Meta-Skills: Best practices in work-based learning

A literature review

Ellen Spencer & Bill Lucas

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UNIVERSITY OF
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Contents

Executive Summary

The term' meta-skills' is relatively unusual in education and work-based learning in both a European and global context, but meta-skills (competencies, capabilities, habits of mind, wider skills) are increasingly seen as an important way of thinking about skills for work and life.

While there are many examples of meta-skills frameworks for developing meta-skills in use across the world, these have widespread variation in their conceptualisation of both individual meta-skills and how they are combined into a framework. Frameworks also differ according to their intended use - adult skills, education and work, business and employability, technical and vocational education and work.

A number of themes emerged from this analysis of implementing existing frameworks including the importance of achieving 'buy-in' from a range of stakeholders, the need to focus on building consensus over definitions, the value of developing clear progression frameworks for each of the meta-skills and the desirability of producing more detailed guidance for employers and work-based learning providers.

While understanding how best to develop meta-skills is not yet well researched, such evidence as there is suggests that infusion models of delivery, where such skills are embedded in real work-based contexts, are likely to be more effective than one-off, stand-alone interventions. Various specific pedagogies, broadly defined as deeper or expansive learning are suggested.

There is growing interest in learners taking a more proactive role in shaping their learning journeys with words such as 'agency and, to a lesser extent, 'co-agency' being used by organisations such as the OECD to describe these changes. Such learner-centredness will nevertheless need to be within the context of the development of work-based competence and its associated assessment requirements. No specific examples of agency or co-agency in practice were found in the context of apprenticeships..

A number of useful evaluation models relevant to meta-skills were identified, but longitudinal evaluation of meta-skills is almost entirely absent. Assessing meta-skills requires different approaches from other work-based competences; a core principle from research is that assessments are ideally multi-method using the perspective of employer, educator/trainer and learner. Selection of assessment methods need to reflect the breadth of desired learning outcomes and the purpose of any assessment in achieving and validating these.

Evidence suggests that meta-skills are transferable but that this process is complex involving a clarity of understanding by the learner, clear models or explanations received when they are first encountered as an idea and opportunities to practise their development extensively practised in different contexts.

In terms of culture and of the human factors which make up cultures two key concepts are helpful - communities of practice and the idea of the learning organisation. Important for any organisation seeking to develop a learning culture in which meta-skills are valued, and modelled.

A number of recommendations are made in four broad categories – the provision of guidance on developing meta-skills using this research, commissioning new materials, empirical testing by employers and learning providers and longer-term evaluation of meta-skills in Scotland.

1. Introduction

This review of literature was commissioned by Skills Development Scotland (SDS) to help deepen its understanding of meta-skills with a particular interest in work-based learning. The review pays particular attention to best practices in the science of learning and how this could be applied to apprenticeships in Scotland, to the role of the individual learner in the learning process, to the evaluation of meta-skills and to the transferability and translatability of meta-skills from one context to another. As a result of the review recommendations are offered for the further development and delivery of meta-skills in Scotland.

Across the world there is a growing interest in frameworks which seek to describe the competencies, capabilities, dispositions, habits or wider skills which are likely to be most useful at work, in life and in learning[1]. SDS's *Skills for the future: Meta-skills* is one such example, and its focus is specifically on vocational and work-based learning.

While there are different ways of grouping meta-skills, there is a growing consensus as to what these skills are[2]; the Scottish meta-skills framework is in line with such approaches. Describing these meta-skills and grouping them into a logical framework is an important first step. To ensure they are understood, valued and embedded in work-based learning, with employer buy-in from across all sizes and types of organisations, is more challenging.

Applying the framework to two new products in the Scottish apprenticeship family, Graduate apprenticeships[3] at SCGF 7-10[4] and the new programme at SCNF 4-5, is helpful in enabling SDS to test how the skills can be incorporated into learning programmes, how they can be taught, learned, and assessed. The importance of getting 'buy-in' from all organisations providing training and development is widely acknowledged. As such, the particular balance of skills needed will be context-dependent. Yet it is important that there is a clear understanding of terms so that they can be incorporated and used in ways that are consistent and meaningful across work boundaries.

1.1 Thinking about Scotland's meta-skills framework

Frameworks like the meta-skills example invite a number of questions including:

- From what perspective are they organised – Employability? Lifelong learning? Character? Something else?
- Is it a demand-led model (what employers want), a supply-influenced one (what schools or colleges or universities think they should provide), or is it based on some other criteria about what is worth valuing more widely by society?

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[1] Meta-skills is just one word of many used to describe these wider skills. Terms include attributes, capabilities, character, competences, dispositions, habits, non-cognitive skills, soft skills, transferable skills, transversal skills, twenty-first century-skills and wider skills, with each word/phrase bringing certain associations with it.

[2] For example: Dede, C. (2010). Comparing frameworks for 21st century skills. In J. Bellanca and R. Brandt (Eds.), *21st century skills : Rethinking how students learn* (pp. 51-75). Bloomington: Solution Tree Press; Lamb, S., Maire, Q. and Doecke, E. (2017). *Key skills for the 21st century: an evidence-based review*. Sydney: Centre for International Research on Education Systems; Pellegrino, J., and Hilton, M. (Eds.). (2012). *Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st Century*. Washington: National Research Council of the National Academies, The National Academic Press.

[3] See https://www.apprenticeships.scot/become-an-apprentice/graduate-apprenticeships/?gclid=Cj0KCQiAqNPyBRCjARIsAKA-WFyn7GW8eq5CDTrVAPLHEf3HeFUCPOvESxAG3wNRdmfwClHzUwVPSi8aAmuBEALw_wcB

[4] See https://scqf.org.uk/interactive-framework/

- To what extent are the selected skills timeless and to what extent particularly relevant to current challenges?
- Are the individual skills roughly similar in 'size' or 'scope'?
- To what extent has the identification of the skills drawn on research?
- To what extent is there evidence that each skill is learnable or teachable?
- To what extent is there evidence that each skill is measurable?
- To what extent has the model been validated or tested by those who will use it?
- To what extent are the elements of the model discrete and so ensure the model is coherent and clear?
- To what extent is the model comprehensive?
- What words are used to frame such frameworks –attributes, capabilities, character, competences, habits, non-cognitive skills, soft skills, wider skills?

The foundation of this review has been an extensive search for relevant frameworks from across the globe using the kinds of terms listed in the last bullet point above. We have searched both in educational databases and in grey literature (reports and policy documents from government, government agencies and specialist skills organisations) and have found some 80 relevant papers mostly identified via grey literature.

1.2 Use of the term meta-skills

The term meta-skills is relatively unusual in education and work-based learning in both a European and global context. It is less than twenty years old, with the first use we found of meta-skills relating to the way universities develop workplace skills (Dillon and Hodgkinson, 2002).

In Europe the two main terms tend to be 'competences/competencies' or 'transversal skills', while across the world there is more variety - breadth of skills, capabilities, dispositions, habits of mind, twenty-first century skills.

Cedefop (2009, p. 47) cites the OECD 'design and selection of key competences (DeSeCo) project' – which prefers the word 'competency' over 'competence' – that 'has developed a classification of key competences' (p. 47) in three broad categories: using tools (such as language and technology) interactively, interacting with heterogeneous groups; and acting autonomously' (p. 47). This DeSeCo 'scheme' is for 'general education'.

Cedefop, 2009 also makes reference to the concept of 'meta-competences', which it also refers to as 'meta-cognition', thereby demonstrating a subtly different usage from SDS. For SDS (*Skills 4.0* p. 8), 'meta-skills' are 'timeless, higher order skills that create adaptive learners and promote success in whatever context the future brings'. For Cedefop, by likening meta-competencies to meta-cognition its view is much narrower; restricted to 'knowledge concerning one's own cognitive and thought processes, and the active monitoring and development of these processes in the pursuit of goals or objectives' (p. 41).

Lucas (2019, p. 5) cites the OECD's 'recognition of the nuances within the words 'knowledge' and 'skills'' and identifies some of the 'main trends' (p. 7) in commentators' discussions of 'the kinds of capabilities, competencies or dispositions that we need'. Such skills frameworks include those from Pellegrino and Hilton (2012), Gutman and Schoon (2013), Heckman and Kautz (2013), Lamb et al. (2017) and the European Commission (2019).

2. Best practices in developing meta skills

In this section we provide an overview of meta-skills frameworks and of the development practices associated with them for the Scottish context. From this overview we offer some pointers to best practices.

2.1 Existing frameworks for meta-skills

There are many frameworks of meta-skills, worldwide. Most are developed through literature review, expert working groups, and/or extensive consultation with employers and other stakeholders.

In our review we use the word 'competences' unless a given framework refers to 'competencies', in which case we are consistent with the language those specific cited sources choose to use. We also use the term 'skills' interchangeably with 'competences', consistent with Skills 4.0.

Some papers are literature reviews or other reports that do not derive a conceptual framework themselves, but discuss other frameworks, or compare the sorts of skills employers value, or that different countries' education systems value.

We have kept a consistency about how we categorise frameworks and papers as far as is possible. It is not always obvious what sector a report is focusing on (for example, UNESCO's 'intercultural competencies' seems to be developed without a specific school or work setting in mind). Educational policy-makers and researchers have focused on twenty-first century skills for two decades and there are many frameworks for these skills of which Skills 4.0's concept of 'meta skills' is one such framework.

Conceptual inconsistency

Lists of such skills are not always internally consistent in their labelling. A piece from UNESCO (Roegiers, 2016) clarifies the different way competencies are being understood in curricula. Conflicting conceptions of competency lead to difficulties in comparing frameworks for us and for other reviews.

As an example of internal inconsistency, Roegiers offers the European 'key competencies' framework. Its list of 8 are:

1. communication in the mother tongue;
2. communication in foreign languages;
3. competency in maths and basic competencies in science and technology;
4. digital competency;
5. learning to learn;
6. social and civic competencies;
7. the spirit of initiative and enterprise; and
8. cultural sensitivity and expression.

While recognising that the list is fairly clear about its priorities, Roegiers demonstrates that the list is contains a mixture of types of competency. Some, for example, 'are competencies to be mastered upon completion of studies' and some not, some serve 'educational learning processes' while others do not. UNICEF's mapping of initiatives for developing life skills and citizenship education (Middle East and North Africa region) finds 'confusion between competencies and skills', with 'most countries' using the two terms interchangeably. At global-level, it finds 'a lack of agreement as to what distinguishes a competency from a skill' (2017, p. 25).

UNICEF develops a conceptual and programmatic framework to reframe the concepts of 'life skills' and 'citizenship education' in schools because it finds both a conceptual gap and a programmatic gap. The development of this framework included 'an extensive mapping and review of national, regional and global taxonomies and frameworks' relating to the definition and use of terms relating to 'skills', which includes life skills, competencies, 21st-century skills, soft skills, foundational skills 'etc' (p. 23).

In terms of conceptual gap, it finds 'a lack of conceptual clarity, both in the literature and in international and national strategies, as to what life skills [we might call these meta skills] and citizenship education entail, what their scope is, and how they relate to knowledge acquisition, competencies, and socially desirable behaviours' (p. 22). It finds 'multiple perspectives' resulting in 'a plethora of terminology and taxonomies, as well as partial frameworks' that show both lack of consensus and overlap.

In terms of programmatic gap, at least in education, we can conclude that UNICEF's finding is representative, that: there is no 'clearly defined, holistic, and systemic programmatic approach' to integrating life skills into national education systems. It finds some 'isolated initiatives' but no 'comprehensive take on the multidimensionality of education' and no lifelong learning perspective.

Ahonen and Kinnunen (2015) cite some of the main frameworks, which include:

1. The European Union's eight key competences
2. ATC21S's 21st Century Skills
3. The P21 Framework for 21st Century Learning
4. The OECDs own version of 21st century skills formulated through the Definition and Selection of Competences (DeSeCo) initiative. (DeSeCo is also the basis for PISA, the OECD's 'Programme for International Student Assessment').

It is not the intention of this review to compare the frameworks for content, but the thinking above demonstrates that, when we discuss how the skills in such frameworks might be developed, we need to be aware of whether we are talking about comparable items.

Buchanan et al.'s (2018, p. 24) critical review observes a change in tone of policy developments in recent years from one of 'individuals having the primary responsibility for adjusting efficiently to changing market signals' to a perspective ('evident in recent EU publications') that recognises the importance of employers for meeting the training needs of individuals to promote labour mobility.

Some common forms of frameworks

Frameworks come in a number of common forms:

Single level of meta-skills

Some are single lists of competences, or meta-skills, to use the language of Skills 4.0., such as Canada's *Shifting Minds 3.0* list of '7Cs' (Milton, 2015).

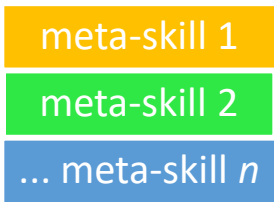


Figure 1 - Single lists of competences

The European Commission's *LifEComp* (Caena, 2019) is a more complex framework but still a single-level one. It identifies six competences, which it splits across three life dimensions (personal, social, learning to learn). Competences are grouped in these pairs so that a 'core element' can be identified for each pair. For the 'learning to learn' life dimension, for example, the 'core element' is given as 'growth mindset'. This core element is simply what we refer to in our framework for creativity (Lucas and Spencer, 2017) framework as a 'signature pedagogy': Shulman's (2005) term for a typical way of instilling a particular habit, such as 'managing learning', in this case.

Sub-levels: meta-skills divided into skills
Others break down meta-skills into skills / competences / habits. We have found this approach less common. Skills 4.0 refers to 12 meta-skills that have been classified under three 'headings'. It is possible to argue that the three 'headings' could equally be described as 'meta-skills' with the 12 'skills' being skills / competences / sub-habits. As such, we would argue that Skills 4.0. takes a 'sub-levels' approach.

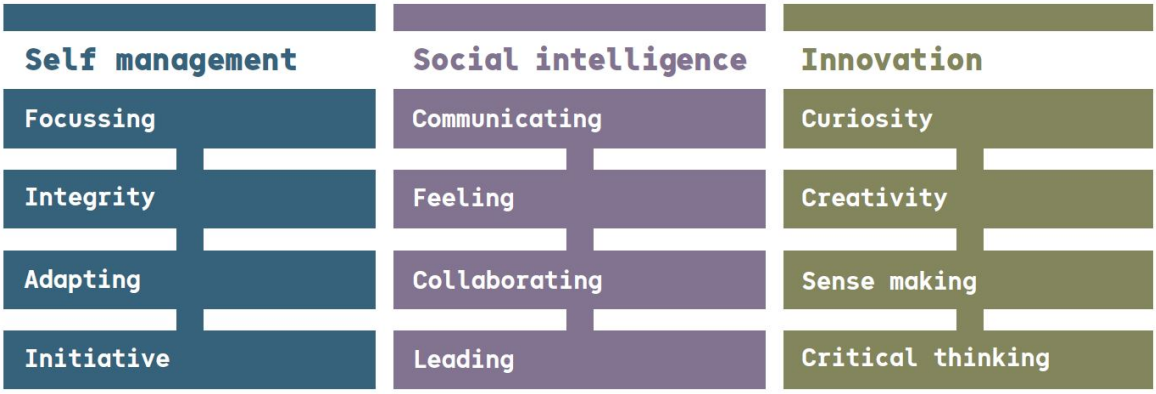


Figure 2 - Skills 4.0

Where there are layers to other frameworks they tend to begin a step up from competences and so do not break meta-skills up into more fine-grained sets of habits.

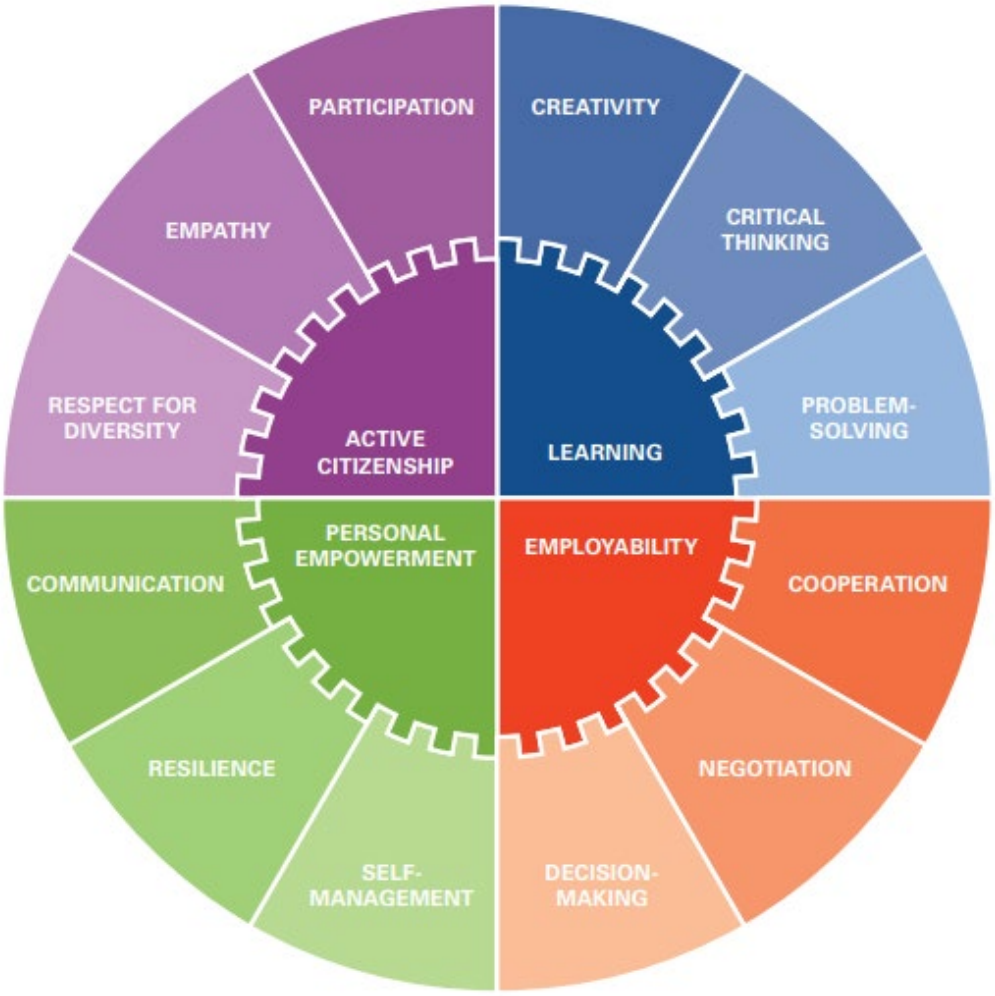
Mansilla and Jackson's framework for global competence (2011) takes this single meta-skill and breaks it into habits and sub-habits. It is able to do this because it is focussed on a single meta-skill: global competence. As such it is not a framework for meta-skills but a framework for one particular meta-skill. Our own frameworks for competences 'creative thinking', 'tenacity' and 'zest for learning' serve the same purpose. Each is a meta-skill, broken down into habits and sub habits, but the meta-skills are not collected into a single unifying framework.

The EU's DigComp (digital competence) framework does the same. The reason for inclusion of the Mansilla and Jackson framework is to demonstrate that Skills 4.0. sits in unusual territory in its breaking down into habits a set of all-inclusive meta-skills.

Clustered by habit language
While it could be argued that Skills 4.0 has 12 meta-skills clustered by habit language of its three 'headings' (p. 8), it is hard to make the case that 'self-management' is not a meta-skill. When compared to UNICEF's example, below, it becomes clearer that Skills 4.0 sits in the 'sub-levels' classification of frameworks.

UNICEF's (2017) *Life Skills and Citizenship Education* is a good example of a framework that looks like it is breaking meta-skills into habits but is in fact clustering meta-skills by the

outcome they serve. 'Active citizenship' 'learning' 'employability' and 'personal empowerment', are not habits / competences – they are just too broad – but are what we might call desirable outcomes. Compare this with Skills 4.0's 'social intelligence', which is clearly a skill and not just a desirable outcome.



Similarly, others cluster similar meta-skills into groups under a descriptive heading that on its own would perhaps be too broad to count usefully as a habit but are, nevertheless, written in capability / competence language. For example, the Australian Government's (2015) *Core Skills for Work Developmental Framework* clusters skills like 'make decisions' and 'create and innovate' under the broad heading 'get the work done'. Similarly, Care et al.'s (2019) *transversal competencies* framework has six categories of very broad competency area, including 'interpersonal skills' and, less helpfully, 'other'.

The US's *National Work Readiness Credential Profile* skills for work readiness (2006) comprise broad clusters of meta-skills grouped under skills-focused labels: communication skills, interpersonal skills, decision-making skills, and lifelong learning skills. Some of the skills identified within each category are, arguably suitably fine-grained to be habits. For example under 'communication': 'listen actively'. We suggest, however, that 'interpersonal skills' and 'lifelong learning' are too broad to be identified as meta-skills.

Clustered by non-habit language
Moving further from the idea of skill habits, others cluster meta-skills under headings that do not themselves represent skills or competences. For example the EC's EntreComp – entrepreneurship competence – (Bacigalupo et al., 2016) groups meta-skills under three areas: 'ideas and opportunities', 'into action', and 'resources'.

Underpinned
Another approach sees a framework that identifies factors in addition to skills that have a role to play in their development and deployment. The *Cambridge Life Competencies Framework* (2019) sees the foundational contributions of 'emotional development', 'digital literacy' and 'discipline knowledge' as layers that 'underpin' its six competencies, for example.

Cedefop's *Typology of Knowledge, Skills and Competences* (Winterton et. al, 2006) aims to clarify concepts around 'learning outcomes' used in Member States. The authors note that there is a 'growing interest in multi-dimensional frameworks of' knowledge, skills and competences (p. 59), where functional and cognitive competences 'are increasingly being augmented by social or behavioural competences' with a move 'towards the more holistic approaches' of Germany and France that include attitudes and behaviours. Notably, the 'holistic approach … is gaining ground over narrower approaches' (p. 59)

Progression and partial progression
In a subtle variation of this approach that sees meta-skills as the second step in a three-stage skills hierarchy, UNESCO (2012, p. 171) labels all aspects of its framework as skills. It distinguishes three types: foundation skills, transferrable skills, and technical and vocational skills; each a prerequisite for the next. In this case 'transferable skills' would be akin to Skills 4.0.'s meta-skills.

A variation of this three-stage skills hierarchy is exemplified by the World Economic Forum (2015), which removes an element of the hierarchy, placing foundational literacies below competencies, and character qualities, for which they 'serve as the base' (p. 2). These two remain on a par with one another.

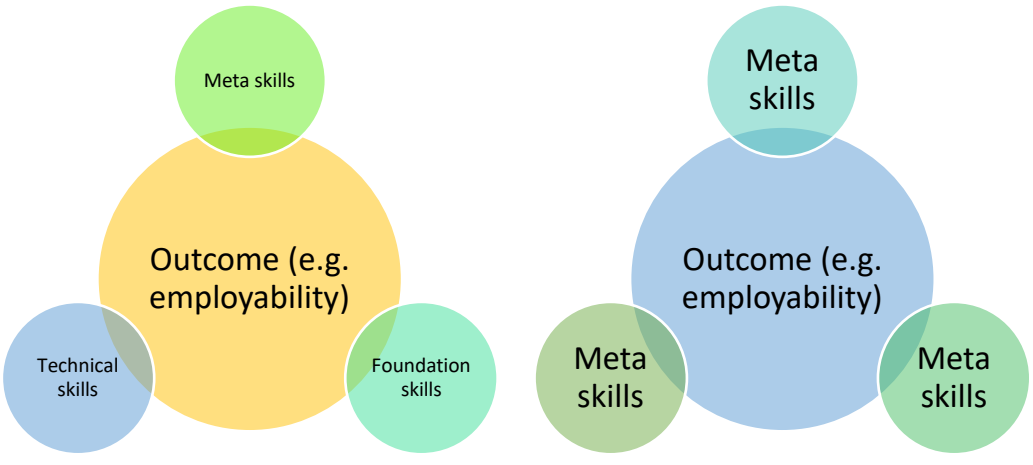


Figure 4 - Some frameworks consider skills beyond 'meta skills'; others focus only on meta skills

2.2 Practices in developing meta-skills

While there are many frameworks that identify the meta-skills needed for success in work and life, there is very little evidence of these frameworks being embedded in common use by employers and training organisations.

There is work focusing upstream of the skills gap, where interested parties (for example, the CBI) identify skills needed for employability and attempt to drive changes in the education system as a whole, particularly in terms of what is taught in schools and which skills are valued and developed. This kind of advocacy is less directly relevant to SDS's deployment of its framework, but it may be worth looking in more detail at what schools are doing in this area

This review found occasional glimpses of skill development, but usually through worked examples (potentially real-life scenarios) in progression frameworks rather than in field trials.

In this section we focus on 15 work-based frameworks identified in our search. We introduce each but focus specifically on how the framework is intended for use and, in particular, on anything pertaining to best practice.

Some common themes are identified after the frameworks are introduced.

In terms of identifying practices, this review focuses on meta-skills frameworks that are developed for the workplace. Filtering our list[5] of frameworks to remove those less likely to have utility in the workplace, sectors: 'adult skills', 'education and training', 'education and work', 'many contexts including business', 'TVET', and 'work' remain relevant. We look at these in the following sections, and in the order listed below.

1. Adult skills
    - UNESCO Transversal Skills (United Nations)
2. Education and work
    - Employability Skills Framework (US)
    - Skills Builder Framework
3. Many contexts including business
    - EntreComp (European Entrepreneurship Competence Framework) - EC
    - DigComp (European Digital Competence Framework) – European Commission
    - LifeComp (European Framework for Personal, Social and Learning to Learn Competence) - EC
    - EU/European Key Competences for Lifelong Learning (being further defined as EntreComp etc) - EC
    - VIA Institute of Character Inventory of Strengths (US led, global)

[5] The table in Appendix 1 shows frameworks by name, broken down by 'level' (whether applicable to a single country, global, European, United Nations etc). 43 frameworks are identified. The table in Appendix 2 shows frameworks by name, broken down by 'sector' (for example, work, school) according to the context in which frameworks are designed.

4. TVET

- UNESCO Transversal Skills (United Nations)
- Vocational Action Competence (Germany)

5. Work

- Core Skills for Work Developmental Framework (Australia)
- Clusters of occupations by skillset (Canada)
- SDS Skills 4.0 (Scotland)
- ACT WorkKeys National Career Readiness Certificate (US)
- The National Work Readiness Credential Profile (US)
- STEP Employer Survey (World Bank Group)

Where they exist, images for these work-based frameworks are shown in Appendix 3.

UNESCO Transversal Skills

Writing for UNESCO Bangkok, Trzmiel (2015) details the policy implications of transversal skills in TVET (technical and vocational education and training) in the Asia-Pacific region. Transversal skills 'are those that go beyond foundational and occupation-specific skills and can give TVET graduates a comparative advantage when looking for employment.' (p. viii).

There is no single, agreed list of competencies that are included in a list of transversal skills. Trzmiel (2015) uses the term 'competencies', stating that 'it is often used interchangeably with the terms 'skills', 'attitudes', and 'values', (p. 3). Trzmiel suggests that there are some 'robust frameworks for transversal skills' created by 'well-developed education and training systems'. At country level, Germany's 'Vocational Action Competence' or VAC, and Australia's Core Skills for Work framework, are cited as examples. We include these below. At regional level, Trzmiel cites the ASEAN Qualifications Reference Framework in Southeast Asia, and the European Skills/Competencies, Qualifications and Occupations (EPSO) framework that identifies and categorizes skills for EU workers.

Employability Skills Framework (US)

This is a US Department for Education framework[6] outlining necessary personal and interpersonal skills for students in the labour market. Employability, according to this framework is the ultimate goal.

There are nine meta-skills like elements, but the framework does not have a common unit of analysis. 'Critical thinking' , for example, is set on a par with 'personal qualities', which is too high level to be a skill. Its habits might more helpfully be split up under more meaningful skill labels.

The framework places its nine meta-skills into three clusters that aren't themselves meta-skills, do not use the language of habits, and so are not critical for understanding the framework. These are: applied knowledge, effective relationship, and workplace skills.

[6] Available at: https://s3.amazonaws.com/PCRN/docs/Employability_Skills_Framework_OnePager_20180212.pdf
Website at: https://cte.ed.gov/initiatives/employability-skills-framework

From the now defunct College & Career Readiness & Success Center[7] it would appear that the intention was for the framework to 'serve as a one-stop resource for information on employability skills for instructors, employers, and students'[8] and include tools for assessment. According to this source, its influence can be seen in 'large-scale, federal competency models'. Florida has used the framework in its plan for improving the 'talent pipeline'[9]. The Center developed a guide[10] for teachers to use the framework.

One impact can be seen at careeronestop.org[11], where competency models for specific industries, from construction to food services can be seen. The site provides a (restricted) 'Build a Competency Model Tool' with 'instructions, examples, and worksheets to assist in applied uses of competency models'.

These models include 'occupation-related competencies' (relating to technical, knowledge, and management); industry-related technical competencies; and 'foundational competencies' (relating to workplace, academic, and personal effectiveness)

Skills Builder Framework

This is an employer-led framework used by over 500 schools and 130 employers (Grimes, 2019, p. 20) in the UK. It comprises eight essential skills including creativity and teamwork.

The Skills Builder is a progression framework that has an accompanying employer toolkit[12] for member organisation to see in more detail. It is intended that organisations working with young people will reflect on whether all, or just some, of the skills should be a focus for them. The 'mastery approach' is an important principal of the framework: 'no steps should be skipped and only when a step is mastered should learners move onto the next one.'[13] The Skills Builder Partnership's approach has six principles:

1. Keep it simple
2. Start young, keep going
3. Measure it
4. Focus tightly
5. Keep practising
6. Bring it to life

The CIPD (2019) announced the intention of itself and other organisations to agree a universal framework of essential skills. It will build on the Skills Builder Framework, and set out the skills needed to thrive at work, as well as how these can be assessed and developed. Its plan is for the framework to work for students, workers and employers. It will aim to show what progression looks like for each skill. The publication of this is expected imminently.

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[7] https://ccrscenter.org/
[8] This site reports on the original plans for the framework https://ccrscenter.org/blog/common-framework-employability-skills
[9] Florida 2030 available at: http://www.flchamber.com/wp-content/uploads/2019/06/Florida-2030_Employability-Skills-Framework-Report_Preview-Copy.pdf
[10] Teacher guide available at: 10 https://www.air.org/sites/default/files/EmployabilitySkills_PPT.pdf
[11] Specific industry frameworks at: https://www.careeronestop.org/COMPETENCYMODEL/competency-models/pyramid-home.aspx
[12] Available at: https://www.skillsbuilder.org/toolkit-employers
[13] https://www.skillsbuilder.org/framework

EU/European Key Competences for Lifelong Learning - EC

Individual competences within this framework have been further developed as EntreComp, DigComp and LifEComp (European Commission, 2019a). While this adds extra levels of complexity that takes it beyond comparison with SDS's framework, we include them because it is at these levels where examples might be seen of best practices in developing and assessing the eight competences. These include citizenship, literacy, and cultural awareness and expression. The eight are the equivalent of meta-skills. The EC has clearly believed it necessary to expand upon each separately.

EntreComp (European Entrepreneurship Competence Framework) - EC

EntreComp is the EC's *European Entrepreneurship Competence* Framework (Bacigalupo et al., 2016). 15 habits in three key areas combine to make an 'entrepreneurial mindset' (McCallum et al., 2018). The 15 competences include things like 'planning and management', 'mobilising resources', and 'motivation & perseverance' clustered into three categories whose headings are labels like 'ideas and opportunities' rather than being competences.

This framework breaks down a single meta-skill into habits / competences but does not identify sub-habits.

The framework accounts for progression. Eight levels of proficiency are identified for each competence. The proficiency levels and 'an extensive list of approximately 500 learning outcome statements' (p. 8) were identified by researchers, and included 'interaction' with over 100 experts in the field of entrepreneurial learning.

A limitation of the framework is that it has not been field tested. Bacigalupo et al. (2016) do not detail how the skills could be developed in practice.

EntreComp aims to be comprehensive and adaptable to different needs, and recognises that 'not all citizens, learners, or users will be interested in developing all the competences here described to the highest level of proficiency.' (p. 14).

The framework is designed to be actively applied to different contexts by users developing learning outcome statements that are relevant. Its creators state that:

> 'EntreComp learning outcomes should not be taken as normative statements to be directly transposed into actual learning activities, or be used to measure student performance. They are a basis for the development of specific learning outcomes that are fit for the specific context and a basis for the development of performance indicators.' (p. 17)

EntreComp into Action (McCallum et al., 2018) is a user guide.

EntreComp's genesis was a response to a rapidly changing society which individuals need to develop the capacity to navigate successfully. An 'entrepreneurial mindset' is seen as a solution. The European Commission developed EntreComp 'as a reference framework to explain what is meant by an entrepreneurial mindset' and to help 'support the development and understanding of entrepreneurial competence in any setting' ('across sectors … by educators, trainers, employers, professional bodies and policy-makers'). To do this, the framework was proposed for use in a number of ways:

- 'supporting policy and practice to develop digital skills
- assessing digital skills
- supporting training of educators, trainers and teachers to deliver digital skills

- to design programmes and learning opportunities
- to recognise and certify skills'[14]

DigComp (European Digital Competence Framework) – European Commission

DigComp reflects thinking about just one of the EC's eight meta-skills: digital competence.

Although it uses different language, digital competence essentially has five habits, each of which are further divided into sub-habits.

Five habits include elements such as 'information and data literacy'. Each habit contains between 3 and 5 sub-habits. The example just named includes the sub-habits: 'browsing, searching and filtering data, information and digital content'; 'evaluating data, information and digital content'; and 'managing data, information and digital content'.

According to the European Union Joint Research Centre (Carretero, 2017), DigComp, first published in 2013, 'has become a reference for the development and strategic planning of digital competence initiatives both at European and Member State level' (p. 6). DigComp 2.0 was published in 2016, 'updating the terminology and conceptual model, as well as showcasing examples of its implementation at the European, national and regional level' (p. 6). Carretero expands on DigComp 2.1, which expands its use of levels 'to a more fine-grained' (p. 6) description of competences.

Eight levels of proficiency, as for EntreComp, allow for progression and 'supports the development of learning and training materials. It also helps in the design of instruments for assessing the development of citizens' competence, career guidance and promotion at work' (p. 12). The proficiency levels are defined through learning outcomes, 'using action verbs, following Bloom's taxonomy' (p. 12). They were validated with an online survey.

The Carretero report (2017, p. 19) helpfully produces worked examples showing how the learning outcomes representing each proficiency level might be written differently depending on the context in which digital competence was being practised and evidenced. For example, two learning scenarios might be: the job-seeking process, and the preparation of a short report on a specific topic.

Ferrari outlines the multi-stage development process undertaken to produce DigComp. In order to account for context, the framework included a fifth dimension (in addition to naming the competence area (i.e. the five habits); competences (i.e. the sub habits); proficiency levels (foundation, intermediate, advanced); examples of knowledge, skills and attitudes) which was 'purposes'. This was an addition to the structure used in a similar framework upon which DigComp was built, and which had received 'extensive stakeholder support' (p. 9). Ferrari (2013) reports on a project (Jan 2011-Dec 2012) that aimed to develop the framework and to propose a roadmap for DigComp's possible use and development.

The fifth dimension, purposes, was added so that the framework could be applied to different contexts because the framework aims to be 'descriptive rather than prescriptive' (p. 12). The 'purpose' dimension gives a fairly specific example from the broad contexts of 'learning' and 'employment' to illustrate how the language might be applied by users. For example, for the sub-habit 'browsing, searching and filtering information' of habit 'information', a foundation-level employment example might be: 'I can find details of flights using a common search engine.' (p. 16).

[14] Information available at: https://ec.europa.eu/social/main.jsp?catId=1317&langId=en

DigComp into Action (Kluzer and Priego, 2018) is a user guide to aiming to 'support stakeholders with the sharing of experiences of existing inspiring DigComp implementations' (p. 8). Its flexibility which means that adaptation to local needs will require a degree of input. This could also mean that establishing progression – especially in any way that is comparable with other contexts – is challenging. A helpful guide to language that might be relevant at each level of a progression framework will be useful in ensuring consistency as different users write learning statements (p. 19.)

Part of what makes the framework best practice as far as European use is concerned is that it has been developed and endorsed at European level with the involvement of a large number of experts. As such, it ties in with EU policy and broader strategies (for example. the New Skills Agenda for Europe, p. 22).

LifEComp (European Framework for Personal, Social and Learning to Learn Competence) - EC

This is another framework from the European Union's Joint Research Centre that ties in with the EU Key Competences. It aims to have relevance from early childhood to vocational, non-formal and adult education (Caena, 2019).

The framework includes three competence areas: personal, social, and learning to learn. Each has a core element, and two 'compound competences'. Caena (2019) reports on the conceptual underpinnings of the LifEComp framework, including appendices (p. 43) detailing the frameworks that were referred to in its development, including notes about any assessments related to the frameworks.

Unlike the EC's 'EntreComp' and 'DigComp' frameworks there is no *Into Action* report for LifeComp to serve as a user guide.

VIA Institute of Character Inventory of Strengths (US led, global)

This framework is a result of 'several years' study with '55 distinguished scientists' taking part led by Peterson and Seligman[15] (2004). The resulting VIA survey is widely used in many contexts. The 24 character strengths are about 'being your best self' which is possibly a proxy for 21st century employability and life-readiness skills. The accompanying book *The Power of Character Strengths*[16] details how readers can practise putting strengths into action through 'Character Strengths Builder', which is an 'easy-to-learn, four-step, research-backed' programme.

Vocational Action Competence (Germany)

This framework (Hensen and Hippach-Schneider, 2016) is one of a number identified by Trzmiel, 2015 as 'robust frameworks for transversal skills' (p. 3). The framework is applicable to the dual vocational education and training (VET) system that runs at upper secondary level in Germany. The Vocational Training Act requires VET to deliver the 'vocational action competence' for performance of an occupational activity in a work environment, and as part of an organised training course with vocational experience.

Vocational action competence enables individuals to 'undertake independent and wide-ranging vocational activities in a variety of contexts' (p. 4).

Core Skills for Work Developmental Framework (Australia)

This framework (Australian Government, 2013) is one of a number identified by Trzmiel, 2015 as 'robust frameworks for transversal skills' (p. 3), although the term transversal skills

[15] Framework available at: https://www.viacharacter.org/character-strengths-via
[16] Available at: https://www.viacharacter.org/resources/books/the-power-of-character-strengths

is not used in the framework itself, which is abbreviated to CSfW. CSfW 'describes a set of non-technical skills, knowledge and understandings that underpin successful participation in work' (p. 1). These core skills contribute to work performance just as language, literacy, and numeracy skills (LLN Skills), and discipline specific / technical skills do.

In terms of best practice lessons, the framework is not intended to be a set of standards or an assessment tool. Its purpose is simply 'to provide a common language that would assist all education, training and employment services sectors to address these skills more specifically.' (p. 3). Although less of a challenge than developing progression frameworks, this step of developing common language that becomes embedded across vocational areas is fundamental and should not be overlooked.

CSfW describes skill performance in ten Skill Areas, grouped under three Skill Clusters (p. 1)

Cluster 1 - Navigate the world of work

a. manage career and work life
b. work with roles, rights and protocols

Cluster 2 - Interact with others

a. communicate for work
b. connect and work with others
c. recognise and utilise diverse perspectives

Cluster 3 - Get the work done

a. plan and organise
b. make decisions
c. identify and solve problems
d. create and innovate
e. work in a digital world

Clusters of occupations by skillset (Canada)

This Royal Bank of Canada (2018) document reports a framework based on investigation of the skills needed in 300 occupations. Less directly applicable to the SDS project, it identifies a novel way of grouping occupations: by skill into clusters, rather than by industry or educational requirements. The foundational skills identified include critical thinking, co-ordination, social perceptiveness, active listening, and complex problem solving. They are only identified together in terms of their projected demand across all occupations in order of descending importance from the number 1: 'active listening', through to number 35; 'installation'.

SDS Skills 4.0 (Scotland)

SDS has conducted a number of pilots to explore what features of implementation might become best practice.

1. *SDS SCQF4 Construction Formative Evaluation* (2018) (*Open change report*) is an initial evaluation from the first iteration of the Level 4/5 programme (one of the two programmes in which meta-skills are being piloted).

2. *Review of SCQF Level 4/5 Qualifications: A report to Skills Development Scotland* (*SQW final report*) is a more in-depth evaluation of the level 4/5 programme from academic year 2018-19

3. *Work-Based Challenge Specification SCQF Level 4 (L4 Workbased challenge final)* is the SQA unit specification for the newly created Level 4 workbased challenge project, which is piloting this year. This is a newly developed unit to support the pilot activity relating to senior phase (high school) pupils (the 'Level 4/5' programme).

4. *Work-Based Challenge Specification SCQF Level 5 (L5 Workbased challenge final)* is the same as above for the level 5 unit, but at the next level (SCQF level 5) up.

5. *Scottish Apprenticeships: Working for the future - our strategy for standards and frameworks #AHumanFuture (SDS Future Standards Architecture Strategy*) – outlines current strategy in relation to the development of apprenticeship standards and frameworks. This offers some more insight into where meta-skills fit in to the wider skills development / apprenticeships context (although does not cover things like the relationship with the wider education / HEI / FE system)

6. *Graduate Apprenticeship pilot overview* - lists some of the Graduate Apprenticeships being piloted in the 2019-20 academic year. These include Data Science at Edinburgh and St Andrews Universities, Accounting, and Software Engineering, at Robert Gordon's and Glasgow Universities respectively.

7. *Meta Skills Pilot Evaluation Steering Group Meeting* (EKOS 2019) is a presentation from SDS evaluators EKOS outlining some important initial learning and observation from their evaluation of the Graduate Apprenticeship and Level 4/5 programmes this year. There are clearly many issues, from buy-in, to the need for project champions, differentiation for different aged users, need for clarity about the purpose, the need for better self-evaluation by users, for training of employers, and an understanding of what 'success' looks like.

8. *Measuring Skills for the Future* (Branigan, 2017) is a helpful report about the measurement of meta skills including through self-reports, reports by others, behavioural assessments, and multi-method approaches.

9. *Employer perspectives on Meta Skills and Definitions (SBA Project Management)* is a spreadsheet reporting respondents' descriptions of what the different meta skills and their sub-habits might mean in respondents' particular industry / sector context.

10. *Employer perspectives on Meta Skills and Definitions (Meta Skills Financial Services)* is a similar spreadsheet reporting respondents' descriptions of what the different meta skills and their sub-habits might mean in respondents' particular financial services contexts.

From the feedback from EKOS in particular, it would seem that Skills 4.0 should keep its goals clear and simple, with relevant language.

ACT WorkKeys National Career Readiness Certificate (US)

This certificate (NCRC) includes a number of assessments. It is issued at four levels: Platinum, Gold, Silver, and Bronze. The certification 'measures and certifies the essential work skills needed for success in jobs across industries and occupations'[17]. Its 'Talent

[17] See: https://www.act.org/content/act/en/products-and-services/workkeys-for-job-seekers/ncrc.html

Assessment' looks at 12 work-related behaviours including carefulness, cooperation, sociability, and discipline. Its 'Fit Assessment' measures interests and values. Seven values include autonomy, and precision.

This particular framework is not about developing skills, just measuring, and identifying gaps for employees and employers. In this sense, its value is clear to employers, who are free to identify which particular skills they are looking for.

The Equipped for the Future Framework, National Work Readiness Credential Profile (US)

The 'National Career Readiness Certificate' is not the only work readiness credential in the US. Another is the 'National Work Readiness Credential Profile', which looks at the critical skills needed for entry-level workers in particular.

Based on the *Equipped for the Future (EFF) Framework* (which has 16 skills), the National Work Readiness Credential Profile adopts only 10 of these for entry-level workers. The organisation delivering the Profile is the National Work Readiness Council, who have 130 assessment centres across the US.

The Council's skills profile and assessment has been created through engagement with workers and managers across industry sector and by building on research from the EFF framework. The assessment is a web-based assessment using real-world scenarios in four modules: situational judgment, oral language, read with understanding, and use math to solve problems. Its skill categories for work-readiness are communication, interpersonal, decision-making, and lifelong learning.

The Council has produced a guide[18] that provides workforce preparation trainers and instructors with information on how to help entry-level job seekers develop the skills and knowledge necessary to meet the standard for work readiness defined by the Council. This guide explains the Council's *National Work Readiness Credential* Profile. It describes the skills in detail, with a focus on how the skills are linked to the tasks, and to a specific level of performance associated with those tasks. It providing specific steps describing how instructors and trainers can help job seekers improve their proficiency in relevant skills linked to entry-level tasks, and to plan instruction.

STEP Employer Survey (World Bank Group)

This framework takes a 'multi-dimensional view of skills that goes beyond educational attainment to capture human capital more comprehensively' (Pierre et al., 2014, p. 7). Three broad 'skill' types: are cognitive, socio-emotional, and job-relevant.

The STEP program (Skills Towards Employability and Productivity) was designed to better understand the interplay between skills and employability / productivity. It developed survey instruments to collect data on skills in low- and middle-income countries, which Pierre et al. (2014) detail.

The researchers recognise that interpersonal skills needed for particular jobs are less well theorised and measured than the cognitive ones. There is 'low agreement' about what should be included in interpersonal skills and often 'it is not easy to separate interpersonal skills from more purely attitudinal and motivational aspects of work orientations' (p. 23).

There is also a difference in how people use skills related to co-workers and organizational outsiders (for example. clients). In terms of measuring skills, the survey assesses use of

[18] Its guidance report for trainers and jobseekers is available at: http://www.workreadiness.com/images/training.pdf

interpersonal skills at work with questions that relate to 'teamwork, supervision, contact with customers, as well as internal or external communication via presentations' (p. 26).

Pierre et al. make the point that 'simple and intuitive scales' (p. 69) should be used unless the sub-habits identified have a well-established scoring scale.

2.3 Promising practices in meta-skills

As we have reviewed frameworks it has become increasingly clear that the focus shown in creating a new framework is not yet matched by a rigorous interest in how best the framework might be implemented. Occasionally there are glimpses of promising practices, such as when reports mention the importance of pedagogy. That said, there is very little evidence of what practices have been developed to teach or embed meta-skills as a result of these frameworks.

In describing the work-based frameworks in 2.2 a number of themes relating to practice emerge. We return to these themes again in 3.1. In particular we note the importance of:

- Achieving 'buy-in' from a range of stakeholders including schools, employers, learners
- Building consensus over definitions, and the importance of focusing on ensuring a solid base of a common language (for example, the Australian Government)
- Incorporating meta-skills into work-related learning programmes in terms of teaching and learning, and assessment
- Developing clear progression frameworks, or frameworks for flexible use by different stakeholders, with clear language to be adopted with progression frameworks (for example, DigComp)
- Developing learning outcomes - statements about what a learner knows, understands and is able to do after completion of learning (Cedefop, 2009) and 'considered as crucial to make the framework actionable.' (Bacigalupo, 2016, p. 17).
- Using the framework as a basis for developing context relevant learning outcome statements
- Building exemplars for different contexts (for example, DigComp)
- Understanding the degree of context-dependency of particular meta-skills
- Considering meta skills in individual work contexts for both internal (with colleagues, superiors) and external (for example client-facing) scenarios (for example, STEP survey)
- Producing guidance notes for users such as teachers and employers (for example, Skills Builder)
- Developing frameworks for each of the meta-skills (for example, EU key competences).

The importance of pedagogy

Some of the common issues related to pedagogy arise through school- or higher-education-based frameworks. These include a focus on:

- the integration of skills into the wider curriculum or teaching context

- teachers as role models
- ethos
- the purpose of assessment,
- the need for progression frameworks for both teaching and assessment
- the need for individual teachers / trainers to reflect on the framework and 'own' it for their own context.

A paper from the World Economic Forum (2016) is one of very few examples of organisations giving detail about pedagogy. It lists a variety of learning strategies that foster social and emotional skills in children. These include providing opportunities for group work, giving constructive feedback, building in opportunities to learn from failure as seen in Figure 5:

Figure 5 – Strategies to foster social and emotional skills (World Economic Forum, 2016)

Guidance for users

An example of helpful guidance for teachers comes from University of the Arts London. Its Creative Attributes Framework is designed with a view to embedding enterprise and employability into the curriculum. The document *Guidance for Course Teams* is full of questions for teachers. For example, it asks them to draw on their own experience and

aspirations; to reflect on the framework in order to create 'a shared point of reference' for their course (UAL, no date, p. 6).

Integrating skills into the curriculum or syllabus

In terms of integrating skills into the wider curriculum, US framework 'Global Competence' is detailed in Mansilla and Jackson, where each chapter gives an 'invitation to ponder' as cues for teachers to think about what they are teaching and how they could relate it to global competencies.

A New Zealand Council for Educational Research report (Hipkins, 2017) links the New Zealand Curriculum with actions that the teacher takes in order to ensure competencies are woven together with the curriculum content. This is done through 'rich tasks' which draw together 'concepts or big ideas (from one or more learning areas', and 'appropriate aspects of all the key competencies (including the specific language, symbols and texts of the learning area)', which is to say that context matters.

Hipkins distinguishes between competencies – 'capabilities for living and lifelong learning', and capabilities which are 'demonstrated in action'. The distinction is small but significant because it is hard to focus the intended learning if we just say every key competency is in play. 'This is where the idea of capabilities can help. A *capability* is demonstrated in action. It is what the student shows they can do—and is willing to do—as a result of their learning. Capabilities remix aspects of all the key competencies and weave them together with important knowledge and skills'. (Hipkins, p. 1)

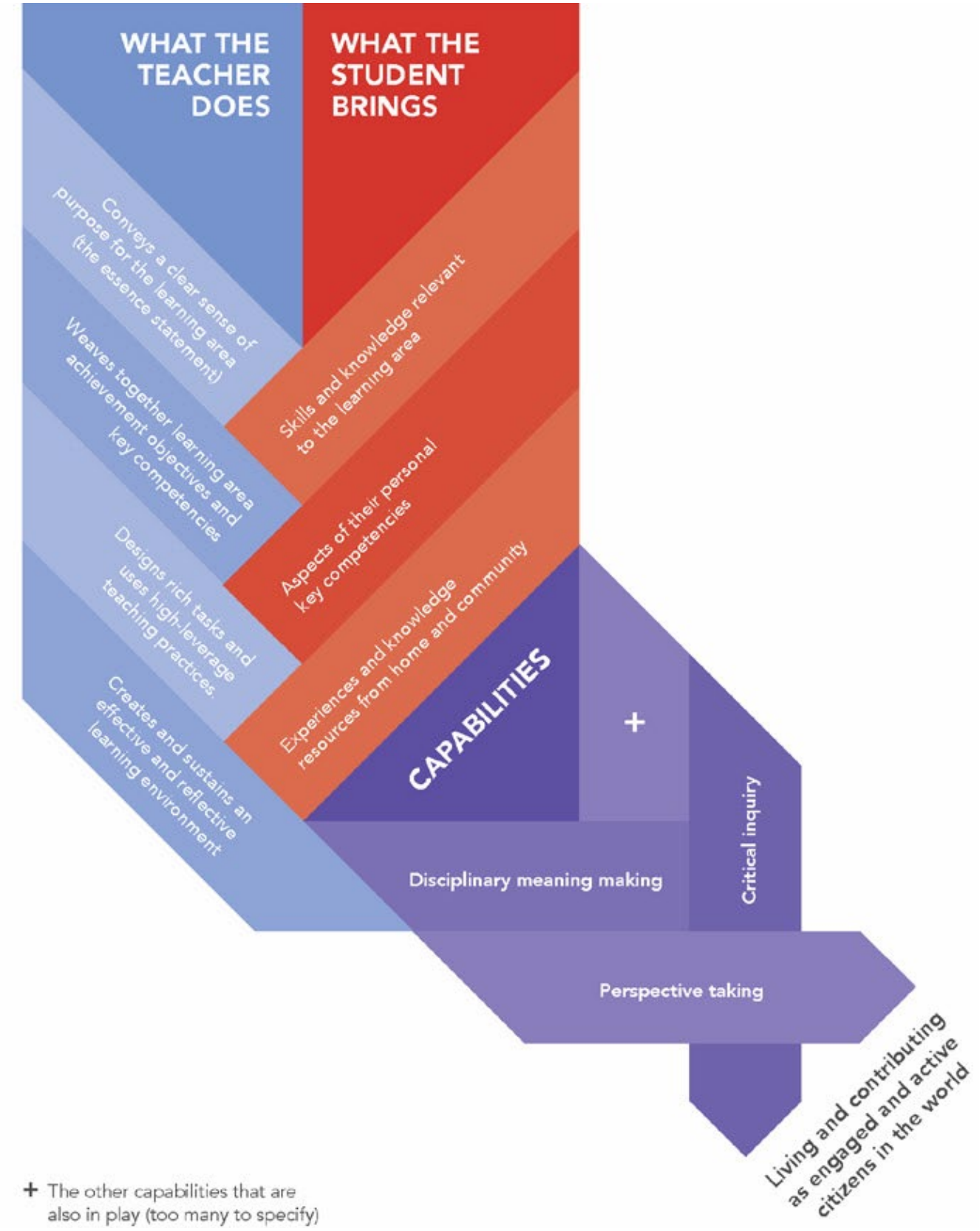

Figure 6 - Building Capabilities: Weaving a coherent curriculum (Hipkins, 2017)

Learning outcomes

Cedefop, creator of the European Qualifications Framework[19], has produced a handbook (2017) on the definition and writing of learning outcomes. It notes that the term 'competence' is widely used across Europe but that several countries substitute 'learning outcomes' (p. 31). Also that the learning or working 'context has a strong influence on the range of learning outcomes that are considered important …' (p. 31). 'Competence' tends to be associated with labour force requirements, whereas 'learning outcomes' has connotations beyond the job market (p. 31).

Competence outcomes, they argue, can therefore allow more context specificity, and so qualifications are 'competence-based' (p. 31). Learning outcomes might be written in terms of *the learner, the action, the object,* and *the context,* for example. 'Learner is expected … to take responsibility for (the action) completion of tasks in work or study (the object) adapting own behaviour to circumstances in solving problems (the context) (p. 48).

Cedefop has also conducted a number of studies that map out and analyse the use of learning outcomes for different purposes, which includes the above handbook. Two detail 'the shift to learning outcomes' (noted above), although they don't spell out shift *from what*. Presumably from mere technical skill acquisition (see p. 99). For our purposes, this confirms use of the word 'competencies' by implying the interchangeability of 'learning outcomes' and 'competence-based approach' (see p. 99).

Cedefop also suggests that, for VET curricula in Germany, considerable 'attention has been paid to the needs of meta-competences, particularly for highly technical manufacturing processes' (p. 100) – but examples aren't given. It goes on to say that 'most countries are adopting categories of learning outcomes for VET curricula that incorporate wider key competences or soft skills' (p. 100).

A Cedefop literature review (2009) covers a range of competency frameworks useful for this review. It addresses how each was derived; whether by negotiation, or research, for example. It notes that, in general terms 'outcomes-based approaches started to make a real impact from the mid- 1980s …' (p. 30). They were about improving young people's employability. Cedefop's review incorporates a number of general education examples of learning outcomes integration, including France, Sweden, Northern Ireland, and England.

A higher education example is the Bologna process (p. 32), which focuses on learning outcomes. Internationally, PISA has done much to re-focus countries on learning outcome assessments (p. 33).

Cedefop's *Typology of Knowledge, Skills and Competences* (Winterton et. al, 2006), already mentioned in the section on common forms of framework aims to clarify concepts around 'learning outcomes' used in Member States.

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[19] The European Qualifications Framework (available at: https://www.cedefop.europa.eu/en/events-and-projects/projects/european-qualifications-framework-eqf) aims to allow comparison of qualifications in 39 European countries by increasing levels (from 1 – 8) of 3 types of 'learning outcome': knowledge, skills, and responsibility/autonomy. 'Skills' does not appear to attempt to define a set of skills, but is one means of qualification comparison. Skills are either 'cognitive (involving the use of logical, intuitive and creative thinking) and practical (involving manual dexterity and the use of methods, materials, tools and instruments)' according to https://ec.europa.eu/ploteus/content/descriptors-page. This framework is not comparable to the SDS framework because it is not attempting to prioritise skills by identifying meta-skills. Its descriptors are available at https://ec.europa.eu/ploteus/content/descriptors-page

The prototype typology draws on 'fairly universal' dimensions of cognitive, functional, and social competences, as well as 'longstanding' knowledge skills and attitudes 'of the training profession' and derived from Bloom's taxonomy of learning. (p. 59). 'Meta-competence' is 'concerned with facilitating the acquisition of the other substantive competences' (p. 60).

	occupational	*personal*
conceptual	cognitive competence (knowledge)	meta-competence (facilitating learning)
operational	functional competence (skills)	social competence (attitudes and behaviours)

Figure 7 - Unified typology of knowledge, skills, and competences (Winterton et al., 2006)

The typology is suggested as a starting point for developing learning outcomes for VET so that 'educational and work-based provision can be more closely aligned, exploiting the synergy between formal education and experiential learning to develop professional competence' (p. 60).

Progression frameworks

A number of frameworks have developed progression frameworks or rubrics to accompany them. For example:

- US framework 'Essential Learning Outcomes (LEAP)' (Association of American Colleges & Universities, no date) also includes downloadable rubrics by learning outcomes.
- UK framework SkillsBuilder has downloadable 'toolkits' that include progression frameworks for its skills.
- EU digital competences 'DigComp' framework (version 2.1) expands on the 3 proficiency levels of earlier iterations to a more fine-grained eight level description with worked examples in the form of a progression framework. This describes the difference between 'foundation', 'intermediate', 'advanced' and 'highly specialised' use of digital competences looks like in practice.
- EU 'EntreComp' framework has a user guide that serves the same purpose.
- Partnership for 21st Century Learning (no date) has a progression framework for early childhood education.

System wide change

Beyond pedagogy is the call for system-wide change. In Canada at school level, C21[20] (Canadians for 21st Century Learning & Innovation) argues for a change at the core of educational practice if in order for all learners to achieve the desired competencies.

Its third publication *Shifting Minds 3.0* (Milton, 2015) proposes that a shift 'away from hierarchical policy-driven systems' is needed (p. 8). If emerging and innovative models of teaching are to become normative in schools, *Shifting Minds 3.0* proposes that what is

[20] http://c21canada.org/

needed is ‘a network of strong, responsive schools, with educators collaborating continuously…’.

Milton contrasts the ‘traditional view’ with the ‘transformative view’, arguing that the latter reflects best practice. The transformative view reflects the idea that learning is a social process. It brings in ideas of personal agency, whereby students and teachers ‘co-design’ work (p. 9). While the read-across to apprenticeships is not a direct one, the report’s focus on management of system-wide transformation could be helpful.

Fuller and Unwin’s paper (*Towards Expansive Apprenticeships*, 2008, p. 5) contrasts ‘restrictive’ with ‘expansive’ apprentices, where the latter aims to develop a ‘rounded expert’ who has dual status as ‘learner and employee’, and who participates in multiple communities of practice.

From the USA Pellegrino and Hilton (2012, p. 7) conclude that ‘development of the full range of 21st century competencies within the disciplines will require systematic instruction and sustained practice. It will be necessary to devote additional instructional time and resources to advance these sophisticated disciplinary learning goals over what is common in current practice.’

While not directly transferable to a work-related learning context, it is likely that the same degree of systematic instruction and sustained practice, additional instruction time and resources will be required. They recommend that those designing and developing the sort of instruction we are interested in should begin with clearly delineated learning goals and a model of how learning is expected to develop, along with assessments to measure student progress toward and attainment of the goals.

2.4 Findings

As part of the review we were asked to provide an overview of meta-skills frameworks and of the development practices associated with them for the Scottish context.

Overview

The evidence we have reviewed shows that there are many examples of frameworks for developing meta-skills in use across the world and that adopting a meta-skill approach is becoming increasingly common.

15 relevant work-based meta-skills type frameworks were identified. These reveal widespread variation in the conceptualisation of frameworks. Some frameworks, for example, are essentially lists of meta-skills, others, like the Scotland’s Skills 4.0, cluster meta-skills under headings of similar items, and others are organised according to their desired outcomes.

Frameworks also differ according to their intended use – adult skills, education and work, business and employability, technical and vocational education and work, with these categories often being permeable and not distinct.

Three frameworks offer particularly useful lessons for SDS – Skillsbuilder (with its active employer engagement and clarity of approach), The World Economic Forum’s approach to social and emotional skills (with its emphasis on guidance and pedagogy) and the Building Capabilities mode from New Zealand (with its coherence of roles between teacher and student, blending of content and meta-skills through ‘rich tasks’ which draw together ‘concepts’ or ‘big ideas’ from one or more learning areas).

A number of themes emerged on the importance of:

- Achieving 'buy-in' from a range of stakeholders
- Building consensus over definitions
- Focusing on teaching, learning and assessment
- Developing clear progression frameworks
- Developing statements of desired learning outcomes
- Using the framework as a basis for developing context relevant learning outcome statements
- Building exemplars for different contexts
- Understanding the degree of context-dependency of particular meta-skills
- Considering meta skills in different contexts
- Producing guidance notes for users
- Developing frameworks for each of the meta-skills.

Recommendations

As a consequence of our review of evidence we recommend that SDS might like to:

1. Produce guidance materials for those designing vocational learning programmes:

    - setting meta-skills in the context of a wider set of desired learning outcomes for life, indicating their value beyond employability
    - with clear examples of what each of the meta-skills looks like in different vocational contexts
    - illustrating through case studies what progression in the development of some of the meta-skills looks like
    - taking a small number of the frameworks described in this section and annotating them to show best practice features from which Scottish providers might like to learn.

2. Invite empirical testing of the guidance materials in settings where apprenticeships are being delivered using an action research model.

3. Meta-skills and the science of learning

In this section we bring together some of the key findings from research into learning and explore the ways in which it might be applied to meta-skills development in Scotland, especially in respect of apprenticeships.

3.1 The science of learning and best practices in meta-skills development

The science of learning, sometimes referred to as the learning sciences, is an emerging inter-disciplinary field spanning cognitive science, psychology and educational research that seeks to understand learning in all of its manifestations and contexts, how it occurs and how it can be most effective.

The focus of this review is on meta-skills development in work-based learning and so it is bounded by the kinds of content, contexts and learning desired outcomes appropriate to apprenticeships in Scotland.

Nevertheless there a wide set of methods which might be relevant for apprenticeship learning and it is not possible to do them all justice in this relatively short review, see Lucas and Spencer (2015). We have not, for example, explored specific new technology-based learning methods or specific models of adult and community learning.

Meta-skills as part of a wider framework of desirable outcomes

SDS recognises the importance of meta-skills for developing capable individuals. Meta-skills are one set of important outcomes for work-based learning programmes. Elsewhere (Lucas et al., 2012) we proposed a pedagogy for developing vocational learners such as apprentices that takes account of a comprehensive set of 'desired outcomes'. We described six desirable outcomes for vocational education, of which 'wider skills' (akin to 'meta-skills) are but one aspect. These are:

1. Routine expertise – skilled routines and the ability to carry out skilful activities to a satisfactory standard.
2. Resourcefulness – the capacity to think and act through a situation not previously encountered.
3. Craftsmanship – pride in a job well done, the highest possible standards of work.
4. Functional literacies – literacy, numeracy, digital and graphical.
5. Business-like attitudes – customer- and client-focused, entrepreneurial and aware of value for money, whether in profit, public sector, or third sector roles.
6. Wider skills for growth – the dispositions and wider skills for a lifetime of learning and change.

SDS's skills model is, essentially, an important but partial view of a broad list of desired outcomes such as this. SDS takes account of (6) with aspects of (2). wider skills for growth, or 'meta-skills', in isolation from other outcomes of apprenticeships and work-based learning programmes.

What will be important, therefore, is that meta-skills do not become detached from the other 4-5 desired outcomes in developing a coherent and ambitious pedagogy for change that SDS desires. For example, when designing learning programmes, it is vital that meta-skills are considered within the context of developing routine expertise, and functional literacies.

Many frameworks recognise the importance of another layer of skills, that they call 'functional' or 'foundational' or similar, and attempt to represent them. Whether this is a

deliberate pedagogical consideration as our own model promotes, or the result of the complexity of dealing with categories of outcome is an interesting question. How do end users of these frameworks factor in those 'foundation layers that underpin the framework' (for example, the *Cambridge Life Competencies Framework*, p. 3) alongside the 'six life competencies' that comprise the main aspect of the framework, for example? The 'can do' statements reflected in the framework's suggested progression do not explicitly incorporate the foundational layers of emotional development, digital literacy and discipline knowledge that are said to 'underpin' the competencies.

In *Teaching Thinking Dispositions* (Tishman et al., 1993) a focus on dispositions is key in developing thinking about how to inculcate the sorts of meta-skills that relate to good learning in young people. They argue that 'being a good thinker means having the right thinking dispositions'; it means being 'disposed to think creatively and critically in appropriate contexts' (p. 147). The same argument can be made for other meta-skills. The idea of dispositions ('abilities, sensitivities, and inclinations') is contrasted with a skills-centred view that sees 'teaching as transmission' (p. 148).

Pedagogy: recognising the need for a shift in pedagogy

A report for the New South Wales Department of Education (Buchanan et al., 2018, p. 3) suggests that the 'prevalent current narrative' that says educators should focus on 21st century skills, 'while superficially attractive', is insufficient for guiding policy. As argued in *How to Teach Vocational Learning*, (Lucas et al., 2012), the purpose of any education and training needs deeper thought than might first be imagined.

A focus on meta-skills has behind it a recognition that technical skills are not enough. In the case of SDS 4.0, there is the argument that citizens 'need the skills not only to cope with the change but to thrive in it … and create change for themselves' (p. 3). But the underlying purpose of this call for action is to 'enhance productivity and address potential labour market shortages' (p. 5); is 'ultimately performance and productivity' related (p. 9); aiming for 'a productive worker'; and for skills that help 'to avoid future [financial] crises' (p. 10).

Where non-productivity outcomes are mentioned, they are still in support of productivity. For example: '[improving] wellbeing, enabling individuals to be more efficient and effective workers who will drive productivity' (p. 9); and 'Confidence leads to experimentation and can support the adoption of new technologies.' (p. 11).

Another reason for focusing on meta-skills is because of its impact on learner attitudes. Although focused on early years education, Buchanan and colleagues comment that 'absence of [learning dispositions] can have lasting effects on people's willingness, interest in and capacity to learn and adapt.' (p. 3).

Care et al.'s (2018) literature review on the assessment of 21st century skills in education finds a rise in learner-centred pedagogies resulting from developments in psychology. The authors argue that the nature of 21st century skills require a 'shift from traditional pedagogies that highlight content, structure, and information acquisition to learner-centred and constructivist pedagogies' (p. 15). They also argue that content and skills require 'different teaching and learning strategies to facilitate their acquisition' (p. 16).

Teaching and learning methods

In a literature review in this area for City & Guilds (Lucas et al, 2012, p. 108) we developed a process for identifying the best learning methods that accounted for subject, desired outcomes and context, see below:

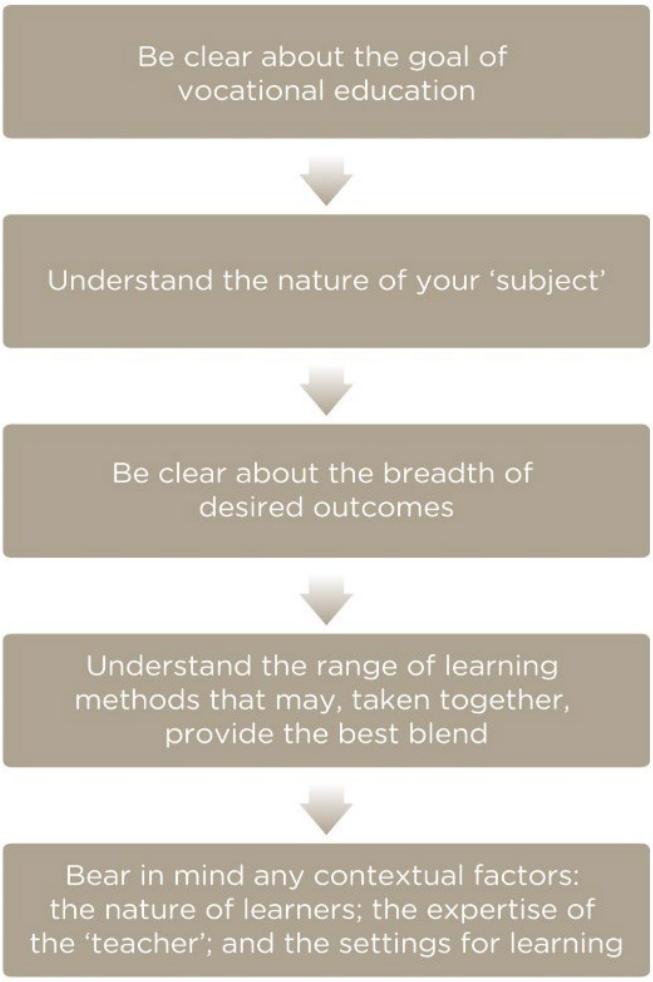

Figure 8 - The process of developing vocational pedagogy (Lucas, Spencer and Claxton, 2012)

We have also developed thinking about the kinds of 'signature pedagogies', teaching and learning methods best suited to particular vocational pathways, which seem to work best when considering the cultivation of meta-skills or capabilities (such as creativity, curiosity, critical thinking, collaborating and aspects of self-management). This was developed in the context of apprenticeship learning, and may be helpful to build on.

Such signature pedagogies include problem-based learning, playful experimentation, approaches associated with growth mindset, and deliberate practice. Figure 9 draws on earlier work in greater detail to note the kinds of learning methods which evidence suggests are most effective.

Figure 9 - Signature learning methods for apprenticeships (Lucas and Spencer, 2015)

Infusion model of skill development

Buchanan et al. (2018) argue that meta-skills 'are often best acquired in the context of mastering specific disciplinary, trade or professional expertise' (p. 4). This is well recognised. In school education, it has long been known that an 'infusion' attempt to teach learning dispositions works better than any one-off stand-alone intervention, although these are often necessary as an introduction to the concepts involved (McGuiness, 1999).

In a German context, 'vocational action competence' (Hensen et al., 2016) is a 'robust framework' for what UNESCO (Trzmiel, 2015, p. 3) calls 'transversal skills'[21]. Transversal skills can be likened to meta-skills in their intention. Hensen et al. recognise that the prefix 'vocational' in 'vocational action competence' serves to make it clear 'that these are not only general abilities but those necessary in the occupations for which training is being undertaken'.

So while there is a broad sense, in line with their name, in which meta-skills are intended to go *beyond* discrete work situations and serve individuals across all aspects of their lives, for the purposes of teaching and developing those skills, they need to be practised *within* and *in relation to* a specific vocational context.

In the German context, Hensen et al., (2016, p. 7) lays out how 'key competences', which are 'structured according to work and business processes' are promoted:

- National/regional policy documents – govern the content of training
- National/regional laws and regulations – set the framework for each training occupation
- National/regional curricula, standards and qualifications – differentiates training content at a company specific level so that 'key competences are acquired implicitly in the company in the course of working'. Framework curriculum for VET schools sets out school-based training content, explicitly mentioning individual key competences.

[21] Trzmiel maps a range of common terms used to refer to what they call 'transversal skills', which vary in their orientation from life- to work-oriented, and in-between.

Underpinning knowledge

The work-related context of competency (meta-skill) development should not be understated. Buchanan et al. (2018) cautions that for vocational education, 'greater attention needs to be devoted to giving students underpinning knowledge for a broadly defined domain of expertise to increase their capacity to adapt to changing opportunities' (p. 4). This is almost counterintuitive, but is worth bearing in mind if meta-skills are to be developed with a genuine view to their use in expanded contexts beyond an immediate narrow job focus.

Buchanan et al.'s main argument is that (in this case, Australian) government and business policy continues to promote 'skills that are allegedly universally appropriate but yet … meaningless if not anchored in domain-specific knowledge and expertise.' (p. 22)

If Buchanan et al.'s rationale is correct, this has profound implications for meta-skills development in Scotland. There is an element of domain specificity to meta-skills. The authors' example of 'a highly skilled 'problem solving' coordinator of a preschool kindergarten has little to contribute to an oil rig facing an uncontrolled fire' (p. 25) illustrates the point.

Two reports in 2018 from Canada (Royal Bank of Canada) and Australia (Buchanan et al.) converge in their recommendation that occupations clustered by skill may be a useful way forward. Highly specific training in a declining industry may prove useful to an individual provided occupation sat within a 'skills cluster' growing in demand. (Buchanan et al., p. 33). The literature in the area of job clusters is 'small but growing (p. 38).

Learning progressions

Care et al. (2018, p. 18) note that evidence for the use of learning progressions for 21st century skills has become increasingly prevalent over the last two decades. There is insufficient evidence, however, for what would count as the relevant subdivisions in 21st century skills to allow for universally accepted progression frameworks (p. 19). Concepts like the zone of proximal development, and scaffolding are helpful pedagogical ideas in this space (p. 19).

Wider capacity building

Beyond the science and psychology of learner at individual level, the issue of skills development can be considered from a societal development perspective. Very broadly, capacity building is about 'creating or enhancing a society's ability to perform specific tasks and attain development objectives' (Ohiorhenuan and Wunker, 1995). We might consider Scotland's work-based learning system as a whole here and the role it has to play in ensuring Scotland meets the development strategy outlined in *Scottish Apprenticeships: Working for the future – Our strategy for standards and frameworks.*

In a narrower sense, capacity building, can also refer 'to the process of enhancing individual skills' or to developing the capabilities of an organisation or group of organisations (Ohiorhenuan and Wunker, 1995, p. 3). In this sense, capacity building has two interconnected components: individual competencies and collective capabilities. 'Collective' can refer to the organisation itself, or to its institutional environment 'which is the set of fundamental political, social, and legal ground rules that establishes the basis for production, exchange and distribution'. (IRENA Secretariat et al., 2012, p. 5).

We suggest that it might be that only by considering the organisational benefits of developing collective capabilities that there is 'buy-in' from organisations charged with developing meta-skills that they otherwise might not prioritise. Indeed, as Fuller and Unwin (2008, p. 5) argue, if organisations develop an 'expansive apprenticeship' philosophy then

apprenticeship is 'used as a vehicle for aligning the goals of developing the individual and organisational capacity'.

The concept of capacity building, functioning at three levels – individual, organisational, and system – also highlights the need to consider the three.

- At the individual level, this would involve all mechanisms for meta skills development that involve the individual including training and informal learning
- At the organizational level, this would involve tools, processes, and management information systems
- At the system level, IRENA Secretariat (2012) tell us that capacity building (in the field of 'development cooperation', i.e. we are borrowing the concept for meta-skills) relates to 'the overall policy, economic, regulatory, and accountability frameworks within which organizations and individuals operate'. This would also include 'relationships and processes between organizations, both formal and informal' (p. 4). The authors include as a fourth category 'functioning cooperation systems' to ensure institutions have the right information.

While this perspective may be a novel body of literature to draw into thinking about individual meta-skills, the need for these skills at organisational, country, and global level, for reasons not limited to economic, makes it important to consider the system within which training organisations and companies have to act.

3.2 Findings

As part of the review we were asked to review research into learning and explore the ways in which key lessons might be applied to meta-skills development in Scotland, especially in respect of apprenticeships.

Overview

The evidence suggests that meta-skills need to be considered as part of a wider framework of vocational excellence including the development of routine expertise, building resourcefulness, pride in craftsmanship, confidence in functional literacies, acquiring business-like attitudes and developing the dispositions and wider skills for a lifetime of learning and change. SDS's skills model offers an important but partial view of a broad list of desired outcomes such as these.

Understanding about how best to develop meta-skills is not yet well researched, albeit with a sense that the nature of meta-skills calls on different kinds of pedagogies from those associated with the teaching of traditional subjects or training of discreet skills. Drawing on a range of possible methods for developing apprentices offers a broad range of options from which SDS might draw. To help those working in work-based learning a process by which appropriate methods can be selected is suggested.

In considering meta-skills development the evidence suggests that infusion models of delivery, where such skills are embedded in real work-based contexts, are likely to be more effective better than one-off, stand-alone interventions for the work-related context of meta-skill development is important.

The review touched on the idea of learning progression to which we return in more depth in section 5.

Recommendations

As a consequence of our review of evidence we recommend that SDS might like to:

1. Produce guidance materials for those designing vocational learning programmes:

- mapping the process of apprenticeship design from agreeing learning outcomes to selecting specific pedagogies
- a process for creating learning progressions for each of the meta-skills.

2. Commission the development of a teaching toolkit for those running the Scottish apprenticeships with which SDS is collaborating laying out the respective strengths of different teaching methods of the kind listed in Figure 9 with a specific focus on developing meta-skills in apprenticeships and other vocational learning.

3. Invite partners to undertake empirical testing of the different approaches to pedagogy in selected guidance apprenticeships using an action research model.

4. The role of the learner

In this section we focus on the learner as she or he follows an apprenticeship pathway. In particular we explore the importance (or not) or personal agency and co-agency in the development of meta-skills.

Over the last few decades it has become generally accepted that it is desirable to engage more authentically and effectively with learners whether in school, in college, on apprenticeships or at work. While authentic engagement is a laudable ambition, it needs tempering in the light of the age, experience, confidence, capability and expertise of the learner as well as with regard to the course content and assessment demands of any learning including apprenticeships.

4.1 Individualised approaches to learning and meta-skills development

In considering individualised approaches to learning there are two distinct bodies of research. One is individualised, or personalised instruction, which is becoming referred to as 'agency', and for which there is a growing and robust evidence base[22].

The other is 'learning styles', the now contested idea that we all learn differently.

Let's briefly deal with the second of these first. For a period in the 1990s and during the early part of this century it was widely asserted in colleges, work-based learning contexts and schools that, 'as we all learn differently, it is unrealistic to expect learners who prefer to learn, say, visually, to deal with instruction that used words' and vice versa.

In fact thorough and damning analysis of these ideas suggests that the evidence for learning styles turns out to be slight to non-existent (Coffield et al., 2014). It is worth stressing the importance of this view given that the extreme version of this belief - Visual Auditory Kinaesthetic Learning Styles – is still widely sold to learners across the world[23] and yet evidence suggest that it has little effect.

Today some colleges and learning providers still hold fast to the idea of learning styles when the learning sciences are telling us that at the heart of engaging learners is creating a culture in which their active engagement in setting challenging learning goals and receiving and acting on formative feedback is encouraged and supported (Hattie, 2009).

Agency and co-agency

Learner agency is a contested term that has arrived on the scene relatively recently; in 2014 it was cited by the New Zealand based agency CORE as one of the top ten trends in thinking about learning[24].

Learner agency tends to involve some or all of these elements:

- the choice of meaningful, authentic activities
- selecting relevant, interest-led activities
- self-initiated learning, with appropriate guidance
- influence over what and how is learned
- an active voice in the process.

[22] See https://educationendowmentfoundation.org.uk/evidence-summaries/teaching-learning-toolkit/individualised-instruction/
[23] https://www.mindtools.com/pages/article/vak-learning-styles.htm
[24] https://core-ed.org/research-and-innovation/ten-trends/2014/learner-agency/

Co-agency, a more recent term, points to the potentially more collaborative relationship that can exist between 'teachers' and learners[25].

In the OECD's *The Future of Education and Skills* (2018; p. 4) a learning framework is included as a 'work-in-progress'. The report explains learner agency and co-agency this way:

> 'To help enable agency, educators must not only recognise learners' individuality, but also acknowledge the wider set of relationships – with their teachers, peers, families and communities – that influence their learning. A concept underlying the learning framework is "co-agency" – the interactive, mutually supportive relationships that help learners to progress towards their valued goals. In this context, everyone should be considered a learner, not only students but also teachers, school managers, parents and communities.'

Figure 10 shows the relationship the various elements that go to make up learning.

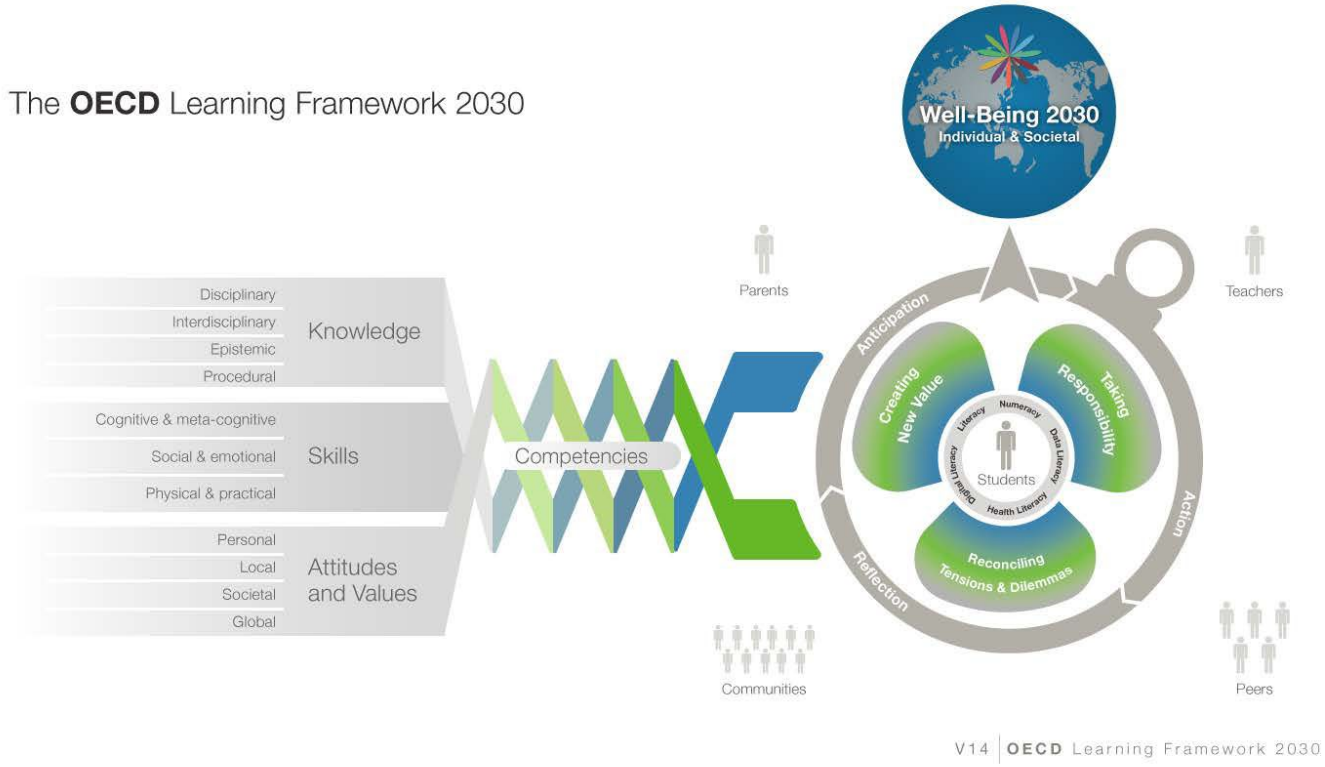

Figure 10 – OECD Learning Framework 2030

The role of the learner as agent or co-agent in navigating his or her way through their learning journey is made even clearer by the OECD by using the metaphor of a learning compass[26], see Figure 11.

[25] https://www.oecd.org/education/2030-project/teaching-and-learning/learning/student-agency/in_brief_Student_Agency.pdf
[26] https://www.oecd.org/education/2030-project/teaching-and-learning/learning/learning-compass-2030/OECD_Learning_Compass_2030_concept_note.pdf

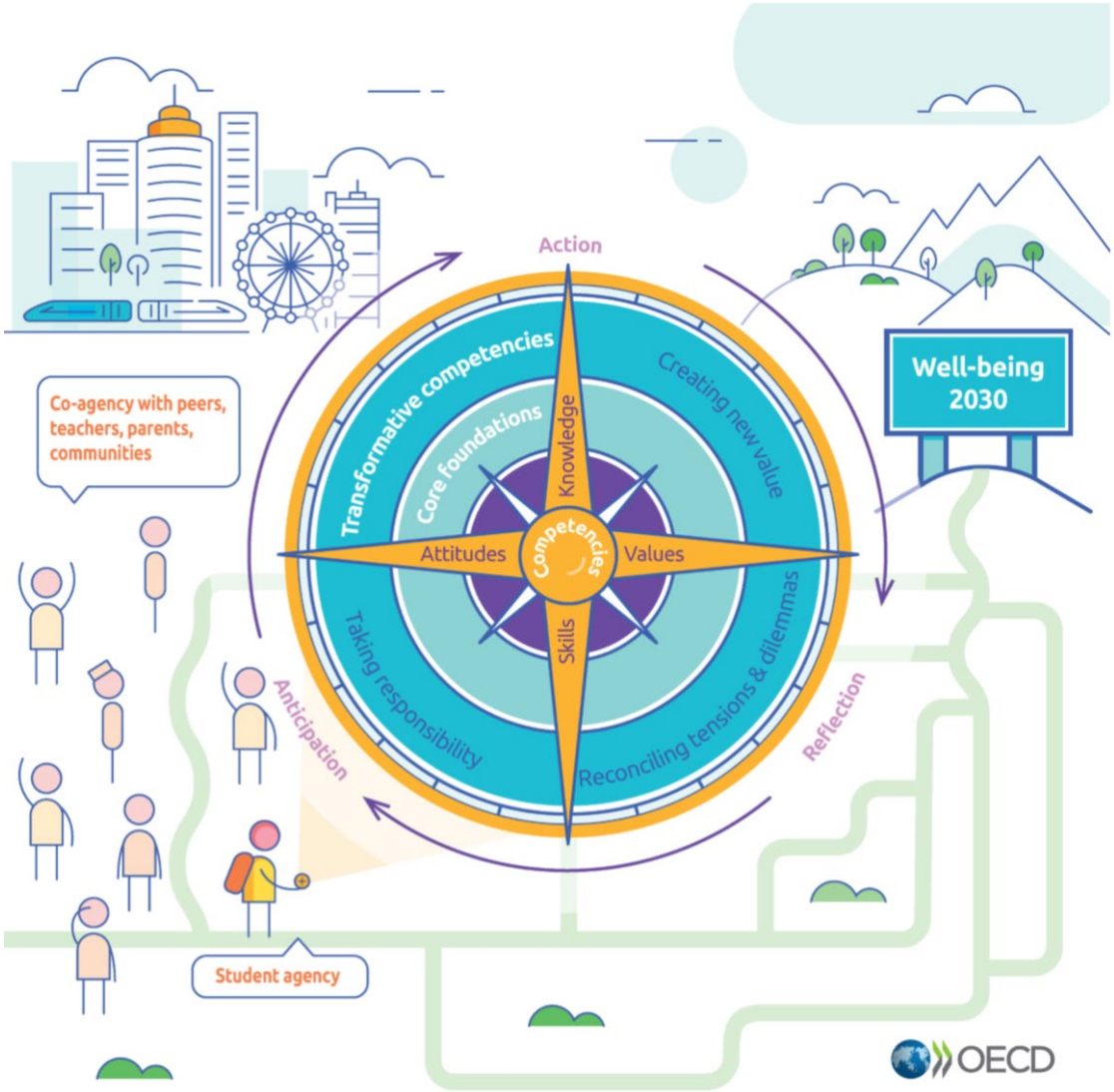

Figure 11 – OECD Learning Compass

The outer ring of the compass has four broad competences which share elements in common with the three headings of the meta-skills framework.

In a school context Furguson and colleagues share evidence about the influence of teachers in developing 'noncognitive factors' or meta-skills, (Ferguson et al., 2015). The authors distinguish between 'agency dampers' and 'agency boosters', and identify four 'agency-related factors' including attempts to focus on:

1. Growth mindset
2. Conscientiousness
3. Future orientation
4. 'Other' skills and mindsets.

The 'opposite of agency' (p. 4) are 'disengagement behaviours' that include faking effort, generally not trying, giving up if work is hard, and avoiding help. Agency is observed through punctuality, good conduct, effort, seeking help, and conscientiousness (p. 5).

In the USA there is a well-evidenced approach to agency which tends to refer to agency as 'student-led' learning (Pellegrino and Hilton, 2012) and perhaps of most relevance to a work-based setting, to 'student-engaged assessment' (Berger et al. 2014). Berger and colleagues suggest a range of authentic kinds of student-led assessment – simple ways of checking understanding, critique and feedback, student-led conferences, exhibitions with expert feedback, presentations, portfolios and so on, very much the kinds of activities which would sit well in apprenticeships.

The UChicago Consortium on School Research (Nagaoka et al., 2015) identify agency as one of three 'key factors' likely to lead to success from childhood through to young adulthood; the other two are competencies and integrated identity. T

The report defines agency as:

> '…the ability to make choices about and take an active role in one's life path, rather than solely being the product of one's circumstances. Agency requires the intentionality and forethought to derive a course of action and adjust course as needed to reflect one's identity, competencies, knowledge and skills, mindsets, and values.' (p. 2)

Learners at the heart

UNICEF (2017, p. 19) argues that low performance in international standardized learning assessment is a reflection of 'traditional teaching and learning approaches, which persist at the expense of student-centred pedagogies'.

In a school context, in an Edge Foundation Future Learning report McGrath and Rogers (Rogers et al., 2019) recognise the common perception that development of '21st Century skills' requires approaches to learning 'that place learners at the heart of the process' (p. 9). More evidence than is provided in this report is needed for this perception to be validated. But the authors helpfully compare three models of how knowledge and skills are balanced in the school curriculum: knowledge-led; skills-led; and knowledge-engaged. Their conclusion is that the latter (which 'sees skills and knowledge as intertwined: a certain degree of knowledge needs to be delivered before a skill can be demonstrated…' p. 9) 'can produce high-level, transferable skills that can be applied to real world issues.' (p. 13).

But what does 'placing students at the heart of the curriculum' (p. 13) mean? And what might it mean in a work-based learning context? It seems to be about enabling students 'to drive or navigate the learning experience' (p. 9). For the authors, this is seen when students learn by 'engagement in real research projects, or projects which replicated the process of research in their discipline' (p. 10). A student-centred approach 'often begin[s] from an inquiry-based approach' and enables 'an element of child and autonomy in their studies' (p. 9).

While teaching and learning programmes that implement these kinds of interventions tend to be well-received by learners, the authors report that 'notwithstanding these positive results, research that looks at a student-centred approach can have mixed outcomes' (p. 10). One report they cited found that 'teacher instruction had been more effective when deeper level learning was assessed'. (p. 10).

Besides the lack of evidence for the genuine learning benefits of a student-centred focus, a main issue that arises from the report is that where skills and knowledge are both the focus, there need to be appropriate opportunities for evidencing skill development. The authors cite the Skills Builder tool (see 2.2) as widely cited for use 'throughout the school years' (p. 10) in this regard.

On the whole, it is generally understood that teachers need considerable support to be able to implement approaches like inquiry-based or project-based learning, particularly if the downsides are to be avoided. A learning environment where students are 'engaged' does not necessarily mean learning is happening.

For UNESCO (Roegiers, 2016), reporting on a conceptual framework for the assessment of competencies (albeit within schools), 'there is general agreement' that 'it is the learner who is the actor of his or her learning process' (p. 11). Roegiers claims that learning depends 'essentially on the cognitive mobilization of the learner' (p. 11). This means that learners 'must take an ever more active role in their learning processes as often as possible' through such learning activities as 'group work, online research, surveys, projects, and so on'.

UNICEF (2017, p. 80) suggests that 'personal empowerment is key' in areas of learning that involve life skills. It repeats its 2016 principles of learner-centred education, which are:

- Every learner is engaged;
- A variety of learning materials is in use;
- Democratic processes and relations are present in the classroom;
- Equitable and inclusive learning environment;
- Physical environment conducive to learning;
- Provision for self-paced and individualized learning;
- Opportunities to learn through different modes;
- Meaningful learning oriented activities;
- Scope for higher-order thinking and critical questioning;
- Continuous assessment integrated with the learning process;
- Contextualization to learners' everyday life; and
- Attention to holistic all-round development.

By way of rounding off this section it is worth noting advice from Schoon (2018):

> 'However, agency does not mean that individual behaviour is unfettered by external constraints, i.e. that individuals do whatever they want. Individual behaviour is embedded in a wider social context that is not completely determined by the individual. It is shaped by social structures and institutions, social norms and expectations, unforeseen events, including unexpected and unintended consequences of one's behaviour.' p.5

4.2 Agency and co-agency in the development of meta-skills

The evidence of the value of student agency or co-agency comes from a wide variety of sources and phases of education. There is no reason to believe that it is not of relevance to the development of meta-skills at school or in work-based settings.

Indeed some of the skills – integrity, feeling, collaborating, sense making, curiosity and critical thinking seem well-suited for an explicit focus on learner agency and co-agency.

We found no specific examples of agency or co-agency in practice but, in the work of Scotland's Centre for Work-based Learning's Pedagogies for Work-based Learning Project[27] there are some clear suggestions about key elements of the way learners are treated such as:

- Creating space for the learner
- Being collective and facilitative
- Having reflective practitioners, and
- Being fair, empathetic and patient.

Figure 12 – A wider collaborative approach, Centre for Work-based Learning

4.3 Findings

As part of the review we were asked to explore the role of learners as they follow an apprenticeship pathway, reviewing the roles of agency and co-agency in the development of meta-skills.

Overview

The evidence reveals growing interest in learners taking a more proactive role in their learning journeys. In thinking about this shift the terms 'agency and, to a lesser extent, 'co-agency' are being used by organisations such as the OECD to describe these changes.

In a school context there is evidence that, when thinking about the development of meta-skills it may be helpful to consider 'agency dampers' and 'agency boosters', and identify four 'agency-related factors' which include seeking to develop growth mindset, conscientiousness, future orientation and other useful skills and mindsets. UNICEF has suggests that low performance is a reflection of traditional teaching and learning approaches, which don't seek to develop student agency. Similarly the Edge Foundation suggests that the development of meta-skills requires approaches that put the learner at the heart of the process.

[27] https://www.centreforworkbasedlearning.co.uk/what-we-do/research/learner-journey/pedagogies-for-work-based-learning/

At this stage, however, much of the thinking about agency and co-agency remains at the level of descriptions of the desirable democratisation of learning in today's world; it does not carefully consider its relationship to the vocational programmes and their demands of their assessment methods and the practices have not been evaluated..

We did not find specific examples of agency or co-agency in practice.

Recommendations

As a consequence of our review of evidence we recommend that SDS might like to:

1. Invite those running apprenticeships to explore different ways of more actively engaging with learners drawing on ideas from UNICEF and the Centre for Work-based Learning and develop case studies arising from these.

5. The evaluation and assessment of meta-skills development

In this section we look first at existing approaches to the evaluation of meta-skills frameworks and then survey approaches to the assessment of meta-skills in order to understand more about how existing processes might be of use in meta-skills development in a work-based setting.

There will inevitably be some overlap in the methods used in evaluating the delivery of meta-skills, often seeking to provide a broader picture across an institution/region or according to a particular framework, and those used to assess progress by individual learners.

5.1 Existing frameworks for the evaluation of learning in meta-skills

By evaluation of learning we mean the extent to which the desired outcomes for any learning programme or intervention have or have not been met in the development meta-skills in its learners.

A spectrum of evaluation models

In evaluation and assessment generally there is a palette of different approaches which, broadly speaking, sit in a spectrum between quantitative and qualitive judgments.

For example, in the USA, Darling-Hammond (2017) produced a report for the Council of Chief State School Officers that looked at the development and measurement of 'higher order skills' in the context of developing models for state performance assessment systems in schools. The report identified four models for integrating performance-based components into school assessment systems. These models have been used successfully 'at scale in states and nations around the world' (p. 1). Combination of models is possible, and the models include:

- Tests that include performance items or tasks. These might be essay and inquiry tasks, or computer-based simulation tasks
- Curriculum-embedded performance assessments. These might include final projects and exhibitions.
- Portfolios / collections of evidence.
- Comprehensive assessment systems.

Darling-Hammond points out that traditional multiple-choice tests are inadequate for measuring higher order-thinking skills. The context is that tests in the US focus almost exclusively on testing recall of facts, and states have now been given greater responsibility in designing their own tests as well as the incentive to innovate through the opportunity to pilot approaches. At the same time, developments in understanding of what 'learning' means have broadened out ambitions for what needs to be developed and, so, tested.

Behind the language of 'performance assessment' is the recognition that what is being assessed needs to be done so in a way that emulates the context in which it is to be applied.

She places assessments on a continuum, Figure 13:

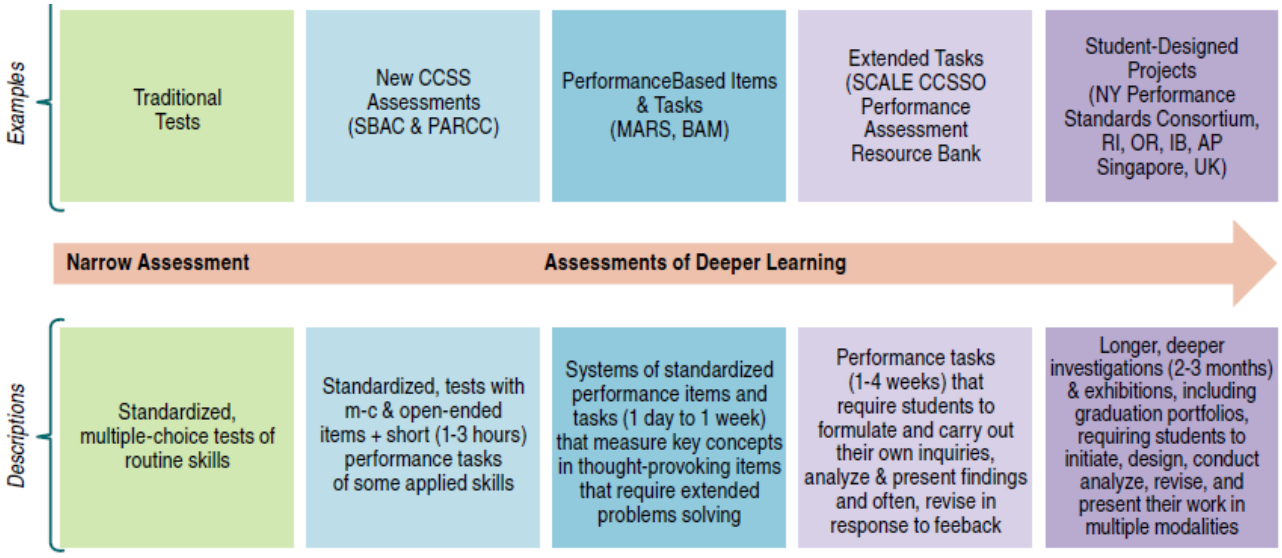

Figure 13 - Darling-Hammond 2017 Assessment continuum

More specifically looking at meta-skills, Heather Branigan's (2017) report for SDS recognises four types of evaluation:

1. self-report
2. report by others
3. behavioural assessment / task
4. multi-method approaches.

These would naturally lean towards the right-hand ('deeper learning') end of Darling-Hammond's continuum because of the link (implicit in the progression upwards in Bloom's taxonomy) between meta-skills and deeper learning.

Similarly Carr and Claxton (2002) have explored the tracking of the development of learning dispositions (broadly another synonym for meta-skills). They list a number of existing methods which they evaluate against a number of criteria: practicability, validity, flexibility, reliability, and formative value. The methods are:

1. dynamic assessment
2. customised challenges
3. learning stories
4. self-report questionnaires
5. learning logs.

The authors conclude that 'no single method is adequate on its own' (2002, p. 9). They argue for the development of instruments and approaches that bring these methods together. They offer two tools: the 'learning disposition grid' and the 'learning disposition portfolio'.

5.2 Existing approaches to assessing meta-skills

By assessment of meta-skills we focus on the degree to which the desired outcomes associated with any meta-skill have been achieved.

In work-based learning and apprenticeships a significant portion of any evaluation will be task or project based and focused on knowledge and skill acquisition as judged by an expert observer. But within apprenticeship learning the evaluation of meta-skills, the focus of this section, is a more complex task.

Learning progressions

Learning progressions are a relatively recent idea in learning and assessment (Shephard, 2018). In a subject discipline sense learning progressions are 'descriptions of successively more sophisticated ways of reasoning within a content domain' (Smith et al., 2006, p. 1). They are different from curriculum scope and sequence charts in that they call for both conceptual analysis and empirical testing of imagined developmental pathways. In other words they are not simple progression ladders but seek to describe how learners actually progress in the real world.

But whereas in, say the development of literacy or numeracy we have a pretty good idea as to how the development of learning takes place, when it comes to meta-skills we do not. Much less is known.

The Brookings Institution has suggested that learning progressions offer promising ways of assessing meta-skills and their ilk:

> 'A first step is to understand how these transferable skills develop. The concept of learning progressions addresses this step. Learning progressions describe how the skills might be demonstrated, both in their early forms and in increasingly advanced forms. It is critical for teachers to be able to identify the behaviors that relate to these skills if they are to intervene at the appropriate levels of challenge.'28

The development of learning progressions for each meta-skill may, as the Brookings Institution suggests, offer a realistic way of both better understanding how they might be demonstrated and, at the same time, improved understanding of teaching methods to develop them.

Meta-skills frameworks that refer to assessment

Some (but not by means all) meta-skills frameworks refer to assessment methods; here we provide some brief details of these. Where we have not previously detailed a framework this may be because it is school-based.

ATC21S

Assessment and Teaching of 21st Century Skills (ATC21S) at the University of Melbourne 'to accelerate global education reform'[29]. Although school-based, it is an example of an employer-led attempt to prepare students for 21st century employment by defining and measuring 21st century skills in new ways. It began in 2009 with the selection of 250 researchers worldwide (Australia, Finland, Singapore, USA, Costa Rica, and The Netherlands) working on five different areas: defining the skills, methodological issues, technological issues, classrooms and formative evaluation, and policy frameworks and new assessments. It has published a significant volume of White Papers[30] and a significant

[28] https://www.brookings.edu/blog/education-plus-development/2018/03/27/learning-progressions-pathways-for-21st-century-teaching-and-learning/
[29] Information at: http://www.atc21s.org/about.html
[30] Available at: http://www.atc21s.org/project-papers.html

handbook, *Assessment and Teaching of 21st Century Skills,* (Griffin et al., 2012). ATC21S has 'introduced innovative assessments along with teaching and learning resources to help students develop 21st-century skills'[31]. The assessments have been trialled in schools, and empirical progressions for collaborative problem solving created.

Chicago Public Schools Employability Assessment (EA)
Chicago Public Schools has its own tool, created by the Chicago Workforce Investment Council after extensively researching industry, education and academic reports on career readiness. An 'employability assessment', the tool measures behavioural skills required for college and career success. The CPS EA claims to be different from other products because it involves the student's skills being observed by an instructor or employer, rather than self-assessing, which is a typical approach. The tool includes Online Assessment Scoring and Rubric[32].

Deeper Learning
Similar in its aims to ATC21S, Deeper learning is corporate led. It is the Hewlett Foundation's programme for spreading a concrete set of skills across young people in the US, through high schools and beginning in 2010. A comprehensive evaluation of the strategy six years later (Warkentien et al. 2017) [33] found that assessment of competencies was the biggest issue. The report identified significant investments being made by the Hewlett Foundation and others to understand how to assess deeper learning competencies that aren't currently measured well (for example., learning to learn.).

DigComp
The European Digital Competence Framework provides a clear progression (Carretero et al., 2017) with worked examples. DigComp 2.0 has an interesting way of indicating progression in the development of digital skills more broadly. A swimmer is imagined making their way in a digital ocean with progression described in generic terms from level 1 (simple tasks, with guidance, remembering) to Level 8 (Resolve complex problems with many interacting factors, propose new ideas and processes to the field, creating)[34], see Figure 14.

[31] Information at: http://www.atc21s.org/about.html Information on the prototype assessments is no longer available on its website, but are available in two publications cited here: http://www.atc21s.org/prototypes-of-assessment-tasks-for-the-21st-century.html
[32] http://stelar.edc.org/instruments/cpscwic-employability-assessment and http://stelar.edc.org/sites/stelar.edc.org/files/Employability%20Assessement%20%28EA%29.pdf
[33] Available at: https://hewlett.org/deeper-learning-six-years-later/
[34] https://ec.europa.eu/jrc/en/science-update/new-digcomp-report-develops-proficiency-levels

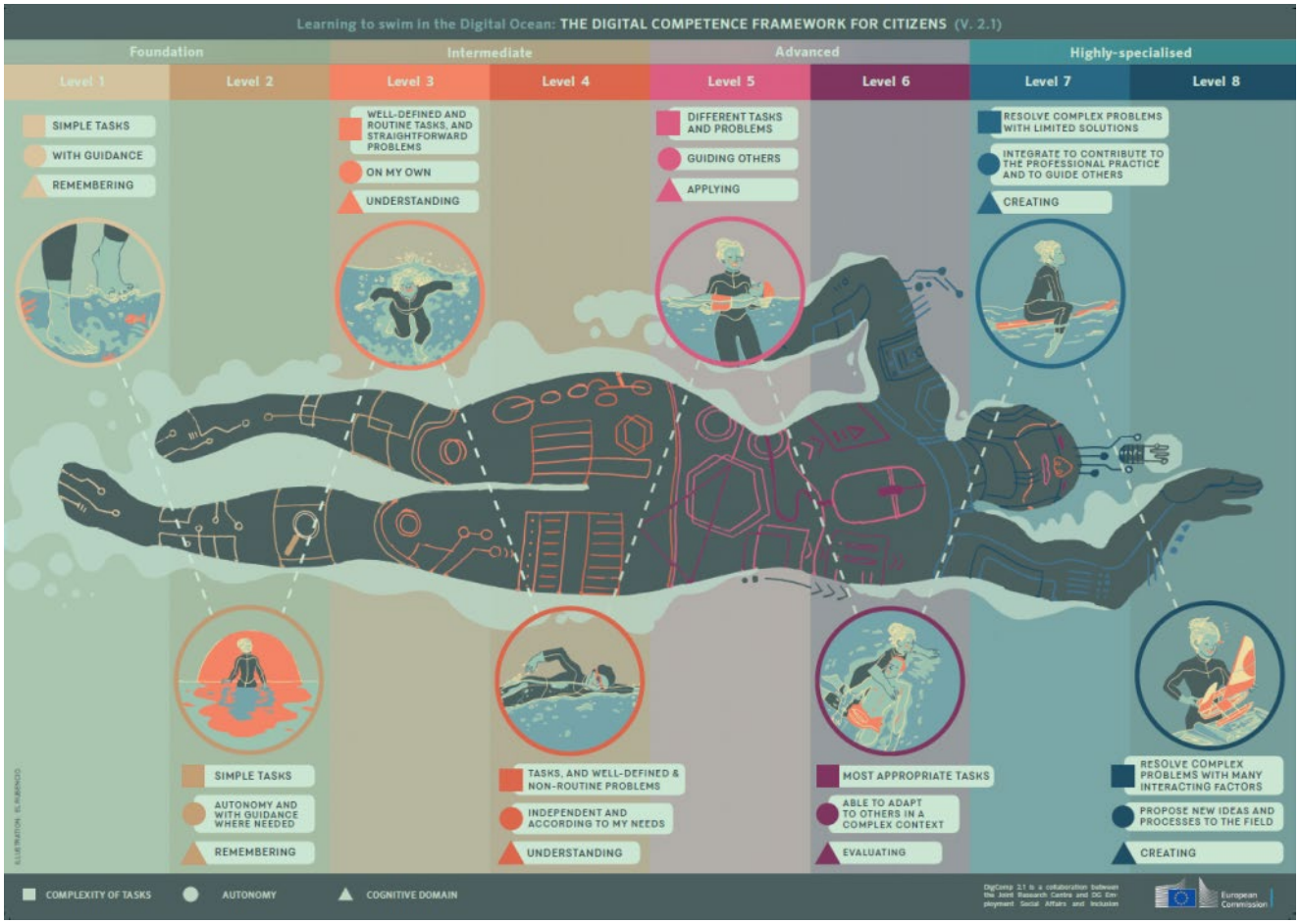

Figure 24 - The DigComp model of progression in digital skills

Global Competence

EdSteps, funded by the Gates Foundation, is the Council of Chief State School Officers project to define and address competences (Council of Chief State School Officers, 2013). Mansilla and Jackson (2011) give examples of how particular pieces of work demonstrate each of the global competences, but evaluation of learning is implicit rather than explicitly dealt with. They use phrases like: 'The children [demonstrate the competency] *investigate the world* ... [as] their drawings exhibit a beginning sense of spatial geography' (p. 15). Throughout the report, the examples of competences in action are led with 'how do these students demonstrate their capacity to ...? and rich qualitative discussions follow. Good teachers know how to draw inference about skills from a piece of evidence, and a series of rubrics help ensure a clear approach.

The rubrics are given to describe what each of the four global competences look like in general, in the arts, in English language arts, in maths, in science, in social studies, and in world languages.

This report offers some principles for assessment, which are generalisable to all meta-skills:

- The need to focus on the competence in question. Teachers (and we could expand this to trainers, employers, coaches) 'have multiple goals when assessing' learning (p. 65). The simple step of ensuring that the competence in question remains in focus should not be overlooked.
- The need for ongoing assessment. The authors point out that those who know a learner; be they a sports coach, theatre director, teacher – or, for our context, a

trainer – 'are rarely surprised by the final performance of a student' (p. 65). This is because they 'assess' informally, as well as formally, over time. With meta-skills, whose development is 'demanding and involves higher order thinking' it is important that

- Learners are monitored and supported
- 'Quality assurance' happens upfront: teachers dialogue with learners to develop an understanding of their assumptions and possible areas of misunderstanding.

- The need for informative feedback. A general grade is insufficient. As for any other type of learning, learners need specifics about what went well and needs improving. 'Explicit criteria and rubrics' are needed if trainers and learners are to reflect on work and 'orient further learning' with the meta-skills in mind.
- The need for multiple points of view. Feedback from all stakeholders can be useful: from the learner themselves, to experts, peers, and – perhaps for the case of apprenticeships – communities of practice and customers.

Jubilee Centre Framework for Character Education in Schools
Jubilee Centre for Character and Virtues (no date) suggests three 'legitimate purposes' (p. 10) of evaluation in the area of character education - and some approaches:

1. Evaluation of how the culture / ethos of a school contributes to character education (this could apply to work / vocational context). Schools can self-audit or peer-audit.

2. Evaluation of the effectiveness of a character education strategy or approach. Can use pre- and post-intervention surveys, observations, interviews with teachers and students. Suggests only one or two virtues are targeted. Advises triangulation.

3. Reflection on 'personal' character and virtues undertaken by students. Students can record in a journal; evidence from peers, teachers, and parents

Skills Builder Framework
The Skills Builder Partnership has produced a *Skills Builder Employers Toolkit*[35] One of the main principles of Skills Builder is that skills need to be measured. Doing so helps ensure skill-building activities are pitched at the right level to enable progress to be made.

The Toolkit mentions the idea of carrying out assessments at both beginning and end of longer programmes.

STEP Employer Survey
This paper (Pierre et al., 2014) is concerned with developing innovative tools for assessing skills. It contributes little to the understanding of assessment of meta-skills, but measured socio-emotional skills using personality traits, behaviour, and preferences, contrasted with cognitive skills that were measured using self-repots, and direct reading assessment (p. 11).

The National Work Readiness Credential Profile
This uses a web-based assessment using real-world scenarios in 4 modules

1. situational judgment
2. oral language

[35] Available at: https://www.skillsbuilder.org/toolkit-employers

3. read with understanding
4. use math to solve problems.[36]

Transversal Competencies (UNESCO Bangkok framework)
This report (Care et al., 2019) focuses on education in particular and discusses the issues of measuring social skills in that context. It raises a number of issues:

Firstly, how to define transversal competences consistently. Secondly, the issue of how skills might be developed and assessed is a 'considerable issue' (p. 32). The report explains why behaviour is not a clear indicator of skills, giving the example of using completion of a long essay to signify perseverance. The third issue is that some school subjects lend themselves more easily to teaching, learning and assessment of particular transversal competences. The same will no doubt be true in certain vocational settings.

UNICEF Conceptual Framework for Life Skills and Citizenship Education in Middle East and North Africa (MENA)
UNICEF's life skills and citizenship framework comprises 12 core life skills. Continuous assessment is one of its main teaching and learning principles, and there will be variation in methods of assessment for different skills. Part of the LSCE Initiative involves the 'development of an evidence-based assessment methodology and toolkit to measure the 12 core life skills' (p. 11) that allows a 'standardized approach to be adapted for localized interventions'. Chapter 3 of this report outlines a 'three-pronged monitoring and evaluation strategy' (p. 13).

As well as the lack of student-centred pedagogies in countries that perform low in international standardize learning, UNICEF argues that poor performance 'is further amplified by poor assessment methods' (p. 19).

Work Ready Now
Work Ready Now![37] is a 'customizable, standards-based work readiness curriculum' programme that incorporates soft skills assessment tools. The Work Ready Now! assessment from the Education Development Center (EDC) aims to test youth in developing countries for the skills and attitudes that demonstrate work readiness. The test is designed to complement P21 and Australia's ATC21s framework.

A small initial study found the test had statistically significant predictive validity[38]. To test young people's 'credentials' it used a combination of situational judgment and knowledge-based test items. Focused on non-cognitive skills 'such as teamwork, problem solving, and customer service' (p. 1)

Assessment of *specific* meta-skills

Within the SDS meta-skills there are three groups of four meta-skills. Here we look at one from each of the 3 categories of meta-skill: 'adapting' (self-management), 'collaborating' (social intelligence) and 'creativity' (innovation) to find commonalities and suggestions for best practice.

[36] Information at: http://www.workreadiness.com/nwrcred.html
[37] Information at: https://www.edc.org/work-ready-now-wrn
[38] See:
https://www.edc.org/sites/default/files/uploads/WRN%20Credential%20Study%20Akazi%20Kanoze%20Fall%202015.pdf

Adapting
This skill includes sub-habits of openness, critical reflection, adaptability, self-learning, and resilience. We address openness, and resilience here.

Openness is one of the 'Big five' personality traits. It has provoked extensive debate in terms of its labelling and naming. DeYoung et al. (2014, p. 47) tell us that until recently, there was a lack of instrument capable of measuring 'openness' and 'intellect' as distinct traits. When psychologists talk about intellect here, they are describing a tendency to think in a certain kind of way:

> The psychological function that appears to be common to all of the traits encompassed by the Openness/Intellect factor is cognitive exploration … Individuals high in Openness/Intellect display the ability and tendency to seek, detect, comprehend, and utilize more information than those low in Openness/Intellect. (DeYoung et al., p. 46)

Relatively fixed, there are validated scales for measuring openness. While extraverts score higher in openness than introverts, both can develop their openness to experience and neither should be limited to particular responses to situations that their psychological make-up would tend them towards favouring.

Resilience can be developed, and attempts to measure it psychometrically have been made. A review of 19 resilience measures, identified systematically, showed concluded that 'the conceptual and theoretical adequacy of a number of the scales was questionable' (Windle et al., 2011, p. 1). Three scales: the *Connor-Davidson Resilience Scale*, the *Resilience Scale for Adults*, and the *Brief Resilience Scale* scored highest.

Resilience means different things in different contexts It is a widely used term in the development literature, where Quinlan et al. (2015) chart its differing definitions across domains from engineering, ecology, social-ecology, social, development, socioeconomic, community, to psychological. It is this last one that is of interest to SDS.

Biggins et al. (2018) approach the development of resilience in learners in unusual way: first targeting teachers in order that they might 'learn and embed the constructs in their own lives, as well as share with students'. They propose use of a 'learning journey' that details 'specific evidence-based activities' that target aspects of resilience and could be used in training sessions. This material[39] could add to SDS's understanding of best practice for development of meta-skills. Where buy-in from organisations has been an issue, perhaps it could be helpful to first trial the meta-skills development with those would be trainers.

In terms of assessment, Biggins et al. advise 'baseline measurements' before commencement of the learning journey; and repeated at termly intervals. They recommend and link to a number of both summative, and formative, assessment options. The purpose of choice is that organisations can select measures that are appropriate for them. Formative approaches are 'tangible', and allow the celebration of 'milestones and achievements' (p. 43).

Collaborating
Two approaches to assessing collaboration in an organisational context (namely, the 'evaluation of coalitions funded to pursue social objectives' p. 322) are noted by Greenwald and Zukoski (2018). These are: to gather perceptions or satisfaction ratings of coalition members; or to focus on 'concrete activity'. The latter is concerned with outputs. The context for this paper is organisational, not individual, collaboration. Nevertheless, these two

[39] Report available at:
https://repository.upenn.edu/cgi/viewcontent.cgi?article=1021&context=mapp_slp

categories of evaluation are useful to think about. The authors note the existence of a series of evaluation tools for addressing perception of coalition members.

In terms of assessing output, web-based technology allows teams to collaborate on projects in such a way that it is possible to track who has contributed what to the project. But assessing 'collaboration' by volume of work submitted is merely a proxy and does not show how well an individual works with others.

Whatever the components (sub-habits) of 'collaboration', rubrics can be developed to describe what this looks like. Muir has produced one that describes four sub-habits (such as group communication) using progression descriptions from 'undeveloped' to 'advanced'[40]. Borden and Perkins (1999) provide a similar self-evaluation tool but using a Likert-type scale ('strongly disagree' through to 'strongly agree') for 12 sub-habits of creative thinking. The rubric is likely to be the more useful tool because it describes behaviour at different levels of competence rather than just stating the idealised (i.e. advanced) behaviour.

Creativity

The study of creativity has a 70 year history. For at least the last 30 years there has been convergence in thinking that creativity is about both originality and effectiveness, which is to say that creativity must lead to something of value to be 'creative'. A five-dimensional framework for understanding and assessing creative thinking was developed at the University of Winchester in 2012 and is used in schools across 27 countries from Australia to Norway.

Figure 15 Creative thinking framework - Lucas et al. (2013, p. 18)

[40] Example rubric available at: https://mailchi.mp/trevormuir.com/collaboration-rubric

In 2021 PISA[41] 2021 will for the first time assess creative thinking after three year's of development work and field trials (OECD, 2019a).

In 2013 the Asia Society's Global Cities Network[42] undertook an extensive review of approaches to measuring 21st century competencies (meta-skills) and listed various approaches including:

Multiple choice, self-report questionnaires, computer-based items, open response tasks, portfolios, simulations.

At the practical level we have identified promising practices in the assessment of creativity from across the world, see Table 1.

Pupil	**Teacher**	**Real-world**	**Online**
Real-time feedback	Criterion-referenced grading	Expert reviews	Reliable, validated online tests
Photos	Rating of products and processes	Gallery critique	Digital badges
Self-report questionnaires	Structured interviews	Authentic tests eg displays	E-portfolios
Logs/diaries/ journals	Performance tasks	presentations, interviews	
Peer review	Capstone projects	podcasts	
Group critique		films	
Badges		Exhibitions	
Portfolios			

Table 1 - Approaches to assessment of creativity in education (Lucas and Spencer, 2017)

5.3 Evaluating and assessing meta-skills development in a vocational context

In terms of approaches to evaluation there are a number of approaches listed on 38-43 from which those working in work-based learning might draw.

In terms of practical classroom assessment techniques, although many have emerged from a school setting, there is ample food for thought for those, for example working with SDS on apprenticeship pilot programmes to pilot activities.

Key messages from the Global Cities Network research (p. 38) are listed below and could easily be adapted.

Key Takeaways from an Investigation of Available Measures of 21st Century Competencies

1. The process of selecting an assessment should begin with a determination of what purpose the assessment is intended to serve.

[41] PISA is the OECD's Programme for International Student Assessment. It measures 15-year-old's ability to use maths, reading, science, and an 'innovative domain' – 'creative thinking' in 2021 – to meet real-life challenges. Policymakers take the PISA rankings seriously and changes are made to education systems as a direct result of these.

[42] https://asiasociety.org/files/gcen-measuring21cskills.pdf

2. Tests that will be used to make consequential decisions need to meet higher technical standards than tests that are used for lower-stakes decisions.

3. The cost of assessment (both expenditures and time) should be weighed against the value of the uses it will serve.

4. More-complex assessments may be needed to measure more-complex competencies.

5. Innovative assessments (involving simulations, remote collaboration, etc.) can require substantial time and resources (e.g., training, computing power, telecommunications infrastructures).

6. 21st century competencies cannot be measured equally well, and competencies that are not well defined are particularly difficult to measure.

7. If the desired assessments do not exist, districts can work with partners to develop them (partners can include other districts, researchers, and assessment organizations).

8. Context and culture matter, and assessments that work in one setting might not work as well in another. It is often necessary to conduct additional research to validate measures locally.

9. Acquiring information about students' understanding of 21st century competencies can make educators and students more intentional about improving the competencies.

10. Educators (and learning scientists) do not know as much about teaching and learning 21st century competencies as they do about teaching traditional academic content, so expectations for improvement need to be realistic.

11. Assessments can have unintended consequences, which should be monitored in each local context.

12. Measures of 21st century competencies should be part of a balanced assessment strategy.

5.4 Findings

As part of the review we were asked to look at existing approaches to the evaluation assessment of meta-skills in order to understand more about how existing processes might be used in Scotland.

Overview

We found a number of evaluation models and have described the range of methods these use in evaluating meta-skills including one by Darling-Hammond looking at the development of 'higher order skills' in the context of developing models for assessment in schools. This approach to evaluation includes performance items or tasks, performance assessments in the curriculum. These might include final projects and exhibitions, portfolios of evidence and a comprehensive assessment system. An internal report for SDS (Branigan, 2017) similarly recognises four types/levels of evaluation with regard to meta-skills - self-reports, reports by others, behavioural assessment tasks and multi-method approaches.

Of particular interest we noted the growing interest in learning progressions as a means of better understanding how, in reality, meta-skills are cultivated.

We have described examples of assessment approaches for some of the frameworks we listed earlier in 2.2. and offered examples of different assessment techniques relevant to various specific meta-skills. These we have illustrated these with examples for Adapting, Collaborating and Creativity. For the latter two examples: PISA's test of Collaborative problem-solving in 2015 and its planned test of Creative Thinking in 2021 have and will help to raise the status of these meta-skills and how they can be taught and assessed. We described our own work in mapping a growing range of assessment techniques with regard to Creativity.

The Global Cities Network has helpfully summarised 12 helpful, evidence-based principles for considering the assessment of meta-skills. Of these, four seem particularly relevant to the SDS context:

1. The process of selecting an assessment should begin with a determination of what purpose the assessment is intended to serve.
2. More-complex assessments may be needed to measure more-complex competencies.
3. Context and culture matter, and assessments that work in one setting might not work as well in another. It is often necessary to conduct additional research to validate measures locally.
4. Measures of 21st century competencies should be part of a balanced assessment strategy.

Recommendations

As a consequence of our review of evidence we recommend that SDS might like to:

1. Produce guidance materials for those designing vocational learning programmes:

- summarising key approaches to evaluation and their respective pros and cons
- outlining best practices in the assessment of meta-skills with examples of their use in action

2. Commission the development of generic learning progressions for each of the 12 meta-skills with examples from a range of apprenticeship programmes.

3. Invite partners to undertake empirical testing of the different approaches to assessment in selected guidance apprenticeships using an action research model.

6. The transfer of learning from one context to another

In this section we look at the factors affecting effective transfer of learning from one context to another, from 'classroom' to workplace and back again as well as within workplace setting with different contexts. The mechanisms affecting learning transfer are complex and field of learning transfer is enormous. This section is necessarily, given the limited scope of this review, very much a summary.

6.1 Some principles of learning transfer

Learning transfer' is concerned with how you ensure something taught in one context is available at a later time to be used in another situation.

Authentic learning

In the context of apprenticeships, it is necessary to consider what kinds of learning need to be transferred. Unlike traditional school-based learning, the learning 'on-the-job' is taking place in the context that performance is needed. A key concept for transfer is that the more authentic the learning context – in terms of its direct relevance to the skill or knowledge being learned – the greater the chance that what is learned can be used in similar, real, situations. For Trilling and Fadel (2009, p. 31) an important principle is, therefore, that learners 'need more real-world problem solving, internships or apprenticeships in real work settings, and other more authentic learning experiences to make learning last and be useful.'

How does this apply to meta-skills? Perkins has been influential in this field over many years. In a widely cited paper Perkins and his colleague Salomon (1989) looked at how simple skills (for example. spelling) could be transferred from school to a family game at home. The transfer is enabled through extensive, varied practice. In contrast, transfer of a complex attribute like 'persistence' between contexts requires a conscious level of understanding of the concept, as well as the experience of practising it in a range of contexts.

Part of the key to being able to transfer learning is having sufficient theoretical understanding of a concept. In both non-routine situations, and those that involve transfer from one context to another, learners must be able to recognise connections, patterns, and models if they are to make use of prior knowledge and experiences. Transfer is assisted by a number of principles:

- Extensive practice in different contexts
- Specifically encouraging learners to consider how they might use what they are learning in other contexts at the point when they first learn something
- Making as many connections as possible to the learner's existing knowledge
- The provision of clear models, explanations and mental models at the point of first learning a new skill. (Perkins and Salomon, cited in Lucas et al., 2013, p. 145)

Transfer of learning is, in a sense, the 'ultimate aim of teaching'. If something learned in one context can be applied and reused in another context, then the learning has truly become useful. While learning transfer is of interest to academics in fields as diverse as psychology, philosophy, schooling, and vocational education with most vocational education practitioners, like pedagogy, it is little talked of.

If vocational teachers are aware that, whatever method they select, the principles above can infuse all that they do, transfer may happen more effectively.

Guile and Young (2003) have looked specifically at the issue of transfer in vocational settings and suggest that, although transfer in vocational education and conclude that, while it clearly

does take place, transfer is not a simple mechanical process. They argue that traditionally in vocational education transfer has been taken for granted through two routes, either 'acquired through experience' in craft apprenticeships or easily moving between learning on the job and off the job college-based injections of technical knowledge (p67). They helpfully distinguish between three kinds of transfer:

1. 'consequential transmission', where the learner is changing their identity (learner to worker, for example) *and* the context is different (workplace rather than classroom)

2. 'expanded learning', where something learned in one context is used more extensively in another

3. 'recontextualisation', where the activity is different precisely because it is in a different context (p. 64).

Knowing that transfer is complex and takes different forms will not on its own necessarily improve vocational teaching. But as vocational learners become more self-aware and reflective it may be possible to coach them to recognize what is going on and modify their actiions accordingly. So, for example, encouraging them to visualize what will be different about dropping a plateful of food in a real rather than in a training restaurant and how their consequent actions might be different.

6.2 Key factors in improving transfer of meta-skills a vocational context

Trilling and Fadel (2009, p. 31) assert that 'context, or the conditions in which learning activities occur (the people, objects, symbols, and environment and how they all work together to support learning), are much more influential than previously thought.' They argue that transferring is often not successful. Because of this, it is important

Different work-based contexts, and employers within those, will value different combinations of meta-skills. It is of primary importance, therefore, that meta-skills are defined clearly and that there is a shared understanding of terms for translatability to be facilitated.

Yet within specific organisations, there will be job-based examples of what 'holistic thinking' or 'pattern recognition' might look like, for instance.

Transfer is possible

Pellegrino and Hilton (2012) write explicitly on teaching and assessing for transfer, within an education for skills and knowledge context. They conclude that, definitional issues notwithstanding, 'emerging evidence indicates that cognitive, intrapersonal , and interpersonal competencies can be taught and learned in ways that promote transfer' (p. 8).

Pellegrino and Hilton (2012, p. 5) found that individuals with higher levels of education are able 'to some extent, to transfer what they learn across occupations'. They find a lack of certainty over which competencies account for 'the labour market benefits of additional schooling'. They call for further research in this area.

The idea of 'transfer' forms a major part of what Pellegrino and Hilton (2012) mean by 'deeper learning', a synonym for the 'lists of broad skills seen as valuable' (p. 1). They define 'deeper learning' as 'the process through which an individual becomes capable of taking what was learned in one situation and applying it to new situations (i.e. transfer).' (p. 5). Deeper learning 'often involves shared learning and interactions with others in a community' (p. 5). Expertise is developed through deeper learning, which gives rise to 'transferable knowledge, including content knowledge in a domain and knowledge of how, why, and when to apply

this knowledge to answer questions and solve problems'. Notably, the authors refer to this 'blend of both knowledge and skills as "21st century competencies"' (p. 6, and see also p. 7).

6.3 Contextual factors supporting meta-skills development and transfer

Context matters in all kinds of learning. Learning something, for example, while sitting beside a supervisor on the line in a factory is different from learning to make a dovetail joint in a college workshop or learning about health and safety legislation in social care via an online course. Each of these situations is different. First, the other learners who may or may not be present will affect things. Then the 'teacher' and his or her experiences, traditions and culture will shape it. And thirdly, of course, the physical location will play an important role. Context is critical in considering apprentices who, as novice learners, are required to develop skills and confidence in one context with expert support, sometimes in the workplace, sometimes in an educational institution, to another context in a workplace, increasingly without support.

Through the research of Lave and Wenger (1991) we now have a much better understanding of the way in which all learning is 'situated' in a particular context. Lave and Wenger coined a useful phrase, 'communities of practice', to describe the kinds of social learning that these spaces require. Members of a community pursue a common interest and help each other as they do so. And as they work and solve problems together, so their learning habits and attitudes rub off on each other.

In their thinking about workplace learning Fuller and Unwin and (2008) have helpfully introduced the notion of the 'expansive apprenticeship'. Expansive apprenticeships balance the need for trainee workers to be productive with the equal need they have of developing and learning. Those responsible for the apprentice see it as their role to involve them in and teach them about the community to which they all belong constantly offering constructive feedback. The idea of expansive apprenticeships sits alongside an approach to education which has been termed expansive, (Lucas et al., 2013), in which teachers explicitly focus on the development of meta-skills as well as on subject disciplines.

A restrictive apprenticeship is found where organisations want to produce profitable workers as quickly and cheaply as possible. Naturally this does not facilitate the learner to enquire and reflect.

To develop real-world problem-solving abilities in learners they need to be given more 'expansive' experiences in order to be able to contribute to business success and to develop worthwhile careers. Fuller and Unwin propose that education providers take into account the 'dual identity of worker and learner, and commit themselves to a model of apprenticeship that has pedagogic, social and economic value' (p. 21). Essentially Fuller and Unwin are arguing that a full range of needs of any apprentice needed to be considered if they are to flourish.

In a school context the OECD has explored what it takes for it to become a learning organisation (Kools and Stoll, 2016), see Figure 16.

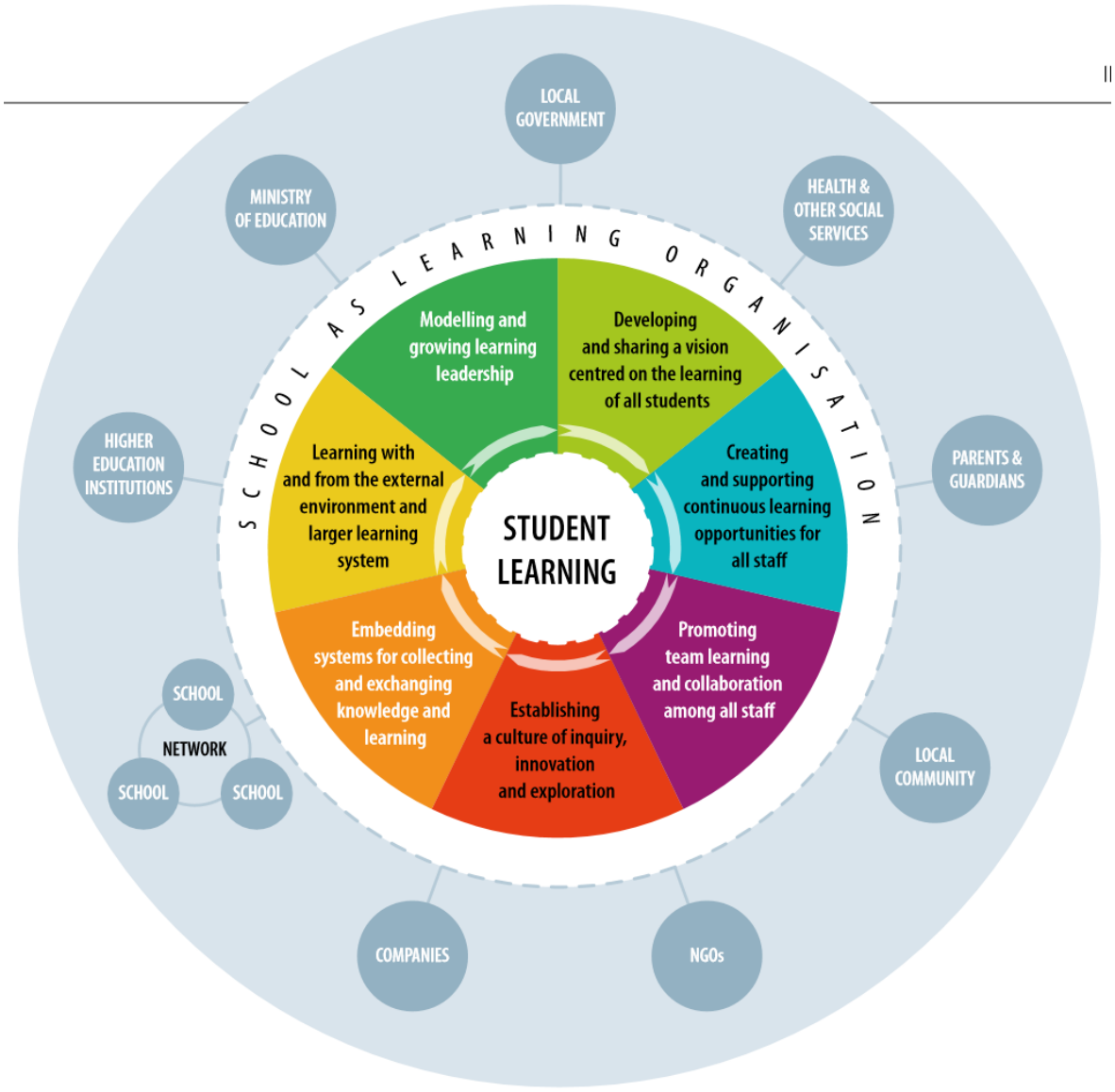

Figure 16 - School as learning Organisation, OECD, 2016

The six elements of the model are:

- developing and sharing a vision centred on the learning of all students
- creating and supporting continuous learning opportunities for all staff
- promoting team learning and collaboration among all staff
- establishing a culture of inquiry, innovation and exploration
- embedding systems for collecting and exchanging knowledge and learning
- learning with and from the external environment and larger learning system
- modelling and growing learning leadership.

Substitute the word 'apprentice' for 'learner' and they are arguably relevant to the kind of context needed to develop learning in the workplace.

With meta-skills there are some additional questions which leaders will need to ask if they are to develop meta-skills, many of which have been touched upon already:

1. Is there a common understanding of the 12 meta-skills understood across the organisation?
2. To what extent do leaders and managers model them?
3. To what extent are they encouraged? Take initiative, for example, is it really promoted or can it all too often be squashed?
4. How are each of the meta-skills embedded in the life of the organisation?
5. What learning and training methods are used to encourage the skills?
6. Are the meta-skills measured and, if so, how?

6.4 Findings

In this section we were asked to look at the factors affecting effective transfer of learning from one context to another and the mechanisms which assist this.

Overview

The evidence suggests that effective vocational learning, which essentially depends on an 'apprentice' learning something in one context and then applying it one or more related but different contexts, is most effective when the setting in which the initial learning takes place is as authentic as possible.

While vocational learning such as software engineering, accountancy, hair-cutting or child-care, for example, can be practised in one setting and fairly easily transferred to another, acquiring meta-skills and then being able to use them in different contexts is more difficult. The literature suggests that for the transfer of meta-skills, they need to be clearly understood, with clear models or explanations given when first encountered as an idea, and extensively practised in different contexts. When first introduced learners need to imagine how they might apply them in the future and find ways of connecting them to their existing knowledge and experience to make them real.

Researchers are increasingly referring to the kind of approach needed when cultivating meta-skills as deeper learning or expansive education.

In terms of culture and of the human factors which make up cultures two key concepts are helpful – communities of practice and the idea of the learning organisation. Important for any organisation seeking to develop a learning culture in which meta-skills can flourish are a common vision of what these are, continuous learning opportunities, collaborative learning, a focus on inquiry and exploration, systems for sharing learning, an orientation to the world beyond the organisation and the presence of leaders who model meta-skills.

Recommendations

As a consequence of our review of evidence we recommend that SDS might like to:

1. Produce guidance materials for those designing vocational learning programmes:

- summarising the key principles of learning transfer in developing meta-skills

7. Recommendations

In addition to the specific recommendations at the end of each section we offer some general suggestions arising from the research.

These can be grouped into four areas – the production of guidance, further development work, local experimentation and longer-term evaluation.

Specifically we suggest that SDS might like to:

1. Produce guidance materials in the form of a leadership toolkit for all those within educational organisations working on apprenticeships and the employers with whom they partner:

- actively communicating its understanding of each of the 12 meta-skills with its partners to build a common language
- offering advice about implementation of meta-skills and their like in workplace settings and the opportunity to develop rich case studies of practice
- suggesting possible a range of active roles learners can play as apprentices
- developing a bank of different approaches to evaluation and assessment.

2. Commission further work to develop

- a meta-skills implementation toolkit and
- learning progressions for each of the meta-skills.

3. Invite its partners to undertake small-scale action research to explore promising practices in pedagogy and assessment and share these as part of a professional learning community.

4. Commission external, ideally longitudinal evaluation of its learning programmes.

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Appendix 1 Frameworks by name, broken down by 'level'

Country - Australia

ATC21s 21st Century Skills

Country - Canada

Clusters of occupations by skillset

Country - Scotland

SDS Skills 4.0

Country - UK

Cambridge Life Competencies Framework

Country - UK

Jubilee Centre Framework for Character Education in Schools

Country - US

ACT WorkKeys National Career Readiness Certificate
Center for Curriculum Redesign (CRR) Framework
Chicago Public Schools Employability Assessment (EA)
Deeper Learning
Employability Skills Framework
Essential Learning Outcomes (LEAP)
Global Competence
ILN Framework for College, Career, and Citizenship Readiness (CCCR)
P21 Framework for 21st Century Learning
The National Work Readiness Credential Profile

European

European Qualifications Framework n/a
The OECD Learning Compass 2030
The OECD Learning Framework 2030 (precursor to OECD Learning Compass?)

European (European Commission JRC)

DigComp (European Digital Competence Framework)
EntreComp (European Entrepreneurship Competence Framework)
LifeComp (European Framework for Personal, Social and Learning to Learn Competence)

European (European Commission)

EU/European Key Competences for Lifelong Learning (being further defined as EntreComp etc)

European (OECD)

OECD DeSeCo project
Skills for Innovation and Research

Global

The IB Learner Profile

Global - literature review

Most Frequently Identified 21st Century Skills
Non-Cognitive Skills (general)
The 'Interdisciplinarity' / cross-cutting capacities approach v 'The Standards approach'

Global (UK led)

Skills Builder Framework

Global (US led)

VIA Institute of Character Inventory of Strenghts

Work Ready Now

Global literature review

Framework for Understanding Skills Interventions

Other

P21 Framework for 21st Century Learning

United Nations

UNESCO Global Citizenship Education (GCED)

UNESCO Global Framework of Learning Domains and Subdomains

UNESCO Intercultural Competences

UNESCO Transversal Skills

United Nations - Bangkok

Transversal Competencies (UNESCO Bangkok framework)

United Nations - MENA

UNESCO Transversal Skills

United Nations: Middle East and North Africa

UNICEF Conceptual Framework for Life Skills and Citizenship Education in Middle East and North Africa (MENA)

World Bank Group

STEP Employer Survey

World Economic Forum

World Economic Forum Framework for 21st Century Skills

Appendix 2 Frameworks by name, broken down by 'sector'

Adult skills

UNESCO Transversal Skills

Early childhood and elementary schools / adolescent

Framework for Understanding Skills Interventions

Education

Non-Cognitive Skills (general)

OECD DeSeCo project

The OECD Learning Framework 2030 (precursor to OECD Learning Compass?)

UNICEF Conceptual Framework for Life Skills and Citizenship Education in Middle East and North Africa (MENA)

Education

Essential Learning Outcomes (LEAP)

Education - all levels, formal and informal

UNESCO Intercultural Competences

Education - international assessments

OECD DeSeCo project

Education and training

EntreComp (European Entrepreneurship Competence Framework)

EU/European Key Competences for Lifelong Learning (being further defined as EntreComp etc)

European Qualifications Framework n/a

Education and work

Employability Skills Framework

Employer led (schools based)

ATC21s 21st Century Skills

Employer led -education system for work readiness

Skills Builder Framework

English language programmes (from pre-primary to work)

Cambridge Life Competencies Framework

Many contexts including business

DigComp (European Digital Competence Framework)

EntreComp (European Entrepreneurship Competence Framework)

EU/European Key Competences for Lifelong Learning (being further defined as EntreComp etc)

LifeComp (European Framework for Personal, Social and Learning to Learn Competence)

VIA Institute of Character Inventory of Strenghts

School

Center for Curriculum Redesign (CRR) Framework

Chicago Public Schools Employability Assessment (EA)

Creative Habits of Mind n/a

Deeper Learning

Early Education Essentials

Global Competence

Human Values

ILN Framework for College, Career, and Citizenship Readiness (CCCR)
Jubilee Centre Framework for Character Education in Schools
P21 Framework for 21st Century Learning
The IB Learner Profile
The 'Interdisciplinarity' / cross-cutting capacities approach v 'The Standards approach'
Work Ready Now
World Economic Forum Framework for 21st Century Skills

School - National curricula

Most Frequently Identified 21st Century Skills
P21 Framework for 21st Century Learning
Transversal Competencies (UNESCO Bangkok framework)

TVET

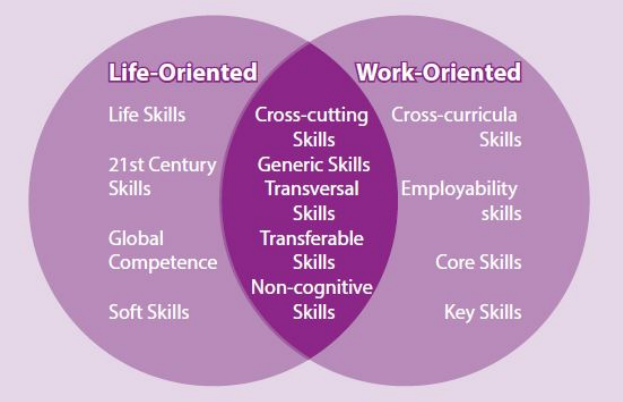
UNESCO Transversal Skills

Work

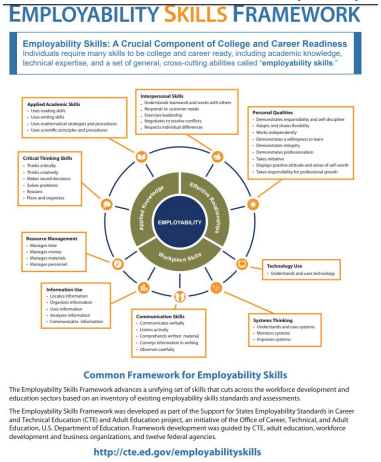
ACT WorkKeys National Career Readiness Certificate
Clusters of occupations by skillset
SDS Skills 4.0
STEP Employer Survey
The National Work Readiness Credential Profile

Appendix 3 Framework images

UNESCO (Trzmiel 2015) Alternative names for transversal skills



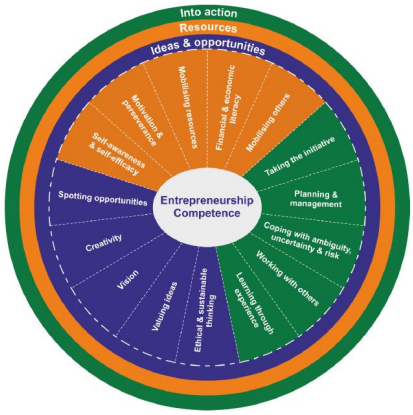
US Department for Education: Employability skills framework



Skills Builder (skillsbuilder.org/framework)

Key Competences for Lifelong Learning (European Commission 2019a)

EntreComp (Baciagalupo et al. 2016)



DigComp (Ferrari 2013)

Table 3: Overview of Dimensions 1 and 2

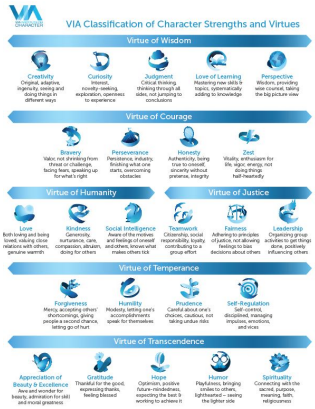
Dimension 1 Competence areas	Dimension 2 Competences
1. Information	1.1 Browsing, searching and filtering information
	1.2 Evaluating information
	1.3 Storing and retrieving information
2. Communication	2.1 Interacting through technologies
	2.2 Sharing information and content
	2.3 Engaging in online citizenship
	2.4 Collaborating through digital channels
	2.5 Netiquette
	2.6 Managing digital identity
3. Content creation	3.1 Developing content
	3.2 Integrating and re-elaborating
	3.3 Copyright and licences
	3.4 Programming
4. Safety	4.1 Protecting devices
	4.2 Protecting personal data
	4.3 Protecting health
	4.4 Protecting the environment
5. Problem solving	5.1 Solving technical problems
	5.2 Identifying needs and technological responses
	5.3 Innovating and creatively using technology
	5.4 Identifying digital competence gaps

LifEComp (Caena 2019)

Table 6. Proposed structure and content of the LifEComp framework

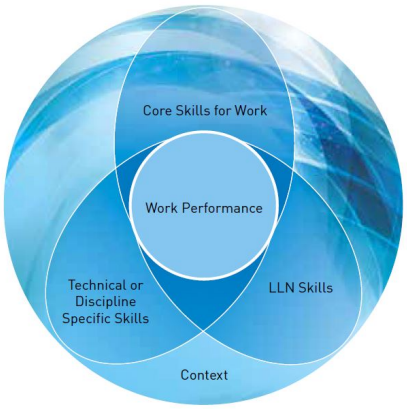
	PERSONAL	SOCIAL	LEARNING TO LEARN
COMPOUND COMPETENCES	Wellbeing	Collaboration	Managing learning
	Adaptability	Communication	Critical thinking
CORE ELEMENTS	Self regulation	Empathy	Growth mindset

VIA Institute of Character, Inventory of Strengths (viacharacter.org/character-strenghts)

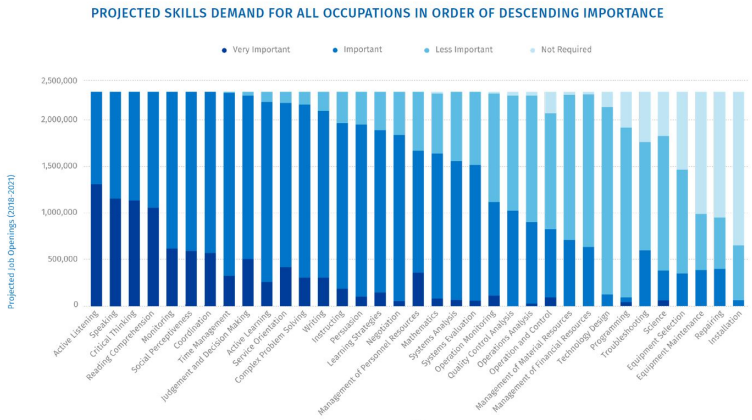


Hensen and Hippach-Schneider (2016) 'Vocational action competence'

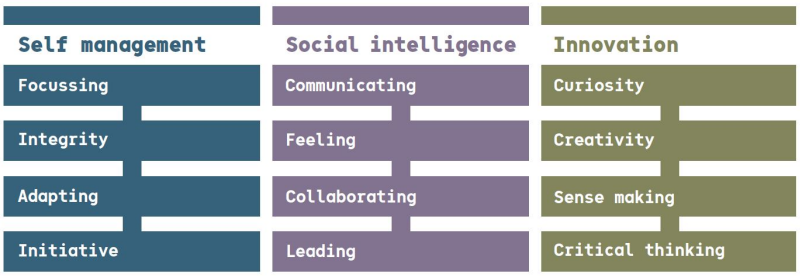
Core Skills for Work (Australian Government 2013)



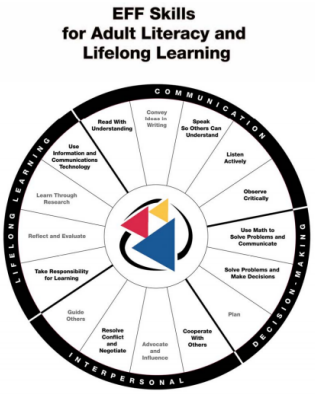
Royal Bank of Canada 2018 Skills required



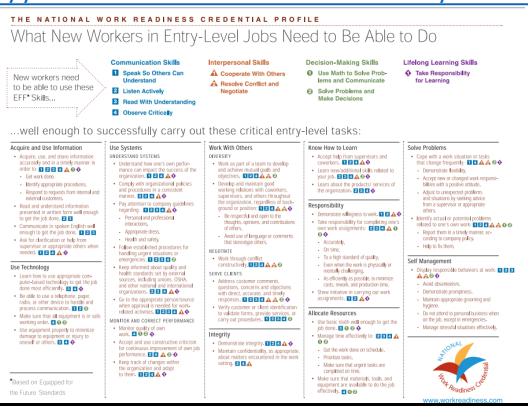
Skills 4.0 (2018)



Equipped for the Future framework (National Work Readiness Credential Profile)



National Work Readiness Credential Profile (based on EFF) (http://www.workreadiness.com/nwrcred.html)


THE NATIONAL WORK READINESS CREDENTIAL PROFILE

What New Workers in Entry-Level Jobs Need to Be Able to Do

New workers need to be able to use these EFF* Skills...

Communication Skills
1. Speak So Others Can Understand
2. Listen Actively
3. Read With Understanding
4. Observe Critically

Interpersonal Skills
- Cooperate With Others
- Resolve Conflict and Negotiate

Decision-Making Skills
- Use Math to Solve Problems and Communicate
- Solve Problems and Make Decisions

Lifelong Learning Skills
- Take Responsibility for Learning

...well enough to successfully carry out these critical entry-level tasks:

Acquire and Use Information

Use Technology

Use Systems

Work With Others

Know How to Learn

Responsibility

Allocate Resources

Solve Problems

Self Management

*Based on Equipped for the Future Standards

National Work Readiness Credential

www.workreadiness.com