CAMBRIDGE
UNIVERSITY PRESS & ASSESSMENT

The Cambridge Skills Framework: Supporting skills development within a holistic education

Research Report

Dr Irenka Suto
Head of Secondary Curriculum, Cambridge International Education
3rd November 2026

Author contact details:

Dr Irenka Suto
Cambridge International Education
Cambridge University Press & Assessment
Shaftesbury Road
Cambridge
CB2 8EA
UK

irenka.suto@cambridge.org
https://www.cambridge.org

As a department of the university, Cambridge University Press & Assessment is respected and trusted worldwide, managing three world-class examination boards, and maintaining the highest standards in educational assessment and learning. We are a not-for-profit organisation.

Cambridge University Press & Assessment is committed to making our documents accessible in accordance with the WCAG 2.1 Standard. We're always looking to improve the accessibility of our documents, so if you encounter any problems or think we're not meeting accessibility requirements, please contact the author using the contact details above.

If you need this document in a different format, please contact us with your name, email address and requirements, and we will respond within 15 working days.

How to cite this publication:

Suto, I. (2026). *The Cambridge Skills Framework: Supporting skills development within a holistic education.* Research report. Cambridge University Press & Assessment.

Introduction

In 2025, Cambridge International Education published a major research report capturing the perspectives of more than 3000 teachers, 4000 learners and around 50 educational experts across 150 countries. *Navigating the future: Preparing learners to thrive in a changing world* provided a unique insight into how international education is experienced today and what educators and learners value most in preparing for a future shaped by rapid technological advances, climate pressures, and shifting global dynamics.

A clear message from the research was the importance of developing a broad range of skills, both to support learners' next steps in education and to prepare for their lives beyond that. These skills are variously described as future skills, 21st century skills, transferable skills, and transversal skills. It is well established that all skills are deeply intertwined with subject knowledge (Hirsh, 2006; Willingham, 2021) and the educational experts consulted in our research similarly agreed that a choice does not need to be made between knowledge and skills. Effective syllabuses and curricula can, and should, be both knowledge-rich and skills-rich. Our recent analysis of several widely taken Cambridge International AS and A levels illustrates how this can be achieved in practice (Suto et al., 2025).

This report builds on our earlier research. It describes a further exploration of the skills that learners need for the future and how these can be synthesised into coherent and meaningful groups. We introduce the *Cambridge Skills Framework*, an evidence-based framework designed to provide a shared language for understanding and developing skills. It is intended to support teachers and learners, while also informing the development of our syllabuses, curricula, teaching and learning resources, and professional development for schools. It can also be used to structure thinking and discussion around emerging skills priorities such as green skills, skills for a world with AI, and the skills needed for resilience.

We situate the Cambridge Skills Framework within our broader, holistic understanding of educational success. Our overarching aim is for skills to be nurtured together with values, executive functions, knowledge, and the Cambridge Learner Attributes in learners of all ages, abilities and nationalities, equipping and empowering them to make informed choices and pursue the paths in life that are right for them.

The skills needed by future ready learners

A seminal paper shaping our understanding of the skills needed for the future was published by researchers at the University of Cambridge's Digital Education Futures Initiative (DEFI) (Kotsiou et al., 2022). The researchers reviewed 99 different skills frameworks, which spanned two decades of literature and were developed by a wide range of academics and organisations. Collectively, these frameworks covered an overwhelming 341 discrete 'future skills' terms. However, the researchers identified considerable overlap among them, and critically, distilled this complexity into nine meta-categories:

1. Higher order thinking skills
2. Dialogue skills
3. Digital and STEM literacy
4. Values
5. Self-management

6. Lifelong learning
7. Enterprise skills / Innovation
8. Leadership
9. Flexibility.

Arguably, a key benefit of the DEFI researchers' approach in creating a comprehensive set of meta-categories is that, in principle, the skills from almost any skills framework can be mapped to them, including skills in frameworks developed by schools, school groups, and education ministries. This proposition was tested by our own researchers through an additional review of skills frameworks published between 2021 and 2024, extending the evidence base beyond the frameworks included in DEFI's original analysis. Across 35 newer frameworks, 562 skills were identified. Remarkably, 98.4% could be readily classified within DEFI's nine meta-categories, providing a strong validation of them.

Development of the Cambridge Skills Framework

DEFI's nine meta-categories are comprehensive, but their number can make them difficult to remember and apply consistently in everyday teaching, learning, and educational discussion. We therefore set out to translate this exhaustive evidence base into a practical skills framework for use both in classrooms internationally and in the development of future syllabuses, curricula, resources and professional development for schools.

To achieve this, we reviewed and regrouped all the individual skills listed in Appendix 2 of Kotsiou et al. (2022), using this analysis to reformulate and combine the original meta-categories into fewer, larger skills areas. Our aim was to preserve their collective comprehensiveness while creating a skills framework that was more memorable and usable in practice. Table 1 outlines the main considerations that guided this process, bringing together a schools-focused perspective with Cambridge's strong commitment to research evidence.

Table 1: Main considerations when developing a skills framework for use in schools

Schools-focused perspective	**Commitment to research evidence**
• Minimising the total number of skills areas for teachers and learners to remember. • Maximising intuitiveness: will most teachers understand the meaning of each skills area at a glance? • Avoiding overly generic terms; for example, *"skills to change the world"* could include almost anything. • Re-using language that resonated with teachers and learners in our earlier research and its dissemination. • Ensuring coverage of the skills in Bloom's taxonomy (Anderson et al., 2001), which are familiar to a large majority of international teachers.	• Ensuring coverage of all skills within all nine meta-categories in DEFI's future skills framework, and, by extension, those in virtually all other skills frameworks. • Weighing the frequencies of different skills across the 99 frameworks reviewed by DEFI, so that rarely mentioned skills do not exert undue influence on structure and terminology. • Cohering where possible with well-regarded work on holistic education, such as Delors' (1996) seminal UNESCO framework and that in Hannon & Peterson's (2021) popular book, *Thrive*.

The process resulted in the Cambridge Skills Framework, presented in Figure 1. It comprises five skills areas and sits within a broader, holistic approach to educational success which is explained subsequently.

Figure 1: The Cambridge Skills Framework

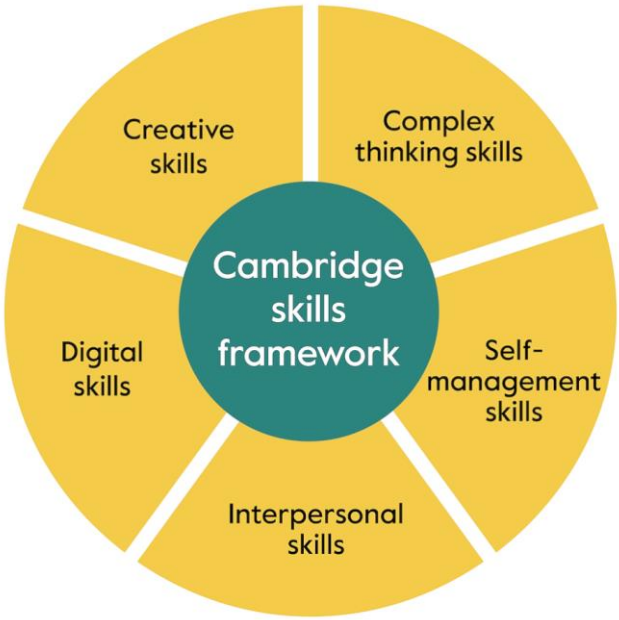


Table 2 provides full descriptions of the five skills areas. These are essentially even larger meta-categories than those created in the DEFI research. Some examples of skills within each area are also listed.[1] See Appendix A for further details of our framework's coverage of skills within the DEFI meta-categories.

Table 2: Descriptions of the five skills areas in the Cambridge Skills Framework

Skills area	Description	Examples of skills
Complex thinking skills	These skills enable you to understand ideas deeply, apply knowledge in new ways, and make informed judgments. They include analysing information to see patterns and relationships, evaluating evidence to reach sound conclusions, and applying what you know to solve problems in different contexts. These skills involve critical thinking to question assumptions, decision-making to choose the best course of action, and systems thinking to understand how parts connect within a bigger picture. By using complex thinking skills, you learn to reason carefully, weigh options, and approach challenges thoughtfully.	Analytical skills Evaluation skills Synthesis skills Problem-solving skills Critical thinking skills Decision-making skills Systems thinking skills
Self-management skills	These skills enable you to recognise and manage your thoughts, feelings, and actions. They help you to understand yourself and make positive choices. The skills include those in self-	Metacognitive skills Self-awareness skills Reflective skills Motivational skills

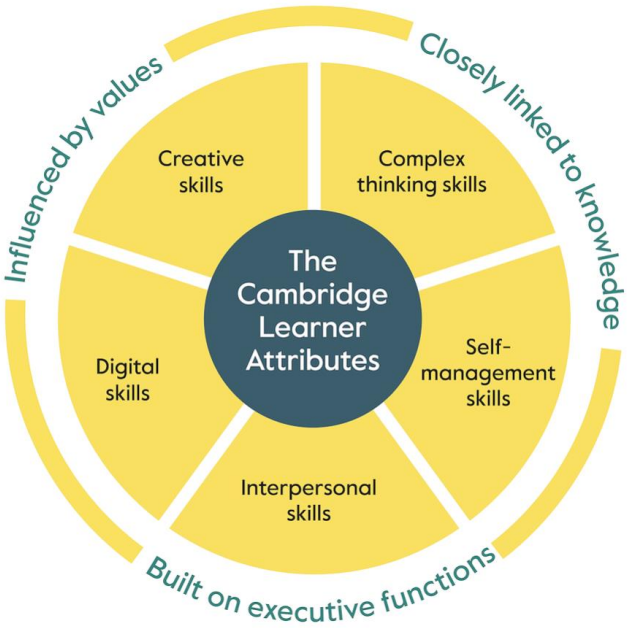
[1] The lists of example skills are illustrative rather than comprehensive. Also, there is some conceptual overlap between the skills within each area, reflecting differences in how skills are conceptualised and defined in the literature. For example, within the Complex thinking skills area, analytical skills and systems thinking skills overlap.

	awareness, around recognising your emotions, strengths, and areas for growth. They also involve self-control and motivational skills, along with resilience, perseverance, and grit to overcome challenges. Lifelong learning is central to self-management: being curious, open to new ideas, and using reflective and other metacognitive strategies to understand how you learn best. Self-management skills enable you to organise your time and responsibilities to maintain balance and purpose, supporting mental and physical wellbeing.	Self-control skills Lifelong learning skills Time management skills Multi-tasking skills
Interpersonal skills	These skills enable you to express yourself clearly, work well with others, and take responsibility in shared tasks. Communication skills include listening carefully, sharing ideas clearly, and showing empathy and respect for different viewpoints. Collaboration skills involve building trust, working as part of a team, and solving conflicts constructively. Many leadership skills are interpersonal skills, including guiding and supporting others, giving clear instructions, managing group efforts, and helping people develop their strengths. By using interpersonal skills, you show care for others, professionalism, and a sense of responsibility, making relationships and teamwork more positive, inclusive, and effective.	Communication skills Listening skills Oracy skills Collaboration skills Team leadership skills Conflict resolution skills Empathy skills
Digital skills	These skills enable you to use technology confidently, handle digital information responsibly, and make sense of data in digital contexts in many subject areas. The skills include identifying how digital systems work, developing and using tools effectively, and applying computational thinking to solve problems logically. The skills involve researching online, managing and interpreting numerical and qualitative data in digital contexts, and evaluating information for accuracy and reliability, including AI-generated information. The skills also include creating digital content and this can entail AI. Skills in protecting your data and digital identity are essential, as is acting responsibly as a digital citizen. By developing skills in this area, you become informed and adaptable in a world shaped by technology and digital information.	Digital literacy skills ICT literacy skills Computational thinking skills Online research skills Digital data interpretation skills Digital data management skills Digital content creation skills Data protection skills
Creative skills	These skills enable you to generate original, unusual, or diverse ideas, take initiative, and turn imagination into action. They can also enable you to express yourself and your identity. The skills include aesthetic skills, and refining ideas to make them stronger and more effective. The skills also include exploring different perspectives and spotting opportunities to solve problems in new ways. Innovation is central: using new methods or ideas, adapting concepts, or re-mixing them to create something new, and experimenting with tools including technology. Taking informed risks and showing initiative builds confidence and independence, helping you approach challenges with originality, vision, and an enterprising mindset.	Idea generation skills Aesthetic skills Innovation skills Enterprise skills Improvisation skills

Situating the Cambridge Skills Framework within a holistic approach to educational success

Since skills are not taught or developed in isolation, we also considered their relationships with values, executive functions, knowledge, and the Cambridge Learner Attributes (confident, responsible, reflective, innovative, and engaged). This enabled us to situate our five skills areas within a coherent holistic conceptualisation, which captures our wider approach to educational success, as shown in Figure 2.

Figure 2: Cambridge's holistic approach to educational success



Values

The DEFI research includes values as one of the nine meta-categories of 'future skills'. Examples from this meta-category include respect, courage, honesty, integrity, and gratitude.[2] While this categorisation reflects the broad range of concepts captured across the frameworks reviewed, values do not fit readily within conventional definitions of skills. The Cambridge Dictionary defines 'values' as *the beliefs people have, especially about what is right and wrong and what is most important in life, that control their behaviour*. We therefore chose to take a different conceptual approach to DEFI, distinguishing values from skills. We see values as influencing the application of skills; that is, shaping how and why skills are applied.

Executive functions

A further area where our conceptualisation differs from that of the DEFI researchers relates to their 'flexibility' meta-category. This encompasses terms from the frameworks they reviewed such as executive function, cognitive flexibility, working memory, attention, adaptability, and multi-tasking.

[2] There is considerable variation internationally across schools, education ministries, and other educators in the values they hold and prioritise, due to diversity of culture, history, religion, politics, and other factors. We do not see it as the role of Cambridge International Education to set out a definitive list of values for all our schools to adopt.

Rather than treating these as an additional skills area alongside the five in the Cambridge Skills Framework, we grouped them under the broader concept of executive functions. We believe this provides a clearer and more useful way of explaining their distinctive role in supporting learning and the development and application of skills.

In her keynote presentations at the 2025 and 2026 Cambridge Schools Conferences, Professor Sara Baker from the University of Cambridge argued that future skills are built on, and underpinned by, executive functions. Our Getting started with executive functions guide defines these as *a set of brain-based skills that help us learn, work towards goals, organise information and adapt to different situations.* Professor Baker describes them broadly as *the skills that help us adapt to our context, rather than just doing whatever we have always done in the past*. She identifies three core executive functions: working memory, cognitive flexibility (also called switching), and inhibition. Appendix B provides examples illustrating how each one supports a range of skills in each of the five skills areas.

Knowledge

The relationship between knowledge and skills was a central theme in our report, *Navigating the future: Preparing learners to thrive in a changing world*, and in discussions that followed its publication. In line with recent neuroscientific research (Oakley et al., 2025) and the work of influential pedagogical theorists (Hirsh, 2006; Willingham, 2021) we regard knowledge and skills as inextricably linked. A useful starting point for explaining this position is to distinguish knowledge from information: knowledge is information that has been mentally processed and integrated with what we already know. Oakley et al. (*ibid.)* describe how we take in information, compare it with our existing knowledge, evaluate and validate it, and use it to refine and extend our mental schemas, the frameworks through which we understand the world. These schemas, in turn, provide a foundation both for acquiring further knowledge and for developing and applying skills.

Knowledge and skills cannot, therefore, be meaningfully developed or applied in isolation. When learners exercise complex thinking or communication skills, for example, they need something to think or communicate *about*, and that inevitably includes their knowledge. Importantly, this extends beyond subject-specific knowledge. It can include knowledge that crosses disciplinary boundaries, as well as broader forms of knowledge that help learners understand and navigate the world around them. In her keynote presentations at the 2025 and 2026 Cambridge Schools Conferences, Professor Rose Luckin highlighted the growing importance of epistemic, social and contextual knowledge in an AI-enabled future. This broader conceptualisation of knowledge is also reflected in some of the frameworks reviewed by the DEFI researchers, which included terms such as global awareness and intercultural knowledge.

Fostering the Cambridge Learner Attributes through skills and values

The last element in our holistic conceptualisation is the Cambridge Learner Attributes: confident, responsible, reflective, innovative, and engaged. The Cambridge Dictionary defines an ‘attribute’ as *a quality or characteristic that someone or something has*, and a holistic view of education recognises the long-term development of such personal attributes as an important educational outcome. In this sense, the learner attributes can be understood as one of the ‘goods’ of education (Brighouse et al., 2018), alongside more readily measured outcomes such as qualifications and progression to higher education and employment. Educational success, from this perspective, is not

only about what learners know and can do, but about the qualities they develop throughout their educational journey.

Teachers frequently ask how the learner attributes can be developed and fostered. We believe the most straightforward approach is to focus primarily upon actively teaching the underpinning skills and values, providing learners with repeated opportunities to develop, practise and apply these in different contexts. When learners become experienced in exercising and demonstrating these skills and values, they can be understood to have strengthened the associated attributes within particular learning, social and cultural contexts. In this way, skills and values contribute to the development and expression of the learner attributes, and learners may demonstrate different attributes, or demonstrate them to different degrees, in different contexts. Our aim is for learners to become increasingly confident, responsible, reflective, innovative, and engaged across as wide a range of situations as possible.

Teachers may also explicitly discuss the meaning of the attributes with learners and use concrete examples to explore what they look like in practice. This can help learners to recognise and reflect on the qualities they are developing. However, the extent to which the attributes themselves are made an explicit focus of teaching should be appropriate to the learners' age and stage of development. In some contexts, placing too much emphasis on the terminology of the attributes alongside the knowledge, skills and values being developed may introduce unnecessary complexity.

It is possible to argue that many skills, or indeed many areas of knowledge, have the potential to engender each learner attribute, either directly or indirectly. For example, developing new skills, or knowledge in almost any area, could enhance a learner's confidence. However, to make the relationship between skills and attributes clear and practically useful for teachers, it can be helpful to begin with some intuitive and easily understood connections. As a starting point, we have therefore paired each of our five skills areas with one learner attribute, providing a broad, teacher-friendly explanation of the relationship between them (Table 3). These pairings are not intended to be exclusive, but to illustrate some of the most readily identifiable connections.

Table 3: Intuitive pairings of skills areas with Cambridge Learner Attributes. (Many others are possible.)

Skills areas	**Cambridge Learner Attribute**	**Cambridge Dictionary definition of the attribute**	**Simple explanation**
Complex thinking skills	Engaged	Involved in something.	When exercising skills in analysis, evaluation and problem-solving, learners become active meaning-makers rather than passive recipients of information. Engagement emerges as learners encounter intellectual challenge which absorbs them.
Self-management skills	Reflective	Reflective: Thinking carefully and quietly. Self-reflection: the activity of thinking about your own feelings and behaviour, and the	Reflection is integral to metacognition, which is 'thinking about one's thinking.' When exercising metacognitive skills, learners reflect upon their thinking, monitoring and evaluating it, which enables them to adapt their learning strategies purposefully.

		reasons that may lie behind them.	
Interpersonal skills	Confident	Being certain of your abilities or having trust in people, plans, or the future.	Through communication and collaboration, learners articulate and test ideas, experience shared intellectual risk and receive affirmation through dialogue. These experiences develop confidence by reinforcing learners' beliefs in their abilities to contribute, reason, and engage purposefully with others.
Digital skills	Responsible	To have control and authority over something or someone and the duty of taking care of it, him, or her.	As learners develop skills in protecting digital data, managing privacy, and responding to risk, they take ownership of their behaviour in digital spaces and build their integrity in an AI-enhanced world. Responsibility emerges as learners recognise their role in keeping themselves and others safe through informed, considerate, and accountable decision-making online. By questioning AI-generated content, learners learn to take responsibility for determining what and who to trust in pursuit of the truth.
Creative skills	Innovative	Using new methods or ideas.	Creative skills, including those developed through entrepreneurship and enterprise, require learners to generate ideas and take informed risks in response to challenge and uncertainty. Innovative behaviour emerges as learners take the initiative to experiment, learn from failure, and apply creative approaches purposefully across contexts.

There are, of course, many other intuitive pairings of skills with attributes. For example, self-management and interpersonal skills help learners to become more responsible for themselves and for others respectively, while digital skills help them to become engaged and confident in the technological world.

The relationship between skills and learner attributes will inevitably look somewhat different across subject disciplines, with particular connections becoming more prominent in different contexts. These relationships are already evident in Cambridge qualifications, where syllabus content and learning outcomes support both the development of skills and the expression of the learner attributes. For example, Cambridge International AS & A Level Psychology (9990) describes confident learners as those who can *communicate psychological ideas and arguments to others and explore contemporary social issues with maturity and insight*. This illustrates a particularly clear relationship between interpersonal skills and the development of confidence. Similar connections can be identified across subjects, demonstrating how the skills areas and learner attributes can reinforce one another within rich, subject-specific learning.

Skills demand and progression

Many educationalists are interested in how learners' skills progress during their educational journeys. One clear form of progression is the acquisition of new skills within a skills area. However, skills often develop in parallel with one another, and therefore progression should not be understood as a simple sequence in which learners master one skill before moving on to a more advanced one. For example, Bloom's taxonomy includes complex thinking skills in application, analysis, and evaluation, and although they are frequently presented hierarchically (for example, Anderson et al.,

2001) they can be developed alongside one another. The same is true for digital skills in data protection and computational thinking.

In addition to acquiring new skills, learners learn to apply their existing skills to increasingly challenging material, problems, and situations. This represents another important dimension of skills progression. As learners progress, they are expected to work with greater volumes of information, engage with increasingly complex, unfamiliar, and abstract concepts and other content, and draw on richer and more sophisticated mental schemas. A particular skill, such as evaluation, empathy, or improvisation, may therefore remain recognisable while the knowledge and context through which it is exercised become substantially more demanding.

For example, systems thinking skills in Cambridge International Education's Lower Secondary Science curriculum involve analysing relationships within a relatively simple and familiar ecosystem such as a pond. At Cambridge International AS Level, in contrast, these skills entail analysing the interactions among multiple biological and physical variables within complex marine systems.

Our view of skills progression is consistent with our earlier research into educational taxonomies and assessment demand (Suto et al., 2020). When articulating demand previously, we have distinguished between the domain of knowledge being used and the level of mental processing applied to that knowledge, arguing that overall demand can be increased in at least five ways: by broadening the range of knowledge involved, by moving towards more advanced categories of knowledge, by requiring higher levels of mental processing (skills), by increasing the sophistication of the operations within those levels, and by increasing the overall volume of curriculum or syllabus content. All of these factors interact with one another.

Applying the framework to emerging skills priorities

The Cambridge Skills Framework is intended not only to provide a shared language for describing skills, but also to offer a structure through which emerging and topical skills agendas can be explored and understood. Rather than treating areas such as green skills, skills for a world with AI, or the skills needed for resilience as separate skillsets, the framework enables us to examine how they each comprise (or highlight) different combinations of skills within our five skills areas. This can help to identify connections between apparently distinct agendas, while also highlighting where particular skills may warrant greater emphasis in different contexts.

We have already begun to use the framework in this way. In preparing for Cambridge's 2026 Student Skills & Future-Ready Teachers Convocation, a brief review of green skills literature found that the skills associated with sustainability and climate action extended across all five areas of the framework, with complex thinking and interpersonal skills being particularly prominent. This analysis helped to provide a common language for discussing green skills at the convocation and informed the structure of the event.

Our work on skills for a world with AI similarly uses the framework, this time to emphasise that AI preparedness extends well beyond digital skills. The central challenge of AI for education is not simply to enable learners to use increasingly powerful technologies, but to ensure that they continue to develop the human skills, in all five skills areas, which these technologies depend upon but could reshape. For example, learners need complex thinking skills to enable them to generate effective prompts and evaluate AI outputs. Alongside these, strong self-management skills, including

metacognitive skills, are needed to resist the temptation of detrimental cognitive offloading. It is essential that learners develop self-discipline skills around when to use AI, when not to, and how to remain actively engaged in sense-making rather than passively consuming AI-generated content.

Research into academic resilience provides a third example. Sparks et al. (2025) conceptualise this as *the process of bouncing back or recovering in the face of challenges, adversities, or stressors to achieve successful outcomes (e.g., academic achievement) by using adaptive behaviours or coping strategies over time* (p. 17). Adaptive behaviours and coping strategies require self-management skills, while the problem-solving skills needed to bounce back from challenges are complex thinking skills.

By categorising topical skills in this way, the Cambridge Skills Framework provides a stable organising structure through which evolving ideas about the skills learners need can be interpreted. These ideas can then be connected and translated into educational practice, without requiring a new framework each time the world presents learners with a new challenge.

Conclusion

The Cambridge Skills Framework and holistic conceptualisation presented in this report are ultimately an expression of what Cambridge International Education stands for: an education that develops the whole learner and is profoundly future-oriented. By reaffirming what we mean by skills, values, executive functions, knowledge, and the Cambridge Learner Attributes, and by making explicit the key relationships among them, we are offering schools and other educational communities a coherent picture of what contributes to educational success. Our approach provides a manageable mental schema for thinking about teaching and learning that develops the learner intellectually, socially, and ethically.

At the same time, our skills framework provides a stable structure for understanding changing and emerging skills priorities. As explorations of green skills, skills for a world with AI, and academic resilience illustrate, new challenges do not necessarily require entirely new sets of skills. Instead, they often call for different combinations of familiar skills, applied in new contexts and with different emphases. By providing a common language through which these combinations can be identified and understood, the Cambridge Skills Framework can help educationalists to make sense of evolving ideas about what learners need, while retaining a coherent view of skills development over time.

Our holistic approach does not prescribe a single route to success. Rather, it enables teachers to articulate what flourishing looks like in their own contexts, for diverse learner populations. As this thinking is embedded deeper across our international curricula, qualifications, resources and professional support, it will further strengthen the distinctive coherence of the Cambridge Pathway. Ultimately, this work reflects our commitment to empowering learners not only to succeed in assessments, but to navigate change, shape their futures, and contribute meaningfully to the world around them.

Acknowledgements

I would like to thank Abbi Barnett, Paula Beverley, Dan Bray, Paul Ellis, Flo Kemsley and Judith Roberts for their reviews of the Cambridge Skills Framework and the holistic approach to educational success in which it is situated.

References

Anderson, L. W., Krathwohl, D. R., Airasian, P. W., Cruikshank, K. A., Mayer, R. E., Pintrich, P. R., Raths, J., & Wittrock, M. C. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. Longman.

Brighouse, H., Ladd, H. F., Loeb, S., & Swift, A. (2018). *Educational goods: Values, evidence, and decision-making*. University of Chicago Press.

Cambridge University Press & Assessment. (2026). *Cambridge Dictionary*. https://dictionary.cambridge.org/dictionary/english/

Hannon, V., & Peterson, A. (2021). *Thrive: The purpose of schools in a changing world*. Cambridge University Press. https://doi.org/10.1017/9781108877152

Hirsch, E. D. (2006). The knowledge deficit: Closing the shocking education gap for American children. Houghton Mifflin.

International Commission on Education for the Twenty-first Century. (1996). *Learning: The treasure within: Report to UNESCO of the International Commission on Education for the Twenty-first Century*. UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000102734

Kotsiou, A., Fajardo-Tovar, D., Cowhitt, T., Major, L & Wegerif, R. (2022) A scoping review of Future Skills frameworks. *Irish Educational Studies, 41:1, 171-186*. https://www.tandfonline.com/doi/full/10.1080/03323315.2021.2022522

Oakley, B., Johnston, M., Chen, K., Jung, E., & Sejnowski, T. J. (2025). *The memory paradox: Why our brains need knowledge in an age of AI*. SSRN. https://doi.org/10.2139/ssrn.5250447

Sparks, J. R., Lehman, B., Gladstone, J. R., Zhang, S., Schroeder, N. L., & Israel, M. (2025). Measuring persistence and academic resilience of K–12 students: Systematic review and operational definitions. *Frontiers in Education, 10*, Article 1673500. https://doi.org/10.3389/feduc.2025.1673500

Suto, I., Greatorex, J., Vitello, S., & Child, S. (2020). A way of using taxonomies to demonstrate that applied qualifications and curricula cover multiple domains of knowledge. *Research Matters: A Cambridge Assessment Publication, 30*, 26–34. https://www.cambridgeassessment.org.uk/Images/598392-a-way-of-using-taxonomies-to-demonstrate-that-applied-qualifications-and-curricula-cover-multiple-domains-of-knowledge.pdf

Suto, I., Nelson, S., Roberts, J., Sidhu, A., & Spence, L. (2025). Filled with skills: An analysis of four International AS and A Levels. *Research Matters: A Cambridge University Press & Assessment publication, 40*, 93-120. https://doi.org/10.17863/CAM.121938

Willingham, D. T. (2021). Why don't students like school? A cognitive scientist answers questions about how the mind works and what it means for the classroom (2nd ed.). Jossey-Bass.

Appendix A: Coverage of skills within the 99 'future skills' frameworks reviewed by DEFI researchers (Kotsiou et al., 2022)

Skills area in the Cambridge Skills Framework	Skills found in at least 10 of the 99 frameworks, according to Figure 4 of Kotsiou et al. (2022) (N occurrences)	Other commonly mentioned terms in the 99 frameworks, according to Table 1 and Appendix 2 of Kotsiou et al. (2022)
Complex thinking skills	• Problem-solving (54) • Critical thinking (39) • Decision-making (21) • Systems thinking (13) • Numeracy (12)	• Reasoning • Application of knowledge
Self-management skills	• Self-management (32) • Self-awareness (24) • Learning to learn (16) • Reflective (10) • Resilience (10)	• Self-motivation • Metacognition • Emotional intelligence • Positive attitudes • Confidence • Willingness to learn • Active learning • Goal-oriented • Multi-tasking • Goal-oriented
Interpersonal skills	• Communication (51) • Collaboration (41) • Literacy (29) • Empathy (24) • Responsibility (21) • Leadership (17) • Teamwork (14) • Social perceptiveness (12) • Conflict resolution (10) • Interpersonal skills (10)	• Listening • Management
Digital skills	• Digital literacy (31) • ICT literacy (17)	• Data skills • Information skills • Digital creation • Computational thinking • Digital citizenship • Online Safety
Creative skills	• Creativity (49) • Innovation (18) • Initiative (17)	• Entrepreneurship • Enterprise • Curiosity • Resourcefulness • Improvisation • Ethical thinking skills

Appendix B: How do executive functions underpin the five skills areas?

These tables provide examples illustrating how each of the main three executive functions supports a range of skills in each of the five skills areas in our holistic framework.

	Working memory
Definition	**The ability to hold information in our minds and work with it, thinking about what we have just learnt, making connections with what we already know, and using this information to complete a task.**
Complex thinking skills	Learners can hold multiple ideas in mind simultaneously to compare, connect, and synthesise concepts. Learners can carry intermediate results through multi‑step reasoning and structured problem-solving, preventing themselves from losing the logical thread. Learners can evaluate evidence against criteria by retaining claims, counter‑claims, and justifications long enough to weigh them coherently. Learners can run mental models of systems or scenarios, updating variables while testing alternatives. Learners can coordinate divergent and convergent thinking, keeping possible options available while applying selection criteria. Learners can interrogate arguments during analysis by holding premises and implications in mind to check validity and bias. Learners can hold prior knowledge in mind long enough to apply it in novel contexts.
Self-management skills	Learners can hold goals and next steps in mind while planning and organising. Learners can remember task instructions long enough to begin, persist, and complete work without repeated prompts. Learners can track routines, rules, and success criteria during independent work to self-monitor and self-correct. Learners can manage their tasks by updating actions against a live mental plan, adjusting priorities as constraints change. Learners can keep feedback active in their minds while altering their strategy or effort in real time. Learners can multi-task, juggling competing demands by keeping key constraints accessible for decision-making. Learners can sustain motivation and persist by holding a clear representation of the end‑goal throughout longer tasks.
Interpersonal skills	Learners can hold others' key points and perspectives in mind to respond accurately and empathetically. Learners can track conversational goals, norms, and turns, enabling effective facilitation and summarising. Learners can integrate verbal and non‑verbal cues (tone, expression, context) while formulating responses. Learners can paraphrase and build on contributions during discussions and other conversations by retaining the gist of what others have said while generating a reply. Learners can resolve misunderstandings by keeping discussion threads active while clarifying assumptions. Learners can juggle competing inputs during group discussions, retaining key points to support collective decision-making. Learners can maintain shared plans and roles in teams to coordinate action and follow‑through, enabling effective collaboration. Learners can support and develop those they are leading by keeping their goals, needs and current understanding in mind while offering guidance. Learners can lead others by tracking what has been communicated so far and what needs clarification, adapting instructions in real time. Learners can deliver and receive feedback against agreed criteria held in mind to ensure specificity and relevance.
Digital skills	Learners can compare values and representations across dashboards by keeping key numbers active in their minds.

	Learner can interpret digital data visualisations by holding scales, legends, and variables in mind while drawing conclusions. Learners can follow multi-step digital workflows (e.g., import → clean → transform → visualise) without losing their place. Learners can hold query parameters, filters, or formulae in mind while iteratively refining searches, code, or calculations. Learners can sustain attention across complex interfaces, retaining where they are in a process while switching panels or tools. Learners can apply quality checks to data in digital contexts by keeping validity and reliability criteria active during ingestion and analysis. Learners can document their digital work accurately, retaining the rationale for steps and decisions while recording methods and results.
Creative skills	Learners can keep multiple ideas on their 'mental workbench' to combine, recombine, and elaborate during ideation. Learners can hold design constraints and success criteria in mind while experimenting with novel approaches. Learners can iterate purposefully, retaining feedback on prior iterations to refine drafts, prototypes, or compositions. Learners can manipulate mental images, sounds, or structures, enabling transformation and variation without external prompts. Learners can balance fluency with quality, keeping selection criteria active while curating ideas. Learners can sustain thematic or stylistic coherence by holding the overarching concept active throughout the process of generating ideas. Learners can translate inspiration into output, retaining the core concept while choosing techniques, tools, and media.

	Cognitive flexibility/switching
Definition	**The ability to shift thinking or behaviour when needed, for example, exploring new ideas or managing competing demands on our attention. Another term for this is switching. It helps us avoid getting stuck, and to adapt to new information or circumstances.**
Complex thinking skills	Learners can shift between perspectives or models, comparing alternative explanations and reframing problems to reveal new solutions. Learners can move fluidly between divergent and convergent thinking, expanding possibilities and then switching to evaluate and select). Learners can shift their focus to alternate levels of analysis, zooming out to see patterns and zooming in to scrutinise assumptions or evidence. Learners can change criteria appropriately, applying different standards of evidence or relevance as the task or subject demands. Learners can reconfigure reasoning pathways, abandoning an unproductive line of argument, and testing a new one without losing coherence. Learners can integrate new information on the fly, updating conclusions as fresh data becomes available. Learners can navigate uncertainty, switching between hypotheses while maintaining a disciplined approach to verification.
Self-management skills	Learners can shift strategies when plans are not working, selecting a new approach without losing sight of the overall goal. Learners can re-prioritise tasks dynamically, moving attention and effort to the most time-critical or high-value task as circumstances change. Learners can toggle between big-picture goals and immediate next steps, ensuring actions remain aligned to purpose while attending to details. Learners can incorporate feedback quickly, switching from a preferred habit to a more effective strategy based on evidence. Learners can adjust emotional and behavioural responses, moving from frustration to problem-solving modes when obstacles arise. Learners can match organisation methods to context, choosing different routines, tools, or checklists for different types of tasks or environments. Learners can sustain momentum across transitions, restarting efficiently after interruptions or schedule changes.

Interpersonal skills	Learners can shift between their own and others' perspectives, enabling empathy, perspective-taking, and productive negotiation. Learners can adjust their communication style in terms of tone, formality, and modality, to suit their audience, purpose, and cultural norms. Learners can change roles fluidly in teams, moving between leading, following, facilitating, or synthesising as group needs evolve. Learners can revise interaction strategies, switching from advocacy to inquiry, or from presenting to listening, to maintain constructive dialogue. Learners can reframe misunderstandings, trying alternative explanations or questions to repair communication breakdowns. Learners can manage turn-taking and topic shifts, tracking the conversational thread while pivoting appropriately. Learners can adapt conflict-management approaches, selecting different resolution tactics as the emotional climate or evidence changes.
Digital skills	Learners can pivot between tools and workflows (e.g., from a spreadsheet to a visualisation or a code notebook) without losing task coherence. Learners can change analytic approaches when the data or question demands it. Learners can switch representational forms, moving from text to table to chart to check consistency. Learners can update search/query strategies, modifying terms, filters, or parameters when initial results are weak. Learners can shift evaluation criteria, applying different data-quality checks (completeness, validity, reliability) as the dataset or stage of analysis changes. Learners can adapt to interface updates or platform constraints, finding new pathways when familiar functions move or tools change. Learners can transition between exploratory and confirmatory data analysis, knowing when to open up possibilities and when to finalise decisions and conclusions.
Creative skills	Learners can move between idea generation and refinement, knowing when to keep exploring and when to critique or select an idea. Learners can combine remote concepts, shifting frames to connect ideas across domains, media, or modalities. Learners can alter constraints deliberately, relaxing or tightening criteria to spur novelty or enhance feasibility. Learners can experiment with alternative techniques and tools, abandoning habitual methods when a different approach better serves the purpose. Learners can reframe problems, redefining the brief or audience to unlock new directions. Learners can iterate responsively, switching direction in light of user testing, peer critique, or performance feedback. Learners can balance coherence with surprise, toggling between adherence to a theme and intentional deviation to achieve creative impact.

	Inhibition
Definition	**The ability to hold back a thought, comment, or action when it is not appropriate. Inhibition helps us control our behaviour, attention, or impulses so that we can make thoughtful choices and respond appropriately in different situations.**
Complex thinking skills	Learners to pause automatic or surface-level responses to questions in order to think more deeply. By inhibiting distracting thoughts, learners can create the cognitive space required to interrogate ideas, weigh evidence, and deliberately select among different possible lines of reasoning. Learners can suppress irrelevant information during analysis and evaluation. Learners can resist default assumptions, question first impressions, resist drawing premature conclusions, and remain open to alternative explanations during analysis and evaluation. Learners can resist selecting the first option they encounter when making decisions and solving problems.
Self-management skills	Learners can resist unhelpful impulses to respond to distractions or other competing demands while working. Learners can avoid blurting out answers they have not been asked for. Learners can resist switching tasks unnecessarily and sustain attention on what matters most. Learners can avoid reacting emotionally or abandoning effort when their work does not appear to go well.

	Learners can adapt to new learning contexts rather than defaulting to habitual behaviours.
Interpersonal skills	Learners can pause before responding in social interactions, enabling them to avoid impulsive reactions and to respond in ways that are appropriate to the social and emotional context. Learners can suppress the urge to interrupt, dominate, or react defensively, supporting effective turn-taking, respectful dialogue, and balanced participation in discussions. Learners can regulate emotional responses during interactions, allowing them to remain calm, constructive, and open when faced with disagreement, feedback, or challenge. Learners can attend carefully to others' contributions, by inhibiting distracting thoughts or competing impulses and focusing attention on what others are saying. Learners can consider perspectives beyond their own, as inhibition enables them to set aside immediate personal viewpoints in order to engage in empathy and perspective-taking. Learners can collaborate more effectively, by inhibiting self-centred impulses and engaging in compromise, shared decision-making, and joint problem-solving.
Digital skills	Learners can resist impulsive interactions with digital technologies, such as clicking indiscriminately, scrolling continuously, or multitasking excessively, enabling more purposeful and focused digital engagement. Learners can filter and ignore irrelevant, misleading, or low-quality digital information, allowing them to attend selectively to data and sources that are credible, relevant, and aligned with their goals. Learners can pause before sharing, posting, or responding online, supporting responsible digital communication by allowing time to consider accuracy, tone, audience, and potential consequences. Learners can sustain attention on data-focused tasks, by inhibiting distractions from notifications, background media, or competing digital demands when analysing information or working with digital tools. Learners can apply their critical thinking skills when interpreting data in digital contexts, resisting the urge to accept outputs, visualisations, or AI-generated content at face value and instead interrogating assumptions, limitations, and sources. Learners can manage cognitive load in digital environments, suppressing non-essential inputs so they can organise, manipulate, and synthesise multiple data sources effectively. Learners can use digital tools ethically and responsibly, inhibiting actions that may compromise privacy, security, or academic integrity in favour of values-aligned decision-making.
Creative skills	Learners can resist premature closure on first ideas, enabling them to move beyond obvious, habitual, or familiar responses and explore a wider range of creative possibilities. Learners can suspend immediate judgment of ideas, allowing them to generate, refine, and combine ideas without dismissing them too quickly as impractical or incorrect. Learners can inhibit dominant patterns of thinking, which supports cognitive flexibility and enables them to approach problems from alternative perspectives or reframe challenges creatively. Learners can manage emotional responses to uncertainty or risk, enabling them to tolerate ambiguity, persist through setbacks, and continue experimenting when outcomes are unclear. Learners can filter distractions during creative processes, allowing sustained engagement in activities such as designing, writing, or artistic production. Learners can avoid over-reliance on familiar tools or methods, enabling them to try new techniques, representations, or creative strategies rather than defaulting to what has worked before. Learners can adapt creative responses to context and purpose, inhibiting impulses to prioritise personal preference over audience, constraints, or intended impact.