tout au long de la vie, et à accroître le besoin pour chaque individu de développer des capacités, compétences et dispositions dépassant les simples compétences fondamentales (Pellegrino & Hilton, 2012 ; Lamb et al., 2018 ; Lucas, 2019).

Employeurs comme pédagogues sont d'avis que la notion de créativité est pertinente dans tous les domaines du programme éducatif et dans tous les aspects de la vie. Des tentatives pour l'enseigner et l'évaluer ont eu lieu, principalement dans l'enseignement obligatoire, mais également dans l'enseignement supérieur et les formations professionnelles et informelles. En 2020 cependant, la plupart des pays n'enseignent pas la créativité ou ne l'encouragent pas de manière systématique.

Dans ce cadre, le JRC a lancé une étude visant à fournir un aperçu exhaustif des concepts et pratiques existants pour le développement de la créativité en tant que compétence transversale (ou ensemble de compétences) pour l'apprentissage tout au long de la vie. L'étude a plusieurs objectifs : résumer et juxtaposer les concepts, définitions et cadres existants pour la créativité, réfléchir à ces derniers, compiler un inventaire des initiatives existantes pour encourager la créativité, et étudier en détail huit études de cas. Les recherches se sont concentrées sur l'enseignement et la formation professionnels, l'enseignement supérieur et l'apprentissage non formel qui n'ont pas encore été beaucoup étudiés, mais également sur l'enseignement scolaire obligatoire qui a déjà fait l'objet de recherches plus approfondies.

Méthodologie des recherches

L'étude a suivi une approche qualitative, en mettant en œuvre des méthodes de recherche reconnues comme les suivantes :

- Une analyse documentaire pour résumer, juxtaposer et réfléchir sur les concepts, définitions et cadres existants de la créativité en tant que compétence transversale pour l'apprentissage tout au long de la vie. En tout, 175 articles/ouvrages universitaires et 59 cadres d'apprentissage et de créativité ont été analysés;
- Un inventaire pour mettre en lumière les pratiques utilisées pour promouvoir la créativité comme compétence transversale. En tout, 34 initiatives ont été analysées, incluant notamment des actions politiques et populaires bien documentées, dont la plupart ont été adoptées après 2010 et mises en œuvre en Europe, ont été analysées;
- Des études de cas pour illustrer la façon dont la créativité est conceptualisée, traduite en objectifs d'apprentissage, enseignée et évaluée. En tout, huit initiatives de grande portée avec un haut degré de maturité et un impact observable ont été analysées en détail;
- Des événements de validation pour vérifier les résultats indicatifs de l'analyse documentaire, de l'inventaire et des études de cas. En tout, quatre événements ont été organisés, à savoir un webinaire s'adressant à des responsables politiques, des experts et des professionnels de l'enseignement, deux ateliers d'experts et un séminaire s'adressant à des représentants de la Commission européenne.

Conceptualisation de la créativité

La créativité figure souvent dans les cadres d'apprentissage, et notamment dans les cadres internationaux, européens, nationaux et à l'échelle de l'État. Elle apparaît également dans certains classifications et cadres de recherche qui s'intéressent exclusivement à définir les composants de la créativité en tant que compétence, aptitude, qualification.

Une comparaison des différents cadres met en lumière les éléments suivants :

- Chacun des cadres inclut la créativité de façon implicite ou explicite, mais il n'existe pas d'approche commune;
- La créativité est de plus en plus souvent reconnue comme attribut humain important, mais le statut et le degré de visibilité qu'on lui confère varient d'un cadre à l'autre;
- Presque tous les cadres estiment que la créativité est omniprésente, concerne toutes les disciplines et tous les âges, même si un petit nombre d'entre eux font encore l'association historique entre la créativité et le monde des arts;

- Dans la plupart des cas, la créativité est comprise à la fois comme un produit et un processus, mais l'accent est mis sur la « créativité de tous les jours », que chacun peut exprimer, plutôt que sur les réalisations exceptionnelles d'un génie;
- Le langage utilisé pour décrire la créativité varie. On parle tour-à-tour d'une faculté, d'une attitude, d'un attribut, d'une aptitude, d'une capacité, d'un trait de caractère, d'une compétence cognitive, d'une compétence ou d'une habileté, d'une disposition, d'un état d'esprit, d'une compétence ou aptitude clé, d'une compétence élémentaire, d'une métacompétence, d'une compétence non cognitive, d'une qualification, d'une compétence non technique, d'une aptitude transformatrice, d'une compétence transférable, d'une compétence ou aptitude transversale ou d'une compétence du vingt et unième siècle;
- Il n'existe pas de définition largement utilisée, mais l'on s'accorde à dire que la créativité implique une pensée nouvelle ou originale et génère de la valeur, quand elle est prise en compte dans un contexte ou environnement donné;
- Malgré l'existence d'un consensus concernant les éléments fondamentaux de la créativité, il existe une forte variété de termes qui lui sont associés : inventivité, innovation, entrepreneuriat, persévérance, cran, et curiosité;
- La plupart des cadres conçoivent la créativité comme multidimensionnelle, mais les « blocs de construction » qui la composent sont présentés comme différents;
- La créativité est principalement associée à quatre compétences clés : compétence numérique, entrepreneuriale, personnelle, compétence sociale, apprendre à apprendre, et sensibilisation et expression culturelle.

Développement de la créativité

Le changement récent qui a vu privilégier les compétences transversales plutôt que les disciplines uniques, la promotion de l'apprentissage basé sur les compétences plutôt que sur les disciplines, des éléments probants de plus en plus nombreux montrant les bénéfices de la créativité : autant d'éléments qui expliquent les nombreuses tentatives visant à aider les apprenants à développer cette compétence. Elles partent toutes du principe que les individus peuvent être créatifs, mais elles choisissent des sources différentes pour leur initiative, différents niveaux de mise en œuvre, mettent l'accent sur différents éléments, choisissent différents groupes cibles, secteurs et contextes couverts, objectifs et champs. La créativité est conceptualisée, enseignée et évaluée de différentes manières, et cette prolifération d'approches, si elle met en avant la richesse de la notion, rend difficile l'intégration de la créativité dans l'enseignement et la formation.

Plus précisément, les résultats de l'inventaire montrent que :

- Pour beaucoup, encourager la créativité est une façon de traiter les problèmes du monde réel ; elle est presque toujours intégrée au sein d'objectifs plus larges comme par exemple l'employabilité, l'éducation, l'innovation de l'entreprise ou le développement personnel;
- La créativité est souvent mentionnée de manière explicite dans des objectifs, mais en pratique, on trouve rarement de définitions solides, élaborées;
- Dans de nombreux cas, la conceptualisation de la créativité est fragmentée, ce qui se traduit par des approches fragmentées de son développement, au sein desquelles seuls un composant ou un petit nombre de composants de la créativité sont traités;
- Si certaines conceptualisations de la créativité se concentrent sur la connaissance (pensée créative), d'autres insistent sur l'importance d'agir, pour traiter les difficultés du monde réel d'aujourd'hui;
- La créativité est souvent liée à d'autres compétences et aptitudes comme la résolution de problèmes et l'innovation;
- Elle est traitée comme compétence discrète ou comme composant d'une autre compétence, par exemple l'entrepreneuriat;
- Les mécanismes qui expliqueraient le déploiement de la créativité ne sont pas toujours clairs;
- Les approches pédagogiques diffèrent, mais les plus en vogue aident à créer des environnements d'apprentissage qui imitent le monde réel, et incluent des apprentissages basés sur des problèmes, des jeux, des expériences, des projets;

- Même si la créativité est définie, les objectifs, résultats d'apprentissage et normes de réussite sont rarement clairs;
- L'évaluation systématique des résultats d'apprentissage est quasi inexistante. Concevoir des évaluations adaptées nécessite de disposer de cadres de compétences qui incluent la créativité et montrent également la progression, mais ces cadres sont pour le moment absents de la plupart des systèmes d'enseignement et de formation;
- Si certains pédagogues trouvent difficile d'évaluer la créativité de manière solide, d'autres, notamment dans des environnements non formels, ne jugent absolument pas nécessaire cette évaluation.

Analyse de huit études de cas

Huit études de cas montrent la variété des approches innovantes dans le développement de la créativité comme compétence. Certaines ont été adoptées pour innover au sein de systèmes, d'autres ont été conçues sur mesure pour entraîner un changement dans un nombre limité d'organisations. Il existe également une voie intermédiaire ; certaines initiatives par exemple attachent beaucoup d'importance au développement professionnel des pédagogues.

Plus précisément, une analyse transversale a mis en lumière les éléments suivants :

- L'innovation des systèmes n'implique pas forcément un champ géographique étendu;
- Si les financements peuvent avoir une influence sur le champ des actions et l'échelle des effets, ils ne jouent pas de rôle dans l'atteinte des objectifs et l'attribution de la réussite;
- La créativité est une force dynamique du changement, et la développer aide à répondre aux défis environnementaux, sociaux et économiques d'aujourd'hui;
- Il n'existe pas de solution unique adaptée à tous pour enseigner et apprendre la créativité;
- Le développement de la créativité est généralement inclus au sein d'objectifs plus larges, et comporte souvent des approches comme l'apprentissage basé sur les problèmes et l'exploration;
- La plupart des approches se concentrent sur la créativité individuelle plutôt que sur la créativité de groupe, mais insistent sur la collaboration pendant l'apprentissage : développer et mettre en pratique des compétences créatives;
- Les ressources, outils et environnements d'apprentissage sont importants pour la promotion de la créativité comme compétence;
- Les résultats par niveau, quand ils existent, sont rarement détaillés. Les approches adoptées sont généralement informelles, comportent des observations, réflexions et auto-évaluations plutôt que des tests de créativités vérifiés.

D'une manière générale, il existe un consensus grandissant concernant les éléments fondamentaux de la créativité, et une base d'éléments probants qui s'étoffe pour les pédagogies et approches d'apprentissage qui facilitent le développement de la créativité. De plus, l'étude montre que plusieurs facteurs conditionnent le succès des initiatives visant à développer la créativité en tant que compétence transversale. Il s'agit notamment de la volonté politique et de l'adhésion à différents niveaux, de la capacité, de l'implication et de la collaboration de l'ensemble des partenaires concernés, d'une attention explicite portée à la créativité, d'une définition claire de cette dernière, de l'encadrement du développement de la créativité au sein d'objectifs plus larges ; il s'agit également de souligner l'importance de la créativité pour l'employabilité et les résultats commerciaux, la nouveauté et le potentiel des pédagogies encouragées et des méthodologies solides ; enfin, il s'agit d'impliquer ensemble étudiants et enseignants, et d'apporter un soutien aux pédagogues. Au contraire, les éléments mentionnés comme manquants, la perception de la créativité comme concept flou facile à apprendre par osmose sans enseignement explicite, le manque de compréhension relatif à la valeur de la créativité, l'accent mis sur les discussions plutôt que sur le développement de la créativité comme compétence, le manque d'efforts, le manque d'outils d'évaluation prêts à l'emploi, de bons exemples tirés d'expérience, et enfin le manque de coordination des différentes actions adoptées pour avancer vers un même objectif entravent la promotion de la créativité comme compétence transversale. Néanmoins, la réalité de l'apprentissage tout au long de la vie est plus complexe, d'où les points suivants :

- S'il est essentiel d'accorder une attention explicite à la créativité, cela ne suffit pas ; pour développer la créativité en pratique, il est nécessaire d'avoir une définition claire de la créativité, de lier cette dernière aux résultats d'apprentissage, d'adopter des pédagogies testées et approuvées et de soutenir les pédagogues;

- Plus la définition de la créativité est détaillée, mieux elle peut être intégrée dans l'enseignement et l'apprentissage ; cette intégration aide à s'assurer de la prise en compte de la nature componentielle de la créativité, et de garantir le traitement de la plupart des dimensions, si ce n'est toutes les dimensions de la créativité sont traitées ;
- Un enseignement et un apprentissage réussis de la créativité nécessitent de clarifier ses mécanismes ; cela peut être fait en reliant la définition de la créativité avec les activités, les options d'apprentissage et les résultats attendus ;
- Pour permettre une évaluation, la définition de la créativité doit être reliée aux objectifs et résultats d'apprentissage, idéalement par niveau de progression.

1 Introduction

In the past several decades, in Europe and across the world, there have been significant changes that have fuelled the recognition of the importance of lifelong learning and heightened the need for all individuals to develop capabilities, competences and dispositions that go beyond foundational skills (Pellegrino & Hilton, 2012; Lamb et al., 2018; Lucas, 2019). The main trends include (World Economic Forum, 2013; Care, Anderson, & Kim, 2016; European Commission, 2018):

- The ubiquity of data, fuelling the demand for digital competences, critical thinking and complex problem-solving skills;
- The potential of automation via Artificial Intelligence and its impact, often contested, on life and work, requiring learning to learn competences and the ability to adapt;
- The proliferation of knowledge sources from the Internet and wider digital world changing the way our brains relate to and understand information;
- Increased self-employment and flexible labour markets, resulting in an increased demand for and recognition of learner autonomy and lifelong learning;
- The increasing complexity of problems such as climate change, data security, and resistance to life-saving drugs and, thus, the need to strengthen both STEM and value-based civic education;
- The increasing interconnectedness and global nature of our relationships, demanding closer cooperation between nations, linguistic and multicultural competences;
- Global population growth, an ageing society, and inequities, calling for multi-stakeholder and interdisciplinary perspectives, and creative solutions to state-of-the-art problems;
- The COVID-19 pandemic heightening the need for high-quality virtual and mobile learning, and the opportunities and risks associated with this phenomenon.

In public and academic discourse, the focus of attention has shifted towards problem-solving, critical thinking, ability to cooperate, computational thinking, self-regulation, adaptability, communication and learning to learn. Most importantly for this report, the challenges listed above have heightened the need for creativity and shaped the existing concepts and practices for the development of it as a transversal skill.

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 (Durham Commission on Creativity and Education, 2019). These dispositions facilitate higher learning, long-term employability, and upward social mobility (Gutman and Schoon, 2013; OECD, 2015). Creativity can also benefit physical fitness, emotional resilience, mental health, confidence, agency, and engender a sense of empowerment. At the collective level, creativity helps to promote social engagement, community identity and cohesion, stimulates economic growth and supports the good functioning of democratic societies.

That said, it is essential to acknowledge that creativity, like any human activity, can be misused. Some argue that there is a 'dark side' to creativity (Gino & Ariely, 2012) and that the search for novelty and problem-solving can lead to dishonesty or the creation of dangerous ideas. Nevertheless, the evidence for the benefits creativity confers on individuals and society is growing. Unsurprisingly, across continents, creativity is now central to discussions about the key competences and core life skills needed today (Collard & Looney, 2014).

In fact, over the last 70 years, creativity has become an established field of research. Much of the scholarly work on the topic has focused on defining its nature and setting the contours of the field (Kampylis & Valtnanen, 2010; Collard and Looney, 2014). Thus, in a comprehensive meta-analysis of creativity literature, Treffinger found 120 definitions, which he clustered into four groups – generating ideas, digging deeper into ideas, openness and courage to explore ideas, and listening to one's inner voice (Treffinger et al., 2002). Several scholars and policymakers have proposed their understanding of creativity since, but as of 2020, no one widely used definition exists in education. That said, there is an agreement that creativity involves novel or original thinking and the generation of value, considered to context and environment. There is also a growing understanding of its relevance in all subjects of the curriculum and all aspects of life.

Recently, the decision by the Programme for International Student Assessment (PISA) to make Creative Thinking the focus of its 2021 assessment (OECD, 2019) confirms a growing confidence in the robustness and validity of the concept of creativity, its usefulness for society, learnability and that creativity can be reliably assessed. In parallel, there is increasingly a consensus that creativity is a learnable skill in formal education (Vincent-Lancrin et al., 2019). Attempts are currently being made to teach and assess it mainly in compulsory school but also in vocational, higher, and non-formal education and training. But as

yet creativity is not systematically taught or otherwise fostered, especially in formal settings, which require a regular monitoring of progress despite increased references to it in national curricula (Care, Anderson, & Kim, 2016).

When the European Reference Framework of Key Competences for Lifelong Learning was first conceived in 2006 (European Parliament and the Council) to offer learning opportunities to people at any stage in their life to prosper in a rapidly changing environment, creativity was a more contested and less understood concept than it is today. The world was a different place, with the full impact of the digital age only beginning to be recognised. In just over a decade since then, employers and educationalists alike have reached a common view that creativity really matters (World Economic Forum, 2013; European Commission, 2018).

In this context, the JRC undertook a study to provide a comprehensive overview of existing concepts and practices for the development of creativity as a transversal skill (or set of skills) for lifelong learning. To our knowledge, very little research has been conducted on creativity for lifelong learning. Accordingly, this work aims to fill this gap by summarising, juxtaposing and reflecting upon the existing concepts, definitions, and frameworks of creativity, compiling an inventory of existing initiatives aimed at fostering creativity, and studying eight cases in depth in the context of lifelong learning. The research focuses on the vocational education and training, higher education and non-formal learning which have not been much explored yet but also covers compulsory school education, which has already been more extensively researched.

This publication features the final study results. It is tailored to policymakers, experts and educators looking for ways to mainstream, define, teach, and assess creativity as a transversal skill. Building on existing knowledge, the publication allows the reader to take stock of the variety of approaches, make use of the lessons learned and choose the direction for further work in the area of developing creativity as a transversal skill.

2 Research methodology

The study followed a qualitative approach, applying recognised research methods such as literature review, an inventory, in-depth case studies and validation events. Each is described in more detail in the sections below, whereas a brief overview is provided in Table 1.

Table 1. A brief overview of the methods applied

Literature review	Inventory	Case studies	Validation events
175 articles/books and **59** frameworks	**34** initiatives	**8** case studies	**4** events
Academic publications in English, which had been peer- reviewed and released from 1 January 2009 onwards featuring definitions of creativity, creative thinking or creative ability, **learning frameworks** encompassing creativity or creative thinking, and **models of creativity**	Well-documented **policy** and **grass-root** initiatives, most of which have been adopted **since 2010** and implemented **in Europe** in the sectors of compulsory school education, vocational education and training, higher education, and non-formal learning	**Erasmus+ projects**: three 'Tinkering EU' projects, 'Design thinking in higher education for promoting human-centred innovation in business and society', 'Teaching creativity in engineering', 'Creative thinking in youth work', **policy actions**: Victorian curriculum and assessment, Lead Creative Schools, High-performing cycles (ETHAZI), and a **private initiative** – IDEO Creative Difference	A **webinar** for the policymakers, experts, and education practitioners, two **workshops** and a **seminar** for the officials of the European Commission

Source: Compiled by the authors.

2.1 Literature review

The purpose of the literature review was to summarise, juxtapose and reflect upon existing concepts, definitions, and frameworks of creativity as a transversal skill for lifelong learning.

In total, 175 academic articles/books were screened using EBSCO Discovery Service, focusing on the publications in English, which had been peer-reviewed and released from 1 January 2009 onwards. Phrases such as 'creativity AND transversal skill AND lifelong learning' (43 hits) and '(creativity OR creative thinking OR creative ability) AND (transversal skill OR transversal competence)' (132 hits) were used for the literature search.

Once the titles and abstracts were screened, the most relevant articles/books were selected and searched for the definitions of creativity, creative thinking, or creative ability. Relevant data was then extracted and compiled into an Excel spreadsheet.

In addition to a semi-systematic academic literature search, grey literature was reviewed, including reports, policy documents, curricula, and guidelines. Using a snow-balling approach, 51 learning frameworks were identified as either explicitly or implicitly referring to creativity as a competence/skill/skill set. These included policy-driven approaches at the international, European, national, and state levels, as well as research-based frameworks. Also, eight publications that focus specifically on creativity and provide elaborate definitions or models of it as a competence/skill/skill set were identified. In total, 59 frameworks were mapped, and 46 of them were selected to be included in the analysis.

As a final step, the literature review report was prepared. It is available as a separate publication (Lucas and Venckutė, 2020), but key insights are also provided in Chapter 3.

2.2 Inventory

The purpose of the inventory was to reveal practices that had been used to promote creativity as a transversal skill. These include initiatives that vary in terms of design, conceptualisation of creativity and methodological approach.

To identify relevant practices, an online survey of experts and educators was carried out, and a comprehensive desk research was conducted. As a result, 34 practices were selected for a more detailed review. The selection process was guided by the principles outlined below:

- Focusing on initiatives that have been adopted since 2010;
- Focusing on initiatives that have been implemented in Europe;

- Focusing on initiatives implemented in vocational education and training, higher education and/or non-formal learning (e.g. adult education and training) sectors;
- Including initiatives that link creativity with the digital, entrepreneurship and/or life key competences;
- Including initiatives launched in the fields of social action, youth work and/or sustainability;
- Including initiatives which are well documented.

For each selected initiative, information was gathered on such aspects as objectives, timeframe, target group(s), geographical scope, sector(s), level(s) and settings of education and training covered, level of implementation, key actors involved and their roles, funding arrangements, key activities/measures, definition of creativity, pedagogical approaches and methods promoted, assessment approaches and methods promoted, outputs, outcomes, impacts, and lessons learned.

As a final step, 34 factsheets were prepared. These are provided in Annex 2.

2.3 Case studies

The purpose of the case studies was to reveal how creativity is conceptualised, translated into learning objectives, taught, and assessed.

Out of 34 cases described for the inventory, eight were selected for a more detailed review:

- Three 'Tinkering EU' projects: 'Tinkering: Contemporary Education for Innovators of Tomorrow', 'Tinkering EU: Building Science Capital for ALL', and 'Tinkering EU: Addressing the Adults';
- 'Design thinking in higher education for promoting human-centred innovation in business and society';
- 'Teaching creativity in engineering';
- Victorian curriculum and assessment;
- IDEO Creative Difference;
- Lead Creative Schools;
- 'Creative thinking in youth work';
- High-performing cycles (ETHAZI).

These are well-documented policy and grass-root initiatives of broad scope, high degree of maturity, and observable impact. Together, they cover different countries, sectors, levels and settings of education and training, focus areas, target groups, levels of implementation, and funding arrangements.

For each case, desk research was conducted along with email enquiries and telephone interviews with the people involved in their design and/or implementation. Concise yet informative case study reports were then prepared, covering such aspects as design features, conceptualisation of creativity, teaching and learning, assessment, results, key drivers and challenges, and lessons learned.

Case study reports are provided in Annex 1. To boost the accuracy and facilitate the interpretation of the descriptions, throughout them, terms adopted by the case owners are used.

2.4 Validation events

To validate the indicative literature review, inventory, and case study findings, the JRC organised four events:

- A webinar for the policymakers, experts, and education practitioners to present the indicative research results. The webinar featured two presentations – one on the language used to define creativity, and another on the approaches adopted towards teaching, learning, and assessing this skill. Each presentation was followed by answers to questions raised in the group chat.
- Two workshops for experts to discuss the indicative research results. Each workshop included a brief presentation of the indicative research findings, followed by a discussion (in the case of the first workshop, in the break-out rooms) and a summary of key takeaways to consider in the next and final study phase.
- A seminar for the officials of the European Commission to discuss the indicative research results from a policy perspective. The seminar focused on group work followed by presentations delivered by the rapporteurs and a plenary discussion.

Given the travel restrictions imposed due to the pandemic of the COVID-19, all four events were held online. Key takeaways were thoroughly documented and, where possible, reflected upon in this report.

2.5 Limitations of research

The study is not without limitations. These mainly result from the time and budget constraints, which influenced the study design and scope of research.

First, most data was collected in English. This may have resulted in the overrepresentation of frameworks and practice examples from the English-speaking world.

Second, only four out of 175 articles/books examined as part of the literature review contained a definition of creativity, creative thinking, or creative ability. Thus, the analysis of the concepts is heavily focused on frameworks. This inevitably limits the variety and depth of the definitions presented.

Third, the inventory is neither exhaustive nor representative. As a result, some other approaches to teaching, learning and assessment of creativity may exist but not be featured in the report.

3 Conceptualisation of creativity

3.1 The language of skills

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

There is currently no international evidence-based 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. The different terms used suggest very different conceptions of creativity; that it is a form of knowledge; that it is a set of skills; that it is something more dynamic like a competence or capability; that it might be non-cognitive rather than cognitive; that it is a mindset or a set of habits of mind.

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. The selection and definition of these terms has, like the frameworks examined in this report, been drawn from across the world.

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 several 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) socialisation. 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 — Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of the European Qualifications Framework, knowledge is described as theoretical and/or factual (European Parliament and the Council, 2008). 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 interpersonal 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 is an expression used primarily by economists to refer to the bundle of skills that are not covered in standard definitions of cognitive skills (numeracy, literacy) (Cinque et al., forthcoming; Messick 1978). 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 a non-cognitive skills (UNESCO, 2016).

Skill – expertise or the ability to do something well, to apply knowledge and use know-how to complete tasks and solve problems.). Increasingly 'skills' are divided into categories such as basic or higher; or as 'behavioural and social', 'technical' or 'creativity and critical thinking'; or as 'academic' or 'vocational'. In the context of the Europe-n Qualifications Framework, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments) (European Parliament and the Council, 2008). It has also been described in the context of understanding creativity as a skill for all (Ferrari, et al, 2010).

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. Soft skills are frequently used by employers as a near synonym for competences 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 it 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.

3.2 Frameworks and definitions of creativity

Creativity is often featured in learning frameworks, including international, European, national, and state-wide ones. It also appears in some research-based classifications and frameworks exclusively focused on laying down the components of creativity as a competence, competency, or skill.

In the sections below, key insights on the conceptual and linguistic framings of creativity are provided[2]. They result from the analysis of the 46 frameworks. The visibility of creativity varies across them; Figure 1 shows all 46 frameworks clustered into three groups to illustrate the degree of visibility of creativity within each one.

Table 2. 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 Entrepreneurship Competence Framework	UNICEF Twelve core life skills for MENA
European Digital Competence Framework for Citizens	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 21stcentury 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

[2] A more detailed analysis of the difference approaches is presented in Lucas and Venckutė (2020).

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.

3.2.1 International approaches

Nine international frameworks were reviewed. These include OECD Definition and Selection of Competencies (2003), OECD Learning Compass (2019), PISA 2018 Global Competence Framework (2018), UNESCO Intercultural Competences: Conceptual and Operational Framework (2013), UNESCO and Brookings Global Framework of Learning Domains (2013), UNESCO and ERI-Net working definition of transversal competencies (2015), UNICEF Twelve core life skills for MENA (2017), World Economic Forum 21st century skills (2015), and World Economic Forum definition of core work-related skills (2016).

Each of these frameworks includes creativity, either explicitly or implicitly, but there is no standard approach. Three bodies have contributed most to the 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, 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 – mainly within the creative arts.

The UNESCO and 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 competence. As observed in Section 3.1, 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.

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.

3.2.2 European approaches

Nine European frameworks were reviewed. These include the European Reference Framework: Key competences for lifelong learning (2006 and 2018), European Entrepreneurship Competence Framework (2016), European Digital Competence Framework for Citizens (2013), European Framework for Digitally-Competent Educational Organisations (2015), European Personal, Social and Learning to Learn Key Competence Framework (2020), definition of cultural awareness and expression key competences (2016), Reference Framework of Competences for Democratic Culture (2018), European Framework for the Digital Competence of Educators (2017), and European Training Strategy II: Competences for Trainers Working at International Level (2014).

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 by the Council Recommendation of 22 May 2018.

Each EU/European framework reviewed includes creativity, either explicitly or implicitly, but there is no common approach. In framing creativity, there is no consistency concerning 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.

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 'hybrid' or 'transformative' 'key' competence and at the same time, without any specific attempt to distinguish them, 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 seven 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 refers to the five-dimensional model of creativity (Lucas et al., 2013), provides a definition of creativity based on it (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 several 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 3.1, 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, several 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 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 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.

3.2.3 National approaches

A significant number of national education systems now include 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.

Some contrasting examples of national frameworks reviewed include the Australian F-10 Curriculum (2015), National Core Curriculum for Basic Education in Finland (2014/2016), Curriculum of the Netherlands (forthcoming), Curriculum of Northern Ireland (2007), and Meta-skills framework of Scotland (2018). Of these exemplars, Northern Ireland, Finland and Australia have, in different ways, demonstrated a longstanding commitment to the development of creativity and 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 several 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.

Finland, Scotland and the Netherlands are examples of three countries which have systematically sought to embed creativity in 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-skillsIssues 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 that 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.

3.2.4 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, hence they were reviewed.

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.

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.

3.2.5 Research-based frameworks

Thirteen frameworks for education and lifelong learning with a significant element of creativity and developed based on a thorough literature research and/or empirical trialling were also reviewed. These include a preliminary classification of 21st century skills by the National Research Council, USA (2012), Assessment and Teaching of 21st Century Skills (ATC21S), Australia (2012), Cambridge Life Competencies Framework, UK (2019), Center for Curriculum Redesign Competencies Framework, USA (2019), enGauge 21st Century Skills: Digital Literacies for a Digital Age by the North Central Regional Educational Laboratory, USA (2002), Key Skills for the 21st Century as defined by the Centre for International Research on Education Systems, Australia (2017), Habits of Mind as defined by Costa and Kallick, USA (2000), Jubilee Centre Framework for Character Education, UK (2017), New Pedagogies for Deep Learning, Canada (2014), Non-cognitive skills model developed by Gutman and Schoon, UK (2013), P21 Learning Framework, USA (2019), VIA Character strengths, USA (n.d.), and Learning Dimensions of Making and Tinkering 2.0 as defined by the Exploratorium USA (2017).

These research-based models adopt a large variety of different approaches. As with the European frameworks the attitude of the researchers or 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 to their cause.

Frameworks adopting a twenty-first-century skills/life skills approach, tend to see creativity as essential and current. In contrast, those with longer histories such as the two character frameworks, 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 specific 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.

Another key theme is the importance of understanding the context and transfer of learning. For example, it is crucial to recognise that how creativity is expressed may vary from one context to another. By the same token skills learned in one domain cannot necessarily be used with confidence in another less familiar setting.

Reflecting on these frameworks, Cambridge Life Competencies and New Pedagogies for Deeper Learning are just two examples of frameworks in use across the world.

These research-based frameworks have been considered as a separate category from those listed earlier, but the truth is that the international, European, national and state-wide frameworks are also evidence-based. The difference is that it is sometimes not clear whether and how the researched-based frameworks listed above are used by international, European, national or state administrations.

The breadth of approaches towards creativity in education and lifelong learning, along with the growing research interest in it, suggest both the complexity and importance of the topic

3.2.6 Research-based creativity frameworks

Eight research-based frameworks, exclusively focused on creativity, were reviewed. These include Creative Problem-Solving (CPS) Framework developed by the Center for Creative Learning, Inc. and Creative Problem Solving Group, Inc, USA (2000), definition of creativity provided by the Durham Commission on Creativity and Education, UK (2019), Five-dimensional model of creativity designed by the Centre for Real-World Learning, UK (2013), Four C model of creativity developed by Kaufmann and Beghetto, USA (2009), definition of creativity adopted by the LEGO Foundation, Denmark (2020), rubrics for creativity and critical thinking compiled by the OECD Centre for

Educational Research and Innovation, France (2019), definition of creative thinking by PISA 2021, France (2019), and Seven Critical Components of Creativity in Children as defined by the Bay Area Discovery Museum, USA (2015).

The number of such evidence-based frameworks which are widely used in schools and lifelong learning is strikingly small. 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.

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.

3.2.7 Differences and commonalities

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

The frameworks we reviewed are in broad agreement in several 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;
- 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.

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 learning versus in order to be assessed. The context in which the framework is written may also influence how creativity is understood along cultural dimensions such as individualisms vs collectivism, power distance and uncertainty avoidance (Hofstede, 1986).
- 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 historical 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 a twenty-first-century skill.

3.3 Links between creativity and the key competences

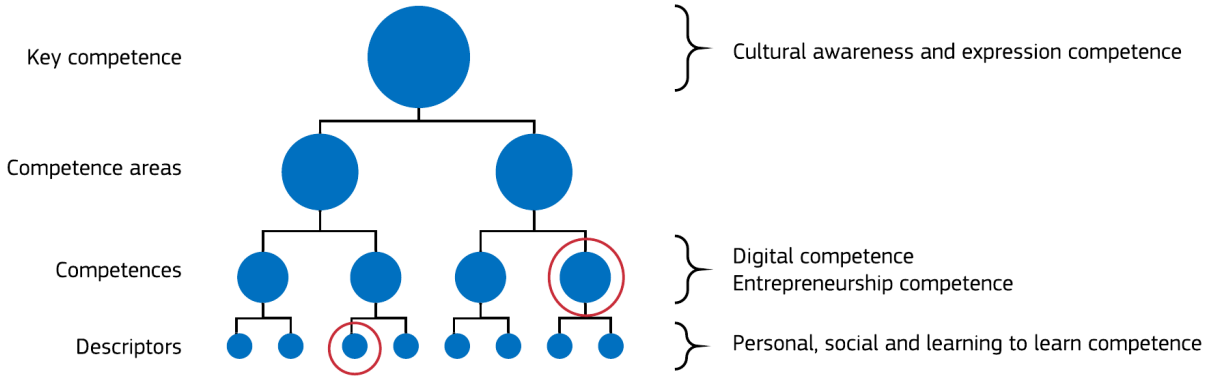
As the world has developed, the Key Competences for Lifelong Learning have been revised and new ones introduced, most recently by the Council Recommendation of 22 May 2018.

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.

Four out of eight competences listed in the European Reference Framework seem to overlap with the idea of creativity the most. These include digital, entrepreneurship, personal, social and learning to learn competence as well as cultural awareness and expression. The JRC has developed frameworks for the first three.

A concise overview of how creativity is embedded in digital, entrepreneurship, personal, social and learning to learn competence as well as cultural awareness and expression is provided in the figure below. It reveals that in some, creativity is explicitly mentioned as one of the sub-competences, whereas in others it is featured in the descriptors of sub-competences or linked with the key competence in more general terms with no clear reference to the sub-competences or their descriptors.



Source: Compiled by the authors.

Figure 1. Creativity and four key competences it links with the most

In the European Digital Competence Framework for Citizens, creativity is seen through the lens of digital activity. It is explicitly part of Problem-solving (Creatively using digital technologies) but implicitly a component of Communication and collaboration and Digital content creation.

In the European Framework for Personal, Social and Learning to Learn Key Competence, creativity sits under Developing creative ideas, synthesising and combining concepts and information from different sources in view of solving problems. It is argued that the capacity to think creatively is relevant to problem-solving and creativity 'enables individuals to question assumptions, re-evaluate problems considering different variables and to take sensible risks' (European Commission, 2020, p. 67). More specifically, creativity is described as emerging from the capacity of generating ideas, digging deeper into ideas, openness and courage to explore ideas, listening to one's inner voice, and self-regulation.

In the European Entrepreneurship Framework, 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 for others.

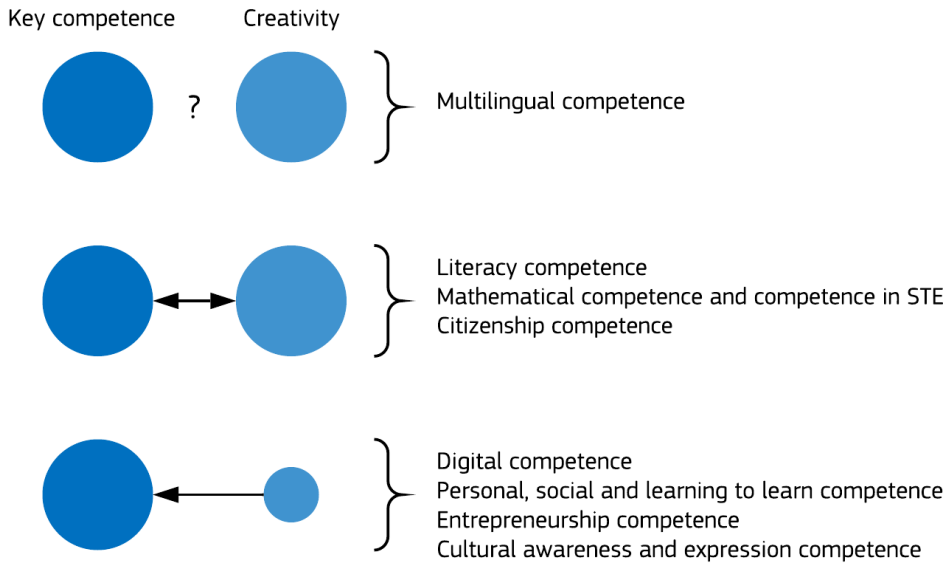
The description of Cultural awareness and expression competence is full of powerful expressions of the value of creativity, albeit and understandably framed by its interest in culture and the arts. Although a clear definition of creativity is not provided, the five-dimensional model published by the OECD (Lucas et al., 2013) is referenced in the working group's report.

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 European Reference Framework as presented in the annex of the Council Recommendation of 22 May 2018:

- '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.'
- '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.'
- '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.'

No obvious connections between creativity and the Multilingual competence were found based on a thorough analysis of the Council Recommendation of 22 May 2018.

Overall, three ways of how creativity is embedded in the key competences emerge from the analysis (see the figure below). In Digital competence, Personal, social and learning to learn competence, Entrepreneurship competence and Cultural awareness and expression competence, creativity is explicitly mentioned and treated as a component of each, hence the smaller circle and one-headed arrow in the third model in the figure below. In Literacy competence, Mathematical competence and competence in science, technology and engineering and Citizenship competence, creativity is implicit. While links between these key competences and creativity can be made, the exact nature of them and their scope are not clear, hence the same size circles and double-headed arrow in the second model in the figure below. In Multilingual competence, no connections with creativity can be found, hence the question mark between the circles illustrating it and creativity in the first model in the figure below.



Source: Compiled by the authors.

Figure 2. Links between creativity and each of the eight key competences (including hierarchical levels at which creativity appears)

4 Development of creativity

Given a move-away from single discipline to transversal skills, promotion of competence- rather than discipline-based learning, and growing evidence of the benefits of creativity, many attempts have been made to help learners develop this skill. To better understand and compare the various approaches to and strategies for promoting creativity as a transversal skill, this study collected and reviewed 34 interventions. These were launched at various locations, levels and across the public-private divide. The inventory of initiatives (see Annex 2) is by no means exhaustive or representative of the above-mentioned diversity. However, it illustrates the approaches that have been adopted so far and allows a deep-dive into the elements that characterise initiatives aimed at fostering creativity as a transversal skill.

Table 3. An overview of the inventory cases

Play, creativity and learning	
2018-ongoing **Denmark, municipalities of Billund and Esbjerg**	'Play, creativity and learning' is a module of the Pedagogical Diploma Programme launched to promote play as a didactic tool among professionals working in the early childhood education and care (ECEC). Participants gain new insights into play and its importance for the development of children's creative and intellectual capacity, while being able to practise what they learn between the individual lessons.
Creative Ireland Programme	
2017-ongoing (until 2022) **Ireland**	Creative Ireland is a culture-based programme designed to promote individual, community and national wellbeing and collective creativity. It gives opportunities and needed investment for children and young people, within and outside of the formal education system, to work on their learning, self-expression and personal development through cultural and creative activities.
Paul Hamlyn Foundation: Teacher Development Fund (TDF)	
2016-ongoing **United Kingdom**	TDF is a fund that supports the delivery of effective arts-based teaching, inquiry-based continuing professional development, and learning opportunities in the primary classroom that embeds learning through arts in the curriculum. Projects are implemented by partnerships of arts/cultural organisations and five to ten primary schools and partnerships working two academic years at a time.
IDEO's Creative Difference tool	
2016-ongoing **Global**	IDEO is an organisation that has developed and offers a Creative Difference tool to help organisations understand their creative capabilities and guide the growth of these capabilities with tailored focus areas and other tools. It aims to help leaders assess, track and guide the development of innovative and adaptive teams and develop a strategy to make them highly effective at creative problem-solving.
Creative work with information	
2016-ongoing **Czech Republic**	Creative work with information is a course at Masaryk University that teaches students to get ownership of their education and master lifelong learning and a variety of techniques to foster creativity. The main activity is tutoring on how to work with information in a creative way focusing on creativity and learning, creative and critical reading and writing, discovery and visualisation techniques.
Lead Creative Schools	
2015-ongoing (until 2022) **Wales, the United Kingdom**	Lead Creative Schools is a scheme to promote new ways of working, with innovative and bespoke programmes of learning designed to improve the quality of teaching and learning. It works with selected schools by providing creative people, skills and resources that are needed to help them address the challenges that they face, and nurture and develop the creativity of learners.
Study Strategy of the University of Zagreb	
2014-ongoing (until 2025)	To orient modern study programmes towards the development of a broader spectrum of

Croatia	competences and, thus, encourage creativity and a motivating learning environment lays at the heart of the Study Strategy of the University of Zagreb. Key activities are to establish specialised centres and invest in systems to support and evaluate the transition.

High-performance cycles (ETHAZI)

2010-ongoing **Basque Country, Spain**	ETHAZI is a learning model designed to develop processes for learning and rolling out support systems for innovative learning models in VET, activate and spark people's ability to be agile about problem-solving, and respond to local and future skill needs. It is implemented through training programmes and close follow-up of the participating schools, VET centres and organisations.

Denkmotor

2005-ongoing **Germany**	Denkmotor is a private training company run by the German entrepreneurs and public figures. Its main activity is to provide seminars and training around creativity, innovation and simplicity. By doing so, Denkmotor wishes to spark ideas that drive successful companies forward and to motivate employees to achieve creative excellence and innovate at the company level and elsewise.

Kaospilot (Chaos Pilot) and the Enterprising Leadership programme as an example

1991-ongoing **Denmark**	Kaospilot is a hybrid business and design school educating HE and adult students in effective creativity and positive change-making. The enterprising leadership programme focuses on developing abilities, cultivating character and creating a sense of direction for the students.

Creative Problem-Solving Institute

1955-ongoing **The United States**	The creative problem-solving institute (CPSI) is an institute that provides training in creativity and how it enhances problem-solving. The activities are implemented on the campus, during in-depth experiential sessions, applying practical tools and skills for the development of creativity and innovation, and networking with global creativity colleagues from diverse industries.

CREUS: Developing and Nurturing the Transversal Skills of Disadvantaged Young People through Creative, Non-Formal Learning in Unconventional Spaces

2017-2020 **UK, Cyprus, Italy, Greece and the Netherlands**	CREUS was an Erasmus+ strategic partnership to introduce ways for 120 disadvantaged young and unemployed people aged 16-24, and 25 young peer mentors (aged 18-24) to develop their transversal skills through non-formal, cultural and artistic learning in 'unconventional places' - spaces unknown for them - events, workshops, a newly developed curriculum and a website.

Creative Thinking in Youth Work

2018-2019 **Bulgaria, Cyprus, Croatia, Hungary, Lithuania, Romania and Serbia**	Creative Thinking in Youth Work was an Erasmus+ initiative to support the professional development and ability of 35 youth workers from 7 NGOs to be creative (a 9-day training course on design thinking, creativity and e-learning) and aware of how creativity increases their impact (intensive co-created MOOC on the subject). A network of youth NGOs was created to upscale the results.

Bullying: I don't stay! Yes to friendship.

2017-2019 **Italy, Poland, Romania and Greece**	Bullying: I don't stay! Yes to friendship was an Erasmus+ strategic partnership to promote the most effective methods for bullying problem solving by developing the creativity and pro-social of students and teachers and increasing their motivation to learn. Students and teacher designed a grand awareness campaign making use of innovative ICT, i.e., a dyadic digital comics book.

Design Thinking in Higher Education for Promoting Human-Centered Innovation in Business and Society (Design IT)

2017-2019

Finland, Estonia, Portugal and Greece

Design IT was an Erasmus+ strategic partnership introducing design thinking interventions into entrepreneurship higher education. The core activities of the initiative were the development and testing of a gamified learning platform and production of instructor support content on design thinking methodology.

Experiential Live Initiative Enhancement

2017-2019

Italy, Lithuania, Finland and Spain

The experiential live initiative enhancement was an Erasmus+ driven strategic partnership to support the adoption of live projects where students in higher education act as consultants to real-life commissioners/business owners. The method required students to employ social skills, take leadership, engage in personal development and creative problem-solving.

Sustainable Consumption and Production in Social Life

2016-2018

Poland, Turkey, Romania, Estonia and Italy

Sustainable consumption and production in social life was an Erasmus+ strategic partnership to improve the effectiveness of teachers in teaching sustainable consumption and improving students critical thinking, creativity, innovation, observation skills, comparison and classification techniques. It did so by engaging students in designing and gaming tasks and futuristic scenarios.

Arts & Humanities Entrepreneurship Hub

2016-2018

UK, Belgium, Spain, Ireland, Denmark and the Netherlands

Arts & Humanities Entrepreneurship Hub was an Erasmus+ strategic partnership to improve the entrepreneurial mindset of students and foster collaborative pedagogical innovation in VET. Five regional alliances consisting of 61 stakeholders consulted on the analysis and development of a toolkit and 10 innovative training activities that were piloted in the participating countries.

Assessment of transversal skills 2020 (ATS2020)

2015-2018

Belgium, Cyprus, Greece, Finland, Ireland, Lithuania, Slovakia and Spain

Assessment of transversal skills 2020 was an Erasmus+ initiative to develop and provide a comprehensive learning model for transversal (including creativity) skills of students (age 10-15) and their teachers. Key activities were to develop an assessment framework, learning platforms, training materials, organising workshops, adopting and implementing the plan across the countries.

Tinkering: Contemporary Education for Innovators of Tomorrow

2014-2017

Ireland, the Netherlands, Hungary, the UK and Germany.

Tinkering EU 2 was an Erasmus+ project to foster STEM-related skills and 21st century transversal skills of adults (parents, museum educators and schoolteachers) and learners (12-18 years) through a learner-centred pedagogical approach (tinkering), developing it and implementing it in school and out-of-school contexts at a European level.

Ontario Technology and Learning Fund (TLF)

2014-2017

Ontario province, Canada

TLF is a fund intended to accelerate the uptake of evidence-based, technology-enhanced pedagogical practices. It invests in the technology, design, and infrastructure required for the classrooms of the future to serve the needs of all communities that enables such methods, focusing particularly on the development of 21st century competences (including creativity).

The Creative Lion

2014-2017

Czech Republic, Italy, Slovakia, Sweden and Turkey

The Creative Lion was an Erasmus+ initiative to provide students of arts, media and general subjects with metacognition techniques around their creative production process while improving their media, language and intercultural skills in the process. Key activities were a supporting website, teacher conferences, international mobility meetings and multimedia production.

Victorian curriculum and assessment of critical and creative thinking (CCT) as described in F-10

2015-2016

Victorian state, Australia

Critical and creative thinking was introduced as a component of F-10 curriculum addressed to students in the first 11 years of school. Together, several resources for teachers were provided, and sample assessment programme launched. Inclusion of the CCT in the curriculum was intended to help students understand their thinking processes and apply them intentionally through logical, strategic, flexible, and adventurous thinking.

Towards a More Innovative Workplace

2014-2016

Austria, Portugal, Finland, Lithuania, UK and Bulgaria

Towards a More Innovative Workplace was an Erasmus+ strategic partnership to provide training material and support to enterprises that would increase their business adaptability and organisational innovation. The course comprised 10 modules, of which the first focused on the concepts of creativity and innovation.

Mobile Learning in VET towards 2020

2014-2016

Italy, Spain, Turkey, France and the UK

Mobile Learning in VET towards 2020 was an Erasmus+ strategic partnership initiative to develop a teaching model for m-learning, which was learner-centred and focused on developing 21st century skills – including creativity. The team trained teachers in pluri-disciplinary approaches to ICT teaching, while teacher co-created learning scenarios following the methodology set out.

Vocational Cooperative Learning Triangles (VoCOL)

2014-2016

UK, Iceland, Sweden, Spain, Czech Republic and Germany

VoCOL was an Erasmus+ strategic partnership to integrate and advance cooperative learning methodologies in VET and assess employment competences, of which creativity was seen a discrete and crucial component. Key activities were setting up and supporting triangles of employers, learners and staff that would work on tasks where they developed their transversal skills.

Sustainable Entrepreneurship: A Game-Based Exploration for Lower Secondary Schools (SUSEN)

2014-2016

Germany, UK, Poland, Belgium and Switzerland

SUSEN was an Erasmus+ initiative to enhance creativity and civic engagement of students in lower secondary schools. The partners developed a classroom game which required students to contact external stakeholders, build successful businesses within budget limits and taking environmental aspects into account. This process leads to a final online and disseminated version of the game.

Creative Minds

2014-2016

Poland and Cyprus

Creative Minds was an Erasmus+ initiative using LEGO and robotics to trigger the creative thinking of students aged 13-16. Key activities were training, student exchanges, technology and language workshops, dissemination events, challenge-based learning scenarios around robotics, space exploration and environmentalism and tests based on LEGO engineer initiative constructs.

TECRINO: Teaching Creativity in Engineering

2013-2016

Cyprus, Portugal, Spain, Croatia, Poland and Romania

TECRINO was a Leonardo Da Vinci funded initiative that set up a Moodle platform for teaching creativity, developed an assessment tool for creativity, did research on creativity in the educational context and trained teachers in the engineering sector to improve the transparency, visibility and the development of their students' competences linked to innovation.

Institute Vasco de Creatividad Aplicado (IDEATK)

2015

Basque region, Spain

IDEATK was an institute operating under the Deputy Minister responsible for VET to support knowledge transfer and innovation in VET focusing on critical, constructive and creative thinking. It researched emotional and executive intelligence and how it can be useful in fostering creativity. Based on its research, it worked with other institutions to implement training

programmes.

KC-MEM: Acquiring Key Competences through Local Memories in Non-Formal Adult Learning	
2014-2015 Spain, Cyprus, Poland, Slovenia, the UK and Italy	KC-MEM was an Erasmus + initiative to develop an educational framework based on dialogic learning to improve the quality, creativity and innovation in adult learning while fostering participants' transversal competences such as critical and creative thinking. The main activity was research into local memories and archives and sharing findings with the community.

Creative Partnerships as implemented in Lithuania ('Kūrybinės partnerystės')	
2011-2015 Lithuania	The initiative was a creative partnerships model in schools, which rested on direct and indirect collaboration between teachers, creative professionals and schoolchildren. The key goal was to expand and enrich conventional learning processes by involving creative professionals from different fields such as art or science, and in this way, develop the creativity of teachers and learners.

Innovation Laboratories for the quality assurance of vocational education and training (i-Labs)	
2012-2013 Germany, Greece, Poland, Slovenia and Romania	i-Labs was an Erasmus + initiative to improve the quality of vocational education and training using innovation laboratories (i-Labs) in the didactic learning processes. The main activities of the project were the creation of the i-lab software tools and cooperation and dissemination of related material over international workshops among the partner countries.

PROACTIVE: Fostering Teachers' Creativity through Game-Based Learning	
2010-2012 Spain, Italy, UK and Romania	PROACTIVE was an initiative to foster the creativity of teachers and trainers of Comenius, Erasmus and Leonardo Da Vinci sub-programmes through game-based learning. It included a workshop, a competition, a conference and online repository to teach, store and disseminate knowledge on game-based learning.

4.1 A typology of initiatives

The initiatives presented in Table 3 can be described according to the set of dimensions and relative modalities reported below. The reader will such initiatives mapped against the dimentions below in Annex 2 to the present report.

Source of the initiative:

- Policy-driven (financing schemes, programmes and action plans, curricula, large-scale schemes, and educator support, etc.);
- Grass-root (projects, events, funds, tools and resources, training courses, etc.).

Level of implementation:

- International;
- National;
- Sub-national (region, province, country or state);
- Local (offered by or applied within a specific organisation, or implemented at the municipal level).

Focus:

- Research (concerning pedagogies and assessment) and educator support (teaching and learning resources);
- Continuous professional development for educators;
- Direct engagement of students (in the sectors of school education, VET, HE, or non-formal learning);
- Provision of funding and financing schemes (including public and private grants);

- Setting the direction for policy and/or practice (including curricula, action plans, and programmes).

Target group:

- Educators (teachers and trainers in schools, VET, HE, or non-formal learning sectors);
- Students (learning in school, VET, HET, or non-formal settings);
- Organisations and teams.

Sectors of education and training covered:

- Formal;
- Non-formal;
- Both.

Settings of education and training targeted:

- Institutional (school, VET, or HE);
- Other (including community, workplace and distance learning).

Objectives:

- Explicit intention to promote creativity as a competence/skill/skillset;
- Implicit intention to promote creativity as a competence/skill/skillset.

Conceptualisation of creativity:

- As a discrete skill, comprehensive approach;
- As a component of other competences and/or skills, fragmented approach (addressing one or a few components of creativity only).

Approach to creativity:

- Embedded in/underpinning the methodology;
- Integral to the objectives;
- Both.

Scope:

- System innovation (e.g. adopting creative learning approaches in schools);
- Intermediary innovation (e.g. a few organisations adopting a new creative approach to promote further uptake of it, for instance, in adult education centres);
- Local innovation (e.g. one or a few organisations adopting a new creative approach).

4.2 Trends observed

The study found some interesting differences and commonalities among the initiatives reviewed. This section elaborates on the most significant ones and, where relevant, explains the reasons for and implications of them. The description of trends is broken down by topic – general approach, pedagogy, and assessment.

4.2.1 General approach

For many people, fostering creativity is not a goal in itself, but a means to address real-life problems, employability, company innovation or personal development. In most of the initiatives reviewed, the higher objectives regard personal development, meeting labour market demands, and encouraging pedagogical or societal innovation. For example, in the initiative 'Bullying: I don't stay! Yes to friendship', fostering creativity was expected to improve the understanding of responsibilities, motivation to learn and ability to engage in pro-social behaviour and, ultimately, reduce the number of children who experience bullying. Lead Creative Schools, as well as most of the VET initiatives, saw creativity as crucial to meet the needs of the labour market and for students to thrive within an increasingly competitive environment of day-to-day life.

In most of the initiatives reviewed, the objectives explicitly mentioned fostering, encouraging or otherwise enhancing the creativity of the target group. For example, one of the objectives of the Ontario Technology and Learning Fund was contributing to a provincial focus on defining and developing measures for higher-order 21st century competencies such as critical thinking, communication, collaboration, creativity and entrepreneurship. The KC-MEM project had an objective to develop an educational framework based on innovative educational practice, e.g. initiative-based and dialogic learning, to improve the quality, creativity and innovation in adult learning.

In a few cases where fostering creativity was an implicit objective, only certain components of creativity rather than it as a whole were addressed. For example, in 'Creative work with information' fostering creativity was not mentioned, although mastering the method of creative writing and techniques to get rid of creative blocks were. This shows that the components of creativity that regard output, action and processing of ideas are more strongly pronounced than those that address idea generation. Similarly, in CREUS, the objective of fostering creativity was implicit, and only the social and problem-solving aspects of it were mentioned.

Having fostering creativity as an explicit objective did not, in all cases, translate into it being clearly defined. Although only implicitly targeted, in both examples mentioned above, creativity was well defined, while there were examples of initiatives in the inventory where creativity was explicitly mentioned in the objectives but not defined.

Yet, the overall trend is that the independent smaller-scope actions, mainly Erasmus+ projects, only implicitly promote creativity as a competence and have a fragmented approach to the conceptualisation and development of it. Whereas examples of systematic innovation had a more consistent and comprehensive approach to creativity, the opposite was the case for local innovation efforts. For example, the Erasmus+ project Creative Lion linked creativity only to metacognition, while the project 'Sustainable Consumption and Production in Social Life' only implicitly linked creativity to innovation, critical thinking and imagination. Due to this fragmented approach to the conceptualisation of creativity, it was unclear whether creativity was promoted as a competence or a component of other competences in these initiatives. The fragmented approach to the conceptualisation of creativity likely translated into a fragmented approach to developing creativity as only one or a few components of it are addressed. Contrastingly, the mentioned systemic innovation examples, e.g., the Creative Problem-Solving Institute, explicitly mentions comprehensive definitions of creativity (e.g. Osborn's Applied Imagination fine-tuned into Creative Problem-Solving) that are grounded in academic literature or developed by themselves (CEF, n.d.; Collard, 2014). This is likely due to the limited life-span and funding of Erasmus+ projects. Whereas a few initiatives used the chance to explicitly link creativity to several of the key competences and highlighting its transversal nature, most were heavily focused on describing the activities and disseminating the outcomes rather than conceptualising creativity or explicitly defining creativity as a competence.

The initiatives that 'put creativity first', explicitly mention it as an objective and embeds it comprehensively in their methodology, are programmes with a systematic approach to teaching creativity. With system here, we mean that they have managed to roll out the programme widely or attempts to do so by creating education content that can be widely applied. Examples that fit this profile are the Creative Problem-Solving Institute (since 1955), the study strategy of Croatia, the Creative Partnership Programme and TECRINO. The Creative Partnerships as implemented in Lithuania ('Kūrybinės partnerystės') serves as a good example of an initiative that was a large-scale strategic programmes to mainstream creativity in school education. Whereas TECRINO may look like an independent small-scope action at first, it was large in terms of geographical scope and its coordinators had already worked on its' methodology through the project i-Lab. Importantly, they were heavily invested in mainstreaming teaching for creativity, as opposed to teaching creativity for a multitude of other goals, and developing educational content that could be mainstreamed in VET. That more systemic innovation initiatives embed creativity more thoroughly in their methodology, and as a result are more effective at fostering creativity, is expected by system models of creativity as developed by Csikszentmihalyi (1997; Henriksen et al., 2016). As expected by system models of creativity, the systemic approach to teaching with creativity being incorporated by national or local policymakers into the educational agenda. Thus, some of the initiatives with a systemic approach (Scotland, Wales, Basque Country in Spain and Victoria state in Australia) had a strong political will and support behind their (initial) implementation.

Yet, being imaginative without implementing one's ideas does not make one creative. The initiatives differed between those that emphasised the creative thinking process and metacognitive elements and those that emphasised both the thinking process and the action or outcome of the thinking process. Among the initiatives that explicitly defined creativity, a vast majority preferred the latter option. Therefore, where creativity (rather than creative thinking) was featured in the inventory, it was usually encompassing not only idea generation but also idea implementation techniques. As defined in KC-MEM, creativity is the ability to 'act on creative ideas'. Chaos Pilot's underscores the same understanding of creativity when talking about making creative minds into change-makers (Kaospilot, 2016), and so does the Creative Problem-Solving institute when citing Osborn 'creativity is imagination inseparably coupled with both intent and effort' (1953, pg. 117).

As such, creativity is most often linked to problem solving and innovation. The preceding finding extends to some of the most mentioned connections between creativity and other competences. Not only did the initiatives often defined creativity as the actionable result of a creative thinking process, but this outcome was further assigned a necessary positive value. This positive value was usually assigned to creativity in the context of solving problems, challenges or coming up with new ideas to fill a

void (a need for action). Thus KC-MEM also state that the ideas to be acted upon must 'make a tangible and useful contribution to the field in which the innovation will occur', whereas Creative Work with Information highlighted that the solutions must be new and socially important.

Creativity is treated as a discrete skill or a component of, e.g. entrepreneurship, digital competence, cultural awareness and expression. Some initiatives address components of creativity (e.g. divergent thinking and the state of being open-minded) rather than every aspect of this transversal skill. For example, in Bullying: I don't stay! Yes to friendship, creativity was not defined, but treated as integral to digital competence and cultural awareness and expression. Concerning the cultural awareness and expression, creativity was defined as the ability to come up with a variety of ideas to produce something new or unique.

4.2.2 Teaching and learning

The pedagogies used the most often to teach creativity were approaches to help create learning environments that mimic the real world: problem-based learning, game-based learning, experiential and project-based learning. In these initiatives, pedagogies based on simulations and games were used to help the students imagine and apply creativity and creative problem-solving to the real world. For example, in 'Sustainable Consumption and Production in Social Life' students took part in a game in which an imaginary spaceship landed on the habitable planet FuturEU after a 500-year-long quest for a planet, and were challenged to build a new civilisation from scratch while dealing with problems related to key themes of sustainable development. The initiatives that used such methods for teaching creativity in most cases conceptualised creativity according to the need to come up with solutions to real-world problems. Besides this, there was no clear trend as to which type of initiatives applied problem-based learning, since a stark majority preferred this method. Few initiatives translated this philosophy into action learning, and most were therefore based on simulating problems and solutions only. This links to previous findings, as it shows the importance most of the initiatives put on the elements of creativity related to action, outcomes and coming up with solutions to problems.

Several methods incorporate collaborative elements. Nevertheless, the focus remains on individual rather than group creativity. Due to the nature of classical creativity techniques, many of the initiatives incorporate classic creativity techniques in the training, ranging from de Bono's six thinking hat to brainstorming exercises. Yet, looking into the definitions of creativity and the associated assessment methods, it is clear that the focus remains on the development of the creative skills and teamwork skills of the individual, rather than the group. The group work serves to enhance the skill development for the individual student by exposing him/her to a wider diversity of ideas and challenges forcing the student to use divergent and parallel thinking, while making it more challenging for the individual to come up with solutions that stand out and are original from the solutions of the peers. In the initiatives were the focus was to produce research and on the creation of educator support content, e.g., a training guide or a MOOC, co-creation and participatory methods had a bigger and more substantial role in the project.

Only a few initiatives make use of applied inquiry-based pedagogies. These include Chaos Pilot ('Creative Inquiry'), Ontario Technology and Learning Fund (TLF) (inquiry-based and authentic learning enhanced by technology) and Victorian curriculum and assessment of critical and creative thinking (CCT) as described in F-10 (inquiry-based approaches to teaching). In general, inquiry-based science instruction was a pioneering method that led the way in assisting students in the process of attaining knowledge on their own rather than recalling information in the 1970s, and it is therefore surprising that few initiatives apply it, as it has been found particularly helpful in increasing students' motivation, wonderment and curiosity. Inquiry learning has been described as a key method to enhance creativity that could also meet the demands of standardised testing (Longo, 2012).

In a few cases, regardless of whether creativity was explicitly or implicitly defined, mechanisms that would explain how the initiative developed the participants' creativity was not clearly provided. For example, Denkmotor claims to teach creativity from a practical and 'hands-on' standpoint using subtle humour to nudge a process of creativity seeing that 'innovation always start in the same place: in the head', while giving little information of the type of thinking is needed to create innovation vis-à-vis regular thoughts and how the programme changes participants thinking, habits and abilities overall. Besides, the initiatives that adopted the six thinking hats test or other standard test did not explain why they are effective in fostering creativity or why they were chosen. While the initiatives do consider the more transversal elements of creativity, in some cases a better understanding of the unique way of thinking and a better description and methodology around how methods affect the thinking of participants, would help to make it clear how creativity was developed through these methods.

4.2.3 Assessment

Even if creativity is defined, learning objectives, outcomes, and achievement standards are rarely clear. Research finds that although curricula and schools may invite teachers to implement creative approaches for learning, they often do not provide guidance about how to take it into account in assessment, and the national assessment systems do not take creativity directly into account (Vicent-Lacrin et al., 2019). The inventory in many ways confirms these findings, as only a minority of the

initiatives provided assessment frameworks, rubrics or otherwise overview of learning objectives. Especially the initiatives that were short-term partnership projects struggled to set up a consistent and well-founded approach to assessment as national assessment systems differed between the countries and the projects were extra-curricular or non-formal, adding another layer of complexity in requiring recognition of the learning. These projects were based on self-assessment or attendance cards where the trainer assessed, sometimes subjectively and without pre-defined learning objectives, how the participants fared along with the key competence framework. Whereas this gave the trainer a chance to tie creativity to the key competences, creativity became less of a focus since the key competence framework does not highlight creativity as a separate competence. Therefore, this method did not lead to any interesting assessment of creativity.

Across the board of initiatives, self-reflection and self-assessment were the most often applied. Several initiatives stressed the importance of assessment and attempts to address this issue, but due to the challenges mentioned above they did not go for more structured and objective approaches to assessment. For example, CREUS asked participants the following questions: Why do you think it is important to be creative in life or work? What is the creative idea that you want to take forward?

While some educators find it challenging to assess creativity objectively, others do not find it necessary at all. The mentioned reasons for not assessing creativity according to pre-defined objectives was that creativity was not objectively defined to begin with, was framed as a personal experience that could only be assessed personally, or that standardised testing is detrimental to the development of creativity. The validity and reasons for applying standardised testing to assess creativity have been largely explored in the literature (Clapman, 2004). However, the position that creativity should not be objectively assessed because it is a personal experience is interesting because this usually is the reason educators and policymakers revert from self-assessment and prefer external testing – self-perceptions of creativity has moderate to strong statistical relationship with personality and 'creative self-efficacy' and weak relationship with outcomes from multiple creativity tests (Reiter-Palmon et al., 2012).

When activities aimed at developing creativity (among other skills) are embedded into pre-existing courses, assessment was more often observed. The reason for this seemed to be that some of the initiatives were already embedded into courses where students were already assessed, and it was relatively easy for the teachers to include some additional indicators in or tests to assess the additional learning. For instance, in the Experiential Live Enhancement Project, the tutor's assessment of the student's performance included a validation of specific skills required in the workplace (i.e. time management, communication, emotional intelligence, assertiveness, teamwork, conflict resolution, work under pressure, creativity, proactivity, etc.), where creativity was assessed together with innovation and as a component of problem-solving and integrated with the description of the highest marks.

The most well-known tools and tests for assessing creativity were not noted in the initiatives. None of the initiatives included in the inventory employed the Torrance Tests of Creative Thinking (TTCT), previously seen as one of the most widely used tests of creativity (Davis, 1997). TECRINO used a divergent thinking test, but altered it significantly. Other specific tools that were used to teach creativity among the initiatives were a self-designed coin system inside an online game (Design IT); self-designed rubrics and check-boxed based on the methodology applied to self-design virtual assessment systems (ETHAZI). The most prominent and well-developed approach to the assessment of creativity was the one developed and used in Victoria, Australia, by the VCAA. This draws directly on a scope and sequence document which maps the development of creativity across twelve years of schooling.

In this context, it is worth noting that it is only very recently that approaches to the assessment of creativity have become more widely researched and discussed (Lucas & Spencer, 2017; OECD, 2019; Vincent-Lancrin et al., 2019). Most of these examples remind us that designing appropriate assessments to assess creativity depends on the availability of competence frameworks for creativity which also show progression, currently not existing in most education systems.

5 Eight cases in focus

To better understand how creativity is developed in practice, eight cases were studied in depth. In the sections below, they are compared along five dimensions – design features, understanding of creativity, approach to teaching and learning, approach to assessment, and results. To identify factors which influence the success of developing creativity, the drivers and barriers of each case are reviewed, so are the key messages from case owners.

5.1 Design features

Initiatives studied include grass-root and policy-driven attempts to promote creativity, taking different forms – examples of digital tools (IDEO Creative Difference), learning models (ETHAZI), projects (Tinkering EU, Design IT, TECRINO, and Creative Thinking in Youth Work), curricula (Victorian Curriculum and Assessment), and policy schemes (Lead Creative Schools). A wide range of actors have been involved in the implementation of these, including government departments and agencies, NGOs, education and training institutions (schools, VET centres, universities, etc.), private companies, and research bodies among other. While policy-driven actions imply partnering with or among the authorities, grass-root initiatives are two-fold. Although most do not involve any government representatives, TECRINO does; hence it is an example of a collaborative attempt.

Eight cases illustrate the variety of innovative approaches in the development of creativity as a skill. Some initiatives such as the Victorian Curriculum and Assessment, Lead Creative Schools and ETHAZI aim at system innovation – introducing a new focus, approach or model of teaching and learning in and across a selected sector. Others are tailored to drive change in a limited number of organisations, be it private businesses, government departments, NGOs (as in the case of IDEO) or universities (as in the case of Design IT). A middle course also exists, for example, Tinkering EU, TECRINO, and Creative Thinking in Youth Work heavily focused on the professional development of museum and school educators, VET teachers and youth workers respectively. They did so expecting that, once trained or otherwise supported, the participants will serve as intermediaries and further the change in their field.

System innovation does not necessarily mean a broad geographical scope. In fact, all three examples of such innovation have been implemented at a sub-national level, each in a selected country or state. Examples of intermediary innovation are initiatives which were implemented at the European level, and each covered several Erasmus+ countries (mainly EU Member States). This reveals the potential of Erasmus+ projects to gather partners and bring together participants from different countries so that they could later become project ambassadors and facilitate innovation at a larger scale.

Information on type, format, scope, level of implementation, geographical scope and key actors involved in the implementation of each initiative is provided in the table below.

Table 4. Key design features of the initiatives studied

	Type by source of initiative	Format	Scope	Level of implementation	Geographical coverage	Key actors involved
Tinkering EU	Grass-root	Erasmus+ projects	Intermediary innovation	European	Italy, the Netherlands, the UK, Austria, Germany, Hungary, Ireland, Spain, Greece, France, and Poland	National Museum of Science and Technology 'Leonardo da Vinci', NEMO Science Museum, Cambridge University, and other science centres, galleries or museums, associations or networks for science, and a vocational school
Victorian Curriculum and Assessment	Policy-driven	Curriculum	System innovation	Sub-national (state)	Victoria – a state of Australia	Victorian Curriculum and Assessment Authority in consultation with external academics and, for designing, testing, and validating the CCT assessment tasks, two external contractors - the Australian Council for Educational Research and the National Foundation for Educational Research
IDEO Creative Difference	Grass-root	Digital tool	Local innovation	Local (organisation)	Taken up globally	IDEO - a global design company whose community is made up of designers, entrepreneurs, engineers, teachers, researchers, and others
Lead Creative Schools	Policy-driven	Policy scheme	System innovation	Sub-national (country)	Wales – a country of the United Kingdom	Arts Council of Wales, Regional Education Consortia and Challenge Advisers, and Estyn – an education and training inspectorate for Wales
Design IT	Grass-root	Erasmus+ project	Local innovation	European	Estonia, Finland, Greece, and Portugal	Five universities - Tallinn University, Metropolia, University of Thessaly, Centre for Research & Technology Hellas, and Polytechnic Institute of Porto
TECRINO	Grass-root	Erasmus+ project	Intermediary innovation	European	Spain, Croatia, Cyprus, Portugal, Romania, and Poland	A consultancy firm RTD TALOS, training institutions – EPRALIMA, Inercia Digital, Syntea a training fund – Fondo formacion Euskadi, a government organisation – Business Innovation Croatian Agency, and two universities – University of Zagreb, and 'Dunarea de Jos' University of Galati
Creative Thinking in Youth Work	Grass-root	Erasmus+ project	Intermediary innovation	European	Bulgaria, Croatia, Cyprus, Lithuania, Romania,	Seven youth NGOs – WalkTogether, Dante Adult Education Institution, Social Policy and Action Organisation, Palanga Culture and Youth Center, Your Europe, Monomyths Association, Best seller,

					Serbia, and Hungary	and Young People's Living Environment Association
High-performance cycles (ETHAZI)	Policy-driven	Learning model	System innovation	Sub-national (region)	Basque Country – a region of Spain	Centre for innovation in education TKNIKA (operates under the Education Department of the Basque Government)

Source: Compiled by the authors.

While six out of eight initiatives target individuals, two focus on collective bodies such as schools (Lead Creative Schools), organisations and teams (IDEO Creative Difference). Most of those tailored to individuals target not only educators or other professionals but students as well. Such an approach provides room for practitioners to learn new pedagogies and methods in everyday settings, observing how students respond to new experience and progress.

Sectors and levels covered by cases differ, ranging from school education to vocational education and training, higher education, and adult learning taking place in workplace (IDEO Creative Difference) or non-formal – museum (Tinkering EU), community (Creative Thinking in Youth Work) or e-learning (TECRINO) – settings. In some cases, these features influence the approach towards teaching, learning, and assessment. This is discussed in more detail in sections 5.3 and 5.4 below.

Except for IDEO, all initiatives studied have received public funds, which is in line with the trend observed based on inventory – privately sponsored efforts exist but are less common. It is not clear how much precisely certain initiatives cost, but the differences in the timeframe and, where available, costs, hint that funding per year ranges to a large extent. While this may influence the scope of actions and scale of effect, case study findings suggest it is insignificant for achieving objectives and claiming success.

Table 5. Targets, timeframe and funding arrangements of the initiatives studied

	Target group(s)	Sector(s), level(s), and settings covered	Timeframe	Funding arrangements
Tinkering EU	Adults as educators and learners; in the first two projects, school-age children as well	Non-formal learning, museum, and other non-formal settings	2014-2017 2017-2020 2019-2022	Funded by the European Commission (Erasmus+ Programme 2014-2020); awarded grants of EUR 436 168, EUR 443 162, and EUR 439 418
Victorian Curriculum and Assessment	Students in their first 11 years of school	Primary and secondary school education, institutional settings	2015-present	Funded by the Victorian Government
IDEO Creative Difference	Organisations and teams	Adult learning, workplace settings	2016-present	Organisations can purchase the product for a certain price
Lead Creative Schools	Schools (locally maintained or voluntary aided primary or secondary schools)	School education, institutional settings	2015-2022	Funded by the Welsh Government and Arts Council of Wales (£9.5 million over five years)
Design IT	Students in higher education and their educators	Higher education, institutional settings	2017-2019	Funded by the European Commission (Erasmus+ Programme 2014-2020); awarded a grant of EUR 232 710
TECRINO	VET teachers; indirectly, students as well	VET, e-learning settings	2013-2016	Funded by the European Commission (Lifelong Learning Programme – Leonardo da Vinci)
Creative Thinking in Youth Work	Youth workers from NGOs	Adult learning, community settings	2018-2019	Funded by the European Commission (Erasmus + Programme 2014-2020, Youth in Action); awarded a grant of EUR 27,700
High-performance	VET teachers; indirectly,	Vocational education and training,	2010-present	Funded by the Government of the Autonomous

cycles (ETHAZI)	students as well	institutional settings		Community of the Basque Country's Ministry of Education

Source: Compiled by the authors.

All initiatives recognise that creativity is a driving force behind change, and developing it helps to respond to environmental, social, and economic challenges of today. This explains why initiatives aimed at fostering creativity often have broader goals – promoting new pedagogies, improving the quality of education and training, meeting labour market demands, etc. Fostering creativity is also viewed as a means to cope with uncertainty and prepare for the future of life and work. This is especially well expressed in the cases of IDEO Creative Difference, Lead Creative Schools, Design IT and ETHAZI.

Although each case has an explicit objective to develop creativity as a competence, capability or a skill, the visibility of it across key activities slightly differs. In cases where mainstreaming, teaching or assessing creativity is the main objective, it is more visible compared to the ones where the promotion of creativity is a vehicle to develop other competences and skills. See, for example, the objectives and key activities of the Victorian Curriculum and Assessment, IDEO Creative Difference, Lead Creative Schools, TECRINO, and Creative Thinking in Youth Work in contrast with Tinkering EU, Design IT and ETHAZI.

Eight cases reviewed exhibit a different focus as well. Lead Creative Schools, Design IT, Tinkering EU, and ETHAZI centre upon introducing educational innovation. The latter two do so through the professional development of educators, which is the main focus of Creative Thinking in Youth Work too. While the Victorian Curriculum and Assessment is an example of setting the direction for teaching and learning practice, in this case, in schools, IDEO Creative Difference and TECRINO focus on developing digital solutions and tools. These findings suggest that there are different ways to approach the development of creativity as a transversal skill, and this may be done at both policy and grass-root levels, building on expertise and experience one has.

Objectives, focus and key activities of each initiative are described in more detail in the table below.

Table 6. Objectives, focus and key activities of the initiatives studied

	Objectives and embeddedness of creativity or creative thinking within them		Focus	Key activities and visibility of creativity or creative thinking within them	
Tinkering EU	Introduce and promote Tinkering in Europe; help individuals develop their STEM competences and 21st century skills	Explicit	Introducing educational innovations (through professional development of educators) in museums and schools	Developing (theoretical and) methodological frameworks, carrying out tinkering activities, providing educator support (materials and workshops), and organising multiplier events	Medium
Victorian Curriculum and Assessment	Help students understand and manage their thinking, develop skills and learning dispositions that support thinking, and gain confidence in evaluating thinking; foster effective learning and the creation of new knowledge; respond effectively to environmental, social, and economic challenges	Explicit	Setting the direction for the teaching and learning practice in schools	Developing F-10 curriculum with CCT as an explicit component of it, producing resources and providing professional learning opportunities for teachers, designing, testing, and validating CCT assessment tasks, and implementing a CCT sample assessment programme	High
IDEO Creative Difference	Help leaders assess, guide, and track the development of creative and innovative teams	Explicit	Assessment survey for teams	Helping organisations deploy the assessment, and providing a consultative review of results to help them interpret key insights, identify focus areas, and act	High
Lead Creative Schools	Promote new ways of working to improve the quality of teaching and learning; develop the creativity of learners for them to achieve their potential, grow as well-rounded individuals, and be prepared with skills for life; improve attainment through creativity	Explicit	Introducing educational innovations by inviting pupils, teachers, and creative professionals to work together in schools	Implementing creative projects in schools (deciding on the inquiry question, planning a framework, implementing the project and reflecting on it, modifying and adapting the project in response to reflections and any assessments of learner progress, and bringing the project to close with a sharing event and evaluation of impact)	High
Design IT	Introduce and promote design thinking in higher education; prepare students for the contemporary labour market – help them be adaptive, resilient, innovative and creative and possess the practical entrepreneurial skills that will allow them to put ideas into action	Explicit	Introducing educational innovations (design thinking and game-based learning) in universities	Developing and testing the online gamified learning platform and providing educator support to foster design thinking in higher education for entrepreneurship skills	Medium

TECRINO	Develop a Moodle platform for teaching creativity; raise awareness and train education professionals and improve the transparency, visibility and development of their students' competences linked to innovation; contribute to quality lifelong learning and address socio-economic challenges	Explicit	E-learning platform for teachers and students in the sector of VET	Developing, setting up, launching, and promoting the e-learning platform and two courses (one for students and one for educators) to teach and learn creativity	High
Creative Thinking in Youth Work	Help youth workers develop their creativity, sense of initiative and problem-solving skills, and raise their awareness of how innovation and creative projects can increase the impact and efficiency of youth activities; increase the level of youth participation and engagement in NGOs	Explicit	Professional development of youth workers	Developing and carrying out a training course on creative thinking in youth work, co-creating a MOOC on creativity in youth work, and organising multiplier events to disseminate the MOOC and share knowledge about the importance of creativity in youth work	High
High-performance cycles (ETHAZI)	Introduce innovative learning models and boost the quality of VET; help students develop transversal competences that are relevant to the labour market, and in turn address skill needs and the future of work; activate and spark the talent of people to solve real-world problems	Explicit	Introducing educational innovations (through professional development of educators) in VET	Developing, piloting, and rolling out a new learning model tailored to VET, i.e. providing training for teachers	Medium

Source: Compiled by the authors.

5.2 Understanding of creativity

All initiatives build on the premise that people can be creative, whereas creativity can be taught and learned. Despite the ambiguity of the term, two cases even picture creativity as discrete, arguing it requires and encompasses specific knowledge and skills. While in the case of Victoria descriptions of these are integral to the curriculum of CCT, TECRINO builds on the model of Amabile (1996). It defines creativity as comprising expertise, creative thinking skills and motivation, but gives no specifics as to what each of the three entails.

Key terms used to refer to one's creative ability are creativity, creative thinking, and problem-solving skills. In six cases, either of the latter two is used interchangeably with creativity. Victorian Curriculum and Assessment, Creative Thinking in Youth Work and High-performance Cycles refer to creative thinking, whereas IDEO, Design IT and TECRINO focus on creative problem-solving skills.

The superordinate concept of creativity is not always clear, but when it is, creativity is understood as a (cap)ability or skill. All cases except for Victoria and Lead Creative Schools (which focus more on the mind) define creativity as including not only coming up with ideas but putting them into action as well. Full descriptions of creativity and other key terms applied in each case are provided in the table below.

Table 7. Conceptualisation of creativity in the initiatives studied

	Key terms used	Superordinate concepts	Definitions
Tinkering EU	Creativity	21st century skills	Note: Creativity was not clearly defined, but descriptors of creativity and innovation prepared by the Partnership for the 21st Century Learning (P21) were used to outline opportunities Tinkering offers for the development of creativity and divergent thinking among other skills. According to P21, creativity has three strands – thinking creatively, working creatively with others, and implementing innovations.
Victorian Curriculum and Assessment	Critical and creative thinking	Capabilities	Critical and creative thinking encompasses (1) questioning and developing ideas, (2) composing, analysing and evaluating arguments, and (3) using strategies to understand, manage and reflect on thinking and learning processes.
IDEO Creative Difference	Creative confidence and creative problem solving	Capabilities	Creative qualities essential to innovation or behaviours of creative teams include (1) having a purpose (2) looking out to understand customers, technologies, and cultural shifts, (3) experimentation with new ideas, (4) collaboration across business functions, (5) empowerment by reducing unnecessary constraints, (6) and refinement to move ideas towards implementation.
Lead Creative Schools	Creativity and creative habits of mind	Not applicable	Five creative habits of mind include being inquisitive (wondering and questioning, exploring and investigating, and challenging assumptions), persistent (tolerating uncertainty, sticking with difficulty, and daring to be different), collaborative (cooperating appropriately, giving and receiving feedback, and sharing the product), disciplined (reflecting critically, developing techniques, crafting, and improving) and imaginative (playing with possibilities, making connections, and using intuition).
Design IT	Creativity, innovation, entrepreneurship, and problem-solving	Transversal skills	Note: Creativity was not clearly defined but understood as the ability to come up with ideas and the act of bringing them into action.
TECRINO	Creativity and creative	Not applicable	Creativity is a multidimensional and dynamic process, involving conscious mental activity, affectivity, motivation, social interaction,

	problem solving		and the general ability to solve problems. Alternatively, creativity can be defined as encompassing expertise, creative thinking skills, and motivation.
Creative Thinking in Youth Work	Creativity and creative thinking	(Cap)abilities	Creative thinking encompasses preparation, incubation, illumination, verification, problem-solving, and exploration. Note: Creativity was not clearly defined but understood as a process comprising two elements – thinking and production.
High-performance cycles (ETHAZI)	Creativity and creative thinking	Abilities	Creativity is the ability to put creative thought into action and offer ideas that contribute value to addressing challenges. Key elements of the creative process include cognitive flexibility, fluidity, originality, and ability to filter and choose the best ideas; they cover divergent, latent, and convergent thinking.

Source: Compiled by the authors.

5.3 Teaching and learning

Cross-case analysis hints that a wide range of solutions to teaching and learning creativity have been adopted across the world. Existing approaches feature such established pedagogies as tinkering (Tinkering EU), design thinking (IDEO Creative Difference and Design IT), five creative habits of mind (Lead Creative Schools), and collaborative challenge-based learning (ETHAZI).

An example of game-based learning, increasingly popular in teaching and learning creativity, was studied as well. In fact, Design IT illustrates how playful approaches can be applied to develop transversal skills not only in non-formal, school but also higher education.

Most cases serve as examples of problem-based or enquiry-based learning, which is in line with the finding that the development of creativity is typically framed within higher objectives aimed at addressing environmental, social, economic and other challenges of the contemporary world. TECRINO and Creative Thinking in Youth Work prove that creativity can also be fostered with no direct interaction, making use of distance e-learning through digital tools.

Except for IDEO, all initiatives studied focus on individual rather than group creativity. Nevertheless, most emphasise collaboration while learning – developing and applying one's creative skills. This reveals the social dimension of creativity and is especially visible in the cases of Design IT and ETHAZI.

In all cases, resources and tools were provided to facilitate teaching and learning of creativity as a transversal skill. These include training and explanatory material for education and training practitioners.

Six out of eight cases studied pay specific attention and highlight the importance of learning environments. For example, Lead Creative Schools builds on the concept of a high-functioning classroom, IDEO sets six conditions allowing creative outcomes within teams, whereas the MOOC created as part of the Creative Thinking in Youth Work teaches about how external factors ranging from lightening to the people one is surrounded with can influence one's creativity.

Table 8. Teaching and learning creativity in the initiatives studied

	Approach	Key resources and tools	Explicit attention to learning environments
Tinkering EU	Tinkering, featuring hands-on activities, learning from failure, iteration, and unstructured time to explore	A practitioner guide, a guide to tinkering activities and tinkering activities for schools, professional development guidelines	Tinkering activities work best in the atmosphere of play, innovation, and creativity
Victorian Curriculum and Assessment	The state does not mandate any pedagogies, but the following approaches and methods are featured in the resources of the VCAA: visual argument mapping, self-reflection, thinking routines, using rubrics, and students	CCT mapping templates, scope and sequence charts, sample learning activities, and videos providing advice	Not applicable

	seeking peer or teacher feedback		
IDEO Creative Difference	Design thinking, featuring creative activities to foster collaboration and solve problems in human-centred ways; learning by doing and iteration	Creative Difference Workshop, IDEO CoLab, IDEO U (online school), ExperienceInnovation (a workshop), Shape (innovation management space), and the Teachers Guild (a professional community)	Conditions allowing for creative outcomes within teams are linked to having a purpose, looking out, experimentation, collaboration, empowerment, and refinement
Lead Creative Schools	Five creative habits of mind used to not only develop a shared language of creativity, but also reflect, self-assess and value own creative skills/dispositions, gather supporting evidence, track progress over time, be more self-aware of when learners are using their creative skills, seek opportunities to be more creative, and identify future learning goals; enquiry-based approach, central to which is involving learners in a discussion, formulation of questions, exploration, reflection, and evaluation of their own learning	FAQ, a handbook, briefing presentation, introduction, prospectus for Creative Agents, and prospectus for schools, project and session planning forms	The model of a high-functioning classroom encourages young people to believe in their creative identity, identifies young people's creative abilities, provides hands-on opportunities for young people to be creative and to develop their creative skills, and fosters creativity by developing young people's creative habits of mind (Lucas et al., 2013); it concerns the role of the teacher, nature of activities, organisation of time and space, approach to tasks, visibility of processes, location of activities, self as learning resource, emotion, inclusiveness, role of learner, and reflection
Design IT	Gamified learning, experiential learning, and design thinking, which build on visualisation as a powerful tool to express intangible concepts, ideas and models, combination of divergent and convergent approaches, and collaborative work style	A learning framework for promoting design thinking in entrepreneurship higher education through exploration, collaboration and creativity, a validated gamified learning platform, and guidelines for educators on learning scenarios and best practice	Students have to feel secure in a virtual learning environment and game-based learning process; they must have the opportunity to experiment and learn in a virtual context that simulates the real world, with no risk of poor judgement or underachievement
TECRINO	Distance e-learning, focused on building motivation of students, improving basic skills, acquisition of domain-specific knowledge, encouraging and rewarding curiosity and exploration, creating opportunities for choice and discovery, developing meta-cognitive skills, teaching strategies and techniques to foster creative performance, and providing positive feedback	Two courses: a course for educators collected the best techniques on teaching creativity available, whereas the course for students included more content on the foundations of creative thinking and how it relates to innovation; both shared the same practical methodology of learning by example	Not applicable
Creative Thinking in Youth Work	The Consortium did not set out any specific pedagogies, but project resources suggest a focus on the pre-assessment of needs, collaboration, participation in teaching, personalised learning, and e-learning	A training course on creative thinking and the MOOC, featuring content on the definition of creativity, creativity activators, creative environment, and creativity tools	It was argued that the right working environment can stimulate learning and the same applies to creativity and innovation. A part of the MOOC teaches about how external factors ranging from lightening to the people one is surrounded with

			can be used to strengthen one's creativity
High-performance cycles (ETHAZI)	Challenge-based collaborative learning (CCBL), which comprises 11 steps and builds on working in teams, rotating challenges, learning as evolution, moving towards social innovation, intermodulation, and self-managed cycle teaching teams	Training courses	CCBL encourages using new and non-formal settings as a means to make the experience of a challenge more realistic; it is argued the implementation of CCBL requires flexible, open, interconnected spaces that favour active collaborative work

Source: Compiled by the authors.

5.4 Assessment

In two out of eight initiatives studied, learning outcomes were not defined. In the case of ETHAZI, the framework of skills used for assessment did not feature creativity, hence it was not assessed. Creative Thinking in Youth Work adopted an altogether different approach – applied no formal assessment but promoted personality type testing and reflection on it as a self-assessment of creative skills.

Outcomes by level were defined only in the Victorian case, which is line with the inventory finding that robust approaches to assessment are rare. Not only in Victoria but other cases as well, the focus is on the creative process rather than the outcome.

Five out of eight cases adopted an informal approach to assessment, featuring an observation of learners and a reflection on it. Initiatives studied provide examples of self-, formative, and summative assessments often assisted by tailored tools.

Table 9. Assessment of creativity in the initiatives studied

	Learning outcomes		Approach		Key resources and tools
Tinkering EU	✓	Defined based on the learning dimensions of making and tinkering developed by the Exploratorium: creativity and self-expression are linked to playfully exploring, responding aesthetically to materials and phenomena, connecting projects to personal interests and experiences, and using materials in novel ways	Informal	Observation of learners and reflection on their behaviour, quality of experience, and its use for the development of the 21st century skills and science capital	Observation and reflection tools
Victorian Curriculum and Assessment	✓	Defined as content descriptions and achievement standards by level, focusing on three strands – questions and possibilities, reasoning, and meta-cognition	Formal	Formative or summative assessment focused on the uncovering of student thinking; psychometrically validated scenario-based assessment tasks and a sample assessment programme	Indicative progress in CCT template, guide to formative assessment rubrics, validated CCT assessment tasks
IDEO Creative Difference	✓	Defined as six qualities essential to innovation or behaviours of creative teams, and include purpose, looking out, experimentation, collaboration, empowerment, and refinement	Formal	A survey to help organisations understand their creative capabilities, and a follow-up to guide the growth of these capabilities, focusing on selected areas and employing the most relevant learning tools	Creative Difference tool

Lead Creative Schools	✓	Defined based on the model of the five habits of mind (Lucas et al., 2013), which includes being inquisitive, persistent, collaborative, disciplined, and imaginative	Informal	Self-assessment by schools, which includes a qualitative review of the impact on learners; all schools are expected to build on the five creative habits of mind, but each is free to choose the format best suiting their needs	Lead Creative Schools Scheme Planning and Evaluation Framework as well as session reflection and project evaluation forms
Design IT	✓	Defined as learning requirements; the key idea is to fully understand the game, accurately define a problem statement, collaborate, and think out of the box to introduce solutions to 'wicked' problems	Informal	Coin system and formative evaluation of group work as part of the game	Student learning requirements
TECRINO	✓	For students, defined in terms of ideational behaviour versus stereotypical thinking and social conformity; for teachers, focused on theoretical knowledge and skills concerning identifying and fostering creativity enablers/driving factors and planning for systematic development of creativity	Formal	Formative assessment of students based on a divergent thinking test, theoretical examination of creative management competences of teachers and their certification based on that	A test for students and exam for teachers
Creative Thinking in Youth Work	✗	Not applicable	Informal	Assessment of training participants was not conducted, nor was it integral to MOOC, but personality type testing and reflection on it were promoted as a form of self-assessment in relation to creativity	Adobe – Creative Type Quiz, Belbin team roles test, and Myers Briggs type indicator personality test
High-performance cycles (ETHAZI)	✗	Not applicable	Informal	Self-, formative, and summative assessment based on the framework of transversal and technical skills	eNOLA – a tool for teachers to self-assess in each stage of the implementation of ETHAZI; SET – an online too which gives an overview of how teachers and students perform against the framework of ETHAZI

Source: Compiled by the authors.

5.5 Results, drivers, and barriers

All eight initiatives achieved their objectives (see the descriptions of outputs, outcomes and impacts in the table below). Nevertheless, in some cases such as Tinkering EU, TECRINO and Design IT, it is challenging to robustly assess the impact the

initiatives had on the development of creativity as a skill. Examples of Lead Creative Schools and ETHAZI illustrate well how large-scope policy-driven innovations in education pay off.

A selection of factors influenced the success of each initiative studied. Some drivers and barriers are case-specific, whereas others apply to most or all. Based on the cross-case analysis, aspects which facilitate the development of creativity as a transversal skill are:

- Political will and policy support;
- Partnerships with key individuals or organisations, and high capacity, commitment and collaboration of all partners involved;
- Clarity of the definition of creativity;
- Explicit attention to creativity with a focus on fostering it as encompassing pre-defined knowledge and skills; making the case for creativity effectively and graphically;
- Framing the development of creativity within higher objectives – as a means to address modern challenges through the improvement of transversal skills;
- Highlighting the importance of creativity for employability and business outcomes;
- Novelty and potential of promoted pedagogies and tools, and capability in pedagogical and assessment design;
- Robust and consistent methodological approach;
- Availability of resources and educator support;
- Engaging students and teachers together rather than focusing on the professional development of educators only.

In contrast, factors hindering the effectiveness of attempts to promote creativity as a transversal skill include:

- Lack of the above;
- Perceptions of educators and business leaders, picturing creativity as a fuzzy thing;
- Lack of understanding of the value of creativity and viewing creative students as being disruptive;
- Focus on talking about rather than developing creativity as a skill;
- The fact that many initiatives are projects and do not last long or become embedded;
- Limited resources;
- Lack of ready-to-use assessment tools;
- Lack of good examples to learn from;
- Lack of coordination of different actions adopted towards the same goal.

Table 10. Results the initiatives studied

	Outputs	Outcomes	Impacts
Tinkering EU 1&2	A series of intellectual outputs, including guides and guidelines for practitioners, methodological and theoretical frameworks, observation and reflection tools	'Tinkering EU 1' reached 27 213 individuals through the multiplier events and around 450 professionals through training 'Tinkering EU 2' reached 138 teachers, and 3110 students through 141 events	Promoted Tinkering methodology Helped to improve the teaching and learning of STEM Helped students develop broad-ranging skills, particularly in the areas of collaboration, teamwork, problem-solving, resilience and creativity
Victorian Curriculum and Assessment	F-10 curriculum with CCT as an explicit component of it A wide range of resources to facilitate teaching and	Schools are implementing CCT but this is has not progressed as well as the more traditional discipline-based learning areas	CCT target set for 10 years was achieved in the first 3 (e.g. in 2018, 22.4% tested students reached the highest level of

	assessment of CCT	At least 800 students are tested each year as part of the CCT sample assessment programme	achievement, while the target set for 2025 was 20.8%)
IDEO Creative Difference	Creative Difference tool for leaders to assess, track and guide the development of innovative, and adaptive teams	Since launching CΔ, IDEO has run it with more than 54,000 respondents at 600+ organisations across every industry category, including private business, government departments and NGOs	Helps organisations develop a common language for innovation; offers a baseline which teams can use to improve and validate progress over time; provides methods, case studies, and a collaborative space to enable organisations to drive change
Lead Creative Schools	Creative projects in schools A wide range of resources to assist with creative projects in schools	Since 2015, 559 schools have participated in the LCS scheme; 233 creative professionals have been trained as Creative Agents to help schools find creative approaches to teaching and learning; over 40,000 learners have benefitted to date	Have had a positive impact on the creative skills of learners (improvements were evidenced and reported with regard to all five creative habits of mind) Have had a positive impact upon the attainment of learners
Design IT	A needs analysis An active learning framework for promoting design thinking in entrepreneurship higher education A validated gamified learning platform Design IT Educator support for the integration of the proposed methodologies and tools into classroom practice	Students from each partner country (100 students from Finland, 64 students from Estonia, 140 students from Greece, 54 students from Portugal) participated in the game validation phase (8 activities)	Helped student teams develop human-centred innovations Allowed for collaboration and fostered students' creativity and other transversal skills
TECRINO	A course for educators, which collected the best techniques on teaching creativity A course for students, which included more content on the foundations of creative thinking and how it relates to innovation	Data on the reach of the project is unavailable	Allowed for learning about creativity The approach and concepts developed within TECRINO have been used as a basis for other initiatives such as 'Evoke your creativity'
Creative Thinking in Youth Work	Training for youth workers and the MOOC for creative thinking in youth work	35 people from 7 countries participated in training and shared their newly acquired know-how with 100 local youth workers and teachers At least 150 people had signed up for the online course as of last year	Helped youth workers discover their own creativity and how to put it into practice by solving problems faced by themselves or their community
High-performance cycles (ETHAZI)	12 training sessions ranging from introductory to advanced implementation of the model Four tools to assist either the	As of 2020, TKNIKA trained 2289 teachers who taught 8175 students across 327 cycles and 70 VET centres in the	Improved students' pro-activity, creativity and ability to develop ideas

	assessment or methodological implementations of the model	Basque region	

Source: Compiled by the authors.

6 Conclusions

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. Also, it is increasingly noted that creativity is ubiquitous in nature, relevant in all disciplines and walks of life, and valuable to us all; most importantly, creativity, at least the everyday form of it, can be learned.

Nevertheless, to date, creativity appears in many different guises – as an ability, attitude, attribute, capability, capacity, character, cognitive, non-cognitive, life, meta, soft, transferable, transversal or twenty-first-century skill, core, key or transformative competence/competency, disposition, habit of mind, knowledge, or trait. No one widely used definition exists, but there is a growing consensus as to the 'building blocks' of it such as imagination, curiosity, the production of novelty and value (according to context), persistence, critical thinking and, almost always, collaboration.

While in some cases creativity stands on its own as a robust concept, in others, it sits alongside related ideas such as critical thinking, innovation, entrepreneurship, and problem-solving. Concerning key competences, it is mainly connected to four - Digital, Entrepreneurship, Personal, Social and Learning to learn, and Cultural awareness and expression.

Given a move-away from single discipline to transversal skills, promotion of competence- rather than discipline-based learning, and growing evidence of the benefits of creativity, many attempts have been made to help learners develop the skills associated with it. Such initiatives build, in different ways, on the premise that individuals can be creative but differ by objectives, source of initiative, level of implementation, focus and scope, target group, sectors and settings covered, etc. How creativity is conceptualised, developed, taught, and assessed vary as well; such proliferation of approaches, though reflecting the breadth of the notion, makes it difficult to mainstream it across formal education and training.

In most cases, fostering creativity is not the only objective, and almost always it feeds into broader goals, for example, introducing educational innovations to boost the quality of teaching and learning, or helping students develop competences and skills for them to succeed in work and life and meet contemporary market demands. This helps to make a case for the development of creativity and put an emphasis on the transversality of it.

While there are often explicit mentions of creativity in objectives, precisely articulated definitions in practice occur much less so. While some conceptualisations of creativity focus on cognition (creative thinking), others emphasise the importance of taking action, and, in this way, addressing real-world challenges of today. Above all, the conceptualisation of creativity is, in many cases, fragmented, and this translates into fragmented approaches to developing it where only one or a few components of creativity are addressed. For instance, even if creativity is defined, learning objectives, outcomes, and achievement standards are rarely clear.

Pedagogies differ, but the most popular ones help create learning environments that mimic the real world and include problem-based, game-based, experiential, and project-based learning. Specific examples of approaches and methods employed are tinkering, five habits of mind, design thinking and collaborative challenge-based learning.

On many occasions, the initiatives focus on the creative process rather than the outcome. Coupled with the fluidity of the term, this focus on the process could explain why systematic assessment of learning outcomes is rare. Approaches adopted are typically informal and formative, using techniques such as observation, reflection and self-assessment.. In the context of lifelong learning it is likely that, indeed, informal tracking of learner progress through means of digital badges and portfolios is a more helpful way to go than formal testing.

Several factors drive the success of the development of creativity as a transversal skill, but political support and buy-in at different levels, explicit attention to creativity, robust methodologies and provision of educator support appear as key. By contrast, the inaccurate perception of creativity as a fuzzy concept learnable by osmosis with no explicit teaching and learning efforts hinders the promotion of it.

Overall, the interest in creativity in education and lifelong learning is currently high with increased attention from researchers, practitioners, employers and policymakers. With high-profile contributions from the OECD, the stage is set for those working in and across Europe. It is time to consider how best creativity can be made visible in all key competence frameworks, explicitly present and valued in the curricula of all countries and informally understood and adopted in all branches of lifelong learning as well. The latter is, of its essence, largely informal, hence it is perhaps inevitable that there will continue to be a proliferation of different approaches towards the development of creativity as a transversal skill. Also, in the wake of the new PISA 2021 test of creative thinking and recent research by the OECD-CERI (Vincent-Lacrin et al., 2019) it seems likely that creativity will increasingly be better understood and developed in schools and that this will gradually filter out into fewer settings of learning. Meanwhile, what should be considered is that:

- The more comprehensive the definition of creativity is, the better it can be embedded into teaching and learning; this helps to ensure that the componential nature of creativity is considered and most if not all dimensions of creativity are addressed;

- While explicit attention to creativity is central, it is not enough; setting a clear definition of creativity, and providing educator support help to turn the goal of developing creativity into practice. In some context, defining learning outcomes and suggesting adoption of "tried-and-tested" pedagogies could also become conducive;
- Successful teaching and learning of creativity require the mechanisms of it to be clear; this can be achieved by linking the definition of creativity with activities, learning settings and results that are expected to be achieved;
- To allow for assessment, the definition of creativity has to be linked with learning objectives and in some contexts, defined expected outcomes, ideally, by the level of progression.

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