CHARLES FADEL, ALEXIS BLACK, ROBBIE TAYLOR, JANET SLESINSKI, KATIE DUNN

Knowledge

Skills

Learner

Character

Meta-Learning

Motivation

Purpose
Agency
Identity
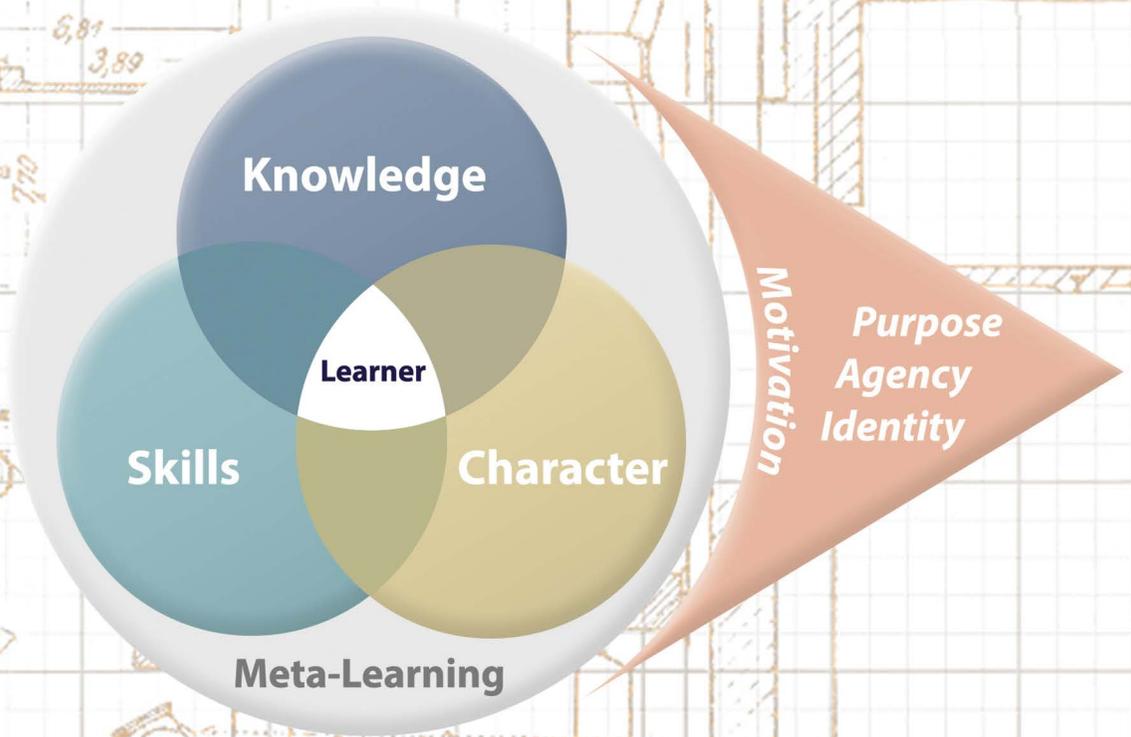
EXCERPT FROM

Education for
the Age of AI

"I feel privileged to write the prologue ... This combination of theory and practice is the beauty of what CCR has been doing for over a decade."

Olli-Pekka Heinonen,
Director General, International Baccalaureate,
Former Minister of Education of Finland.

Chapter Four
Impact on Education - High-Level

"...the symbiotic partnership will perform operations much more effectively than man alone can perform them." - J.C.R Licklider
"As machines become more and more efficient and perfect, it will become clear that imperfection is the greatness of man." - Ernst Fischer

The importance of precise terminology

To avoid vagueness, CCR's approach uses the learning-sciences-extracted, clear definitions described in its framework. For instance, Creativity is synthesized from comprehensive research through the following "subcompetencies" and "associated constructs:"

Competency	Subcompetency	Associated constructs
Creativity	Developing personal tastes, aesthetics, and style	Inspiration, Originality, Ingenuity, Vision, Inventiveness, Idea Generation, Cleverness, Resourcefulness
	Generating and seeking new ideas	
	Being comfortable with risks, uncertainty, and failure	
	Connecting, reorganizing, and refining ideas into a cohesive whole	
	Realizing ideas while recognizing constraints	

The importance of precision and context

In his 2004 book, *Making Minds Less Well Educated Than Our Own,*[1] AI expert, psychologist and educator Roger Schanck described the attributes of an educated mind, as capable of the following tasks:[2]
- Determining connections
- Spotting analogies
- Predicting outcomes
- Learning from failure

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[1] Schank, R.C. (2004). *Making minds less well-educated than our own.* Routledge. https://www.routledge.com/Making-Minds-Less-Well-Educated-Than-Our-Own/Schank/p/book/9780805848786

[2] Paraphrased for brevity

- Recovering from failure
- Seeking explanations
- Absorbing newness
- Handling exceptions
- Dealing with abstraction
- Generalizing reasonably
- Being self-aware

When polled during CCR's presentations, educators the world over agree that, except for self-awareness, all other tasks are within the *present* reach of AI, *with a major caveat: the devil is in the details*, as usual. "It depends" is the most common answer, highlighting the need for *precision* in the question asked (per chapter one, "limitations of language"), as well as the importance of *context* (Does one need to explain an image into words for the AI? What datasets are missing to understand the query?). Similarly, Bloom and other taxonomies in the cognitive, affective, and psychomotor domains should trigger explorations but not panic: these depictions that CCR uses are only a cognitive shortcut to make readers take notice:

Cognitive Domain and Algorithms

CREATING Synthesizing	OpenAI Bard ANTHROP\C MISTRAL AI_
EVALUATING	Post Olympics Medal Leaderboard
ANALYZING	Lex Machina IP litigation data and analytics
APPLYING	Google Translate skype Translate
UNDERSTANDING	DRAGON NATURALLYSPEAKING
REMEMBERING	Google facebook

Source: Bloom/Anderson

Affective Domain and Algorithms

Source: Krathwohl, Bloom, Masia

© Center for Curriculum Redesign

That said, it is important to note that the technologies have been moving UP in the taxonomies stack over time, from passive capabilities to increasingly active ones, thanks to AI (reaching analysis, synthesis, creativity, valuation, and organization, but of course unable of internalizing emotions).

As stated in the Introduction, "We cannot imagine a pedagogically sound argument that would leave a 10-year-old at home, all the time and by themselves, learning via AI on a VR headset." This means that Schooling is still required: it is our only fundamental axiom, logically justified. This ACI phase requires deep interactions between humans and machines, which need to be learned by students as an intrinsic part of their schooling.

If AI can do everything, why learn anything?

Firstly, this is a wrong (and naive) question: AI cannot "do everything" as described in prior chapters. This question about the tool negating the need is a recurring one: in recent times, debates about calculators, and later search engines, have raged in education circles. But superficial statements such as "Google knows everything" have been debunked: it "knows" nothing, it merely indexes everything it can find (and which is approximately only 5% of the total human digital output on the internet).[3] In the digital age, the value of human learning is often overlooked despite the instant access

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[3] Rosen, J. (2014). The internet you can't google. *The Tennessean.* https://eu.tennessean.com/story/money/tech/2014/05/02/jj-rosen-popular-search-engines-skim-surface/8636081/; Wikipedia. (2023). Google search. https://en.wikipedia.org/wiki/Google_Search

to information. While search technology provides data and complex responses, human cognition is indispensable for critical thinking, discernment, and applying knowledge meaningfully.[4]

Because Learning requires scaffolding:

Relying on casual interactions and superficial engagement with technology over 18 years does not equip students with the necessary skills to engage with AI. For example, while scrolling through a social media feed, a student might indirectly interact with AI algorithms, but they remain unaware of the mechanics, ethical considerations, and potential impacts of such technologies. To effectively prepare students for the AI era, **scaffolding** (moving the student progressively towards better understanding[5]) is all the more essential. Scaffolding refers to a pedagogical approach wherein educators provide successive levels of support that help students reach higher levels of comprehension and skill acquisition. In the context of AI and emerging technologies, this means starting with foundational knowledge and progressively introducing more complex concepts as the student's comprehension deepens. Additionally, incorporating AI capabilities in classrooms and encouraging students to utilize these tools for coursework and recreation can bolster their understanding and application of AI.

Because Learning Happens in Context:

Learning happens in a context, and over time it is generalized and abstracted, but isolated information found online cannot fully capture the context in many cases. Daniel Willingham[6] compares this to studying vocabulary words. Students are asked to use new words in sentences when they are learning them, to learn not just a definition, but how the word is used in context. When students simply look up synonyms online, they often end up using them incorrectly, such as saying "he meticulously balanced on the edge" (using the definition of "meticulous" to mean "careful"). The same reasoning, he argues, should be applied to all content learning. Just having the ability to look up a fact may not be enough to apply that fact properly.

To Avoid "Unconscious Incompetence"[7]:

(Or more academically stated, "Avoiding the Dunning-Kruger Effect."[8]). One important use of knowledge is to guide people to what they do not know and should learn more about. As adults, there is a critical mass of knowledge

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[4] Willingham, D. T. (2007). Critical thinking: Why is it so hard to teach? *American Educator, 31*(2), 8-19. http://www.aft.org/sites/default/files/periodicals/Crit_Thinking.pdf

[5] Glossary of Education Reform. (2015) Scaffolding: Definition. *Great Schools Partnership: The Glossary of Education Reform.* https://www.edglossary.org/scaffolding

[6] Willingham, D. (2017) You still need your brain. *Grey Matter*

[7] Wikipedia. (2023). Four stages of competence.

[8] Kruger, Justin; Dunning, David (1999). "Unskilled and unaware of it: How difficulties in recognizing one's own incompetence lead to inflated self-assessments." *Journal of Personality and Social Psychology*, 77 (6): 1121– 1134.

available to create a rough map of our understanding and its gaps. Actor John Cleese humorously explains the Dunning-Kruger ("D-K") effect as "If you're very, very stupid, how can you possibly realize that you're very, very stupid? You'd have to be relatively intelligent to realize how stupid you are." Without a minimum understanding of a subject area, the trap one is likely to fall into is not just ignorance (which can be cured with an internet search), but "meta-ignorance" (ignorance about one's ignorance[9]), which can be far more pernicious.

For example, when reasoning about economic policies, citizens must implicitly estimate various economic realities to compare them to an ideal and consider possible changes. In a 2014 Gallup survey, 63% of Americans said that they believed the crime rate had been on the rise, despite the crime rate being at a 20-year low. Those who thought crime rates were rising were 8 percentage points less likely to support stricter gun control laws.[10] If one does not know that their estimates are not representative of reality, they may not think to look up the true numbers. In fact, in this study, participants who identified with both major US political parties misrepresented the inequality in the same way and agreed on the ideal distribution. Factual information serves a crucial role in one's ability to think critically and creatively.

Having the ability to look things up may exacerbate the D-K effect: In one study,[11] participants who were allowed to use Google to answer trivia questions perceived themselves as smarter than those who were not allowed to use Google (even when the percentage of questions answered correctly was artificially equalized).

To develop Speed, Fluency, and Automaticity, used in daily life:

There is a basic level of each discipline that is necessary for day-to-day living. For example, there is a level of understanding that is necessary for basic math fluency with constructs such as weight, temperature, and money.[12] In neurotypical children, this level is achieved routinely, but it is important to keep in mind which parts of the curriculum will be truly useful for all students' lives.

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[9] Poundstone, W. (2016) Head in the Cloud: Why Knowing Things Still Matters When Facts Are So Easy to Look Up. Little, Brown

[10] Interestingly, 20 years prior, in 1994, people who thought crime rates were increasing were 9 percentage points more likely to support stricter gun laws, so there is some interaction with rhetoric. Kohut, Andrew (2015) Despite lower crime rates, support for gun rights increases. Pew Research Center.

[11] Wegner, D. M., & Ward, A, F. (2013) "The internet has become the external hard drive for our memories." Scientific American 309.6: 58-61.

[12] Patton, J. R., Cronin, M. E., et al (1997). A life skills approach to mathematics instruction: Preparing students with learning disabilities for the real-life math demands of adulthood. *Journal of Learning Disabilities*, 30, 178-187.

While anyone can look up anything at any time, having to look up everything would be completely impractical in real life, and would slow down future learning and problem-solving. For example, although one could frequently look up unfamiliar words, this process is distracting from reading. Generally, the more vocabulary one knows, the greater their reading comprehension.[13] This problem is exacerbated in settings where students have to process information in real-time, such as lectures or group work and do not have the option to look things up whenever they need to.

In such cases, a lack of fluency or automaticity (which is the combination of accuracy and speed) in lower-level components can serve as a bottleneck to learning higher-level concepts.[14] More broadly, research has shown that fluency "increases retention and maintenance of knowledge, endurance or resistance to distraction and application or transfer of training."[15]

To be part of a shared social background:

Consider giving directions to a local compared to a tourist. When speaking to a tourist, one naturally understands that it is impossible to rely on shared information or assumptions, and takes much more time to explain things that would otherwise be taken for granted.[16] Similarly, news and media are not written in a way that explains every single idea; there is a collection of background information that is assumed and relied upon. E.D. Hirsch has worked to identify what content falls into this category for the U.S. (e.g. cholesterol, absolute zero) in his work on Cultural Literacy,[17] **although this list must be adjusted for modernity** (as described in Chapter Five) and for other cultures around the world.

To acquire more complex concepts:

Every complex concept can be said to be made up of smaller pieces of information, which require automaticity to reach more complex understandings, per section above. Nonetheless, learning a concept is usually not simply the process of amassing the smaller pieces of information that comprise it. This is the thinking behind the research exploring learning progressions: "curricula should be designed to provide students with a systematic exposure to increasingly complex meanings... and grounding them in experiences with particular content

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[13] Schmitt, N, Xiangying J, and Grabe. W. (2011) "The percentage of words known in a text and reading comprehension." The Modern Language Journal 95.1: 26-43.

[14] Binder, C. (1993). Behavioural fluency: a new paradigm. Educational Technology.

[15] *ibid.*

[16] Poundstone, W. (2016). Head in the cloud: The power of knowledge in the age of Google. Oneworld Publications. Chicago

[17] Hirsch Jr, E. D., Kett, J. F. and Trefil, J.S. (1988) Cultural literacy: What every American needs to know.

and topics."[18] It may be that learning topics in a certain order or through a certain pathway will lead to the knowledge being represented and stored differently, and serve as preparation for different types of future learning. Therefore, another reason some knowledge may be included in curriculum is that it is part of a particularly effective learning progression.

Because the rate of change in information is misjudged:

There is so much hype about AI (as there was about Search) that there is severe misjudgment as to what knowledge still - or *will* still - matter. To understand this question, it is necessary to analyze each discipline and its topics to identify the speed of their variance, and their ease of adaptation:
- Slowly-variant: For instance, Philosophy does not change rapidly
- Step-variant, which is occasional:
  - Medium step: e.g., expanded Digital Literacy into "Prompt Design" requiring specific training and frequent evolution.
  - Large step: e.g., teaching concepts & competencies, or modifying assessments & pedagogies, are very big "lifts", needing to be addressed by the schools of education, and in-service professional development.
- Rapidly-variant: e.g., the choice of LLM *du jour* (or the computer language du jour) will require informal training via communities of users.

The chapter on Knowledge will clarify these complexities.

The right question is: "Given AI's powerful capabilities, and increasingly so, how do we adapt education to remain relevant?"

## By developing both Expertise and Transfer:

Expertise is the expected result from an education; of course, this expertise is conferred at different levels and to different degrees throughout primary to tertiary education. This expertise is particularly germane to eventually finding activities, most likely remunerated. Contrary to popular opinion, Expertise is made, not born: "What consistently distinguished elite surgeons, chess players, writers, athletes, pianists, and other experts was the habit of engaging in 'deliberate' practice—a sustained focus on tasks that they couldn't do before. Experts continually analyzed what they did wrong, adjusted their techniques, and worked arduously to correct their errors."[19] The

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[18] Mosher, F. (2017). A Hitchhiker's Guide to Thinking about Literacy, Learning Progressions, and Instruction A Hitchhiker's Guide to Thinking about Literacy, Learning Progressions
[19] K. Anders Ericsson, K.A., Prietula, M.J. & Cokely, E.T. (2007). The making of an expert. *Harvard Business Review.* https://hbr.org/2007/07/the-making-of-an-expert

late Anders Ericsson was the author of the Theory of Deliberate Practice,[20] and the concept of "10,000 hours of practice" was falsely attributed to its popularizer Malcolm Gladwell.

Transfer: However, education's more fundamental but little heeded goal has always been to equip someone with enough background to *apply what has been learned in one context, to a different context and time*. This is known as "**Transfer,**" and must be nurtured explicitly, ***while traditional education was content with building expertise mostly, by conflating transfer and expertise.*** Harvard's David Perkins explains[21] how a student can learn to transfer without necessarily learning first to be an expert (as an "expert amateur"), as concepts are stated in natural language and self-explanatory (for example: in History: "History does not repeat itself but it rhymes," or in Maths: "Exponentials are deceiving then explosive"). Transfer and Expertise *reinforce* each other, hence the oscillation between the two.
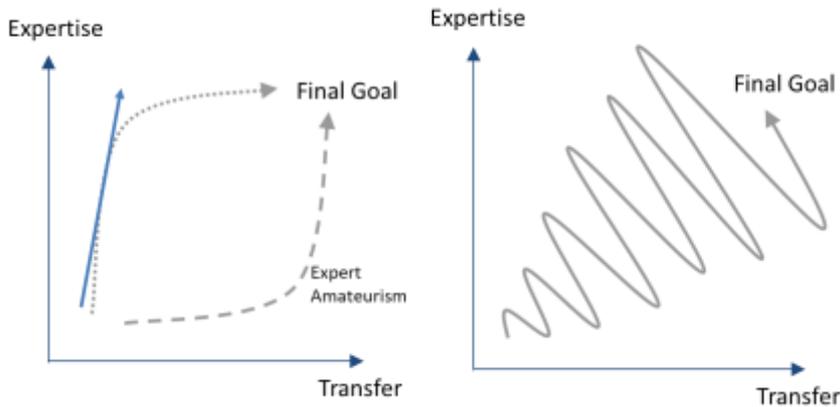
(Source: CCR)

But humans keep searching for a "refuge" from AI, as described in Chapter One: it is the hope that there will be a space left untouched where people can be more "Human." Subsequent chapters will discuss where this space exists, though it is not a simple, identifiable, macro-level "refuge" - it is context-dependent: ***"It depends,"*** as described in the first section of this chapter. So, are Expertise and Transfer such "refuges"?

Can AI be an Expert? Of course.

This has been demonstrated in spades over many tasks, from games (Chess, Go, Stratego, etc.) to more scientific ones (protein folding, disease-modeling, etc.). AI is being applied to just about every

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[20] The Role of Deliberate Practice in the Acquisition of Expert Performance' (Ericsson, Krampe, & Tesch-Römer, 1993).
[21] Perkins, D. (2010). *Making learning whole: How seven principles of teaching can transform education.* Wiley.

occupation, as seen earlier, so expertise is not in question. However, "it takes one to know one" goes the saying, and judging AI's answers will require *both* sufficient subject-matter knowledge and critical thinking. Ethan Mollick, at the Wharton School of Business at the University of Pennsylvania, stated: *"On some tasks, AI is immensely powerful, and on others, it fails completely or subtly. And, unless you use AI a lot, you won't know which is which."[22]*

But Can AI Transfer? Yes, it can somewhat, and increasingly so

First, a clarification of taxonomies: In AI, "Transfer" is used in "Transfer Learning" (a technique), while Transfer itself is termed "Generalization."[23] CCR will use Transfer, as this book is meant for educators.

As stated in Chapter One, LLMs will have access to vast amounts of data, of modalities very much *"beyond text and images, such as molecular structures, network traffic, low-level machine code, astronomical images, and brain scans. It may therefore possess a strong intuitive grasp of domains where we have limited experience, including forming concepts that we do not have."[24]* It will detect analogies between fields that are far apart, and draw interesting correlations that humans will have to filter for causality.
So, Transfer is not a refuge: AI can navigate immense multi-dimensional spaces, and eventually Transfer better than humans for near- and medium-transfer. Far transfer is hard for everyone including Humans, but this may put pressure on Imagination, which will be discussed in the section on Creativity.

Consequences for Education Systems: Wider & Wiser Curricula

Why Wider? For Versatility

The world around us is changing in profound ways, and education must adapt to it. In an age of growing uncertainty, a wise strategy would be to hedge against disruptions by embracing **versatility**. A K-12 education today must equip the learners with the abilities to tackle life challenges, ranging from social and political issues (global warming, pollution, inequities, etc.) to

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[22] Mollick, E. (2023). Centaurs and cyborgs on the jagged frontier. *One Useful Thing.* https://www.oneusefulthing.org/p/centaurs-and-cyborgs-on-the-jagged
[23]Kozlov, M., & Biever, C. (2023). AI 'breakthrough': Neural net has human-like ability to generalize language. *Nature.* https://doi.org/10.1038/d41586-023-03272-3
[24] Bounded Regret. (2023). What will GPT-2023 look like? *Bounded Regret Blog.* https://bounded-regret.ghost.io/what-will-gpt-2030-look-like/

technology's disruption (Social Networks, and now particularly Artificial Intelligence). As such, **Education is NOT Training;**[25] **Education is broad, and life-related at large**, while Training is narrow and job-related (and starts partially in high school). Of course, Education and training are both needed eventually, but must not be conflated as they have different goals (psychosocial-focused for Education, Economic-focused for Training).

The future not being knowable, cultivation of versatility is a wise and appropriate strategy – think of it as a "hedge against all eventualities." Using a Swiss army knife analogy, it is best to equip learners with a broad set of tools that can be sharpened as the circumstances require - poet, physician, painter, and physicist.

(Source: Unknown – Internet)

How Wiser? By redesigning the What and the How

Wisdom is more than ever the goal of an education, as justified in Chapter Three. But to get there, it is necessary to redesign both standards/curricula (the What) and Pedagogy (the How), as there are significant gaps between emerging needs compared to the current practices.

The What:

What schools teach is abdicated to jurisdictional powers, which resist modernization due to inertia, and fear of change. Education has not yet fully adapted to the Information Age: for example, though called "STEM," only "St_M" is taught in K-12 - very little Technology, and no Engineering. Now the Internet Age, 25 years later, which David Houle[26] called the Shift Age, requires adapting rapidly to changing information and dealing effectively with a diversity of languages, cultures, and lifestyles. And with the AI age, the accumulated deficit of the past two ages comes back even more

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[25] With a respectful nod to former MIT Professor Woodie Flowers, R.I.P.

[26] Houle, D. (2008). *Entering the shift age: The end of the information age and the new era of transformation.* Sourcebooks.

forcefully, augmented by a new set of challenges, reviewed herein.

As a result of this inertia, some will argue, perhaps to temper their cognitive dissonance, that the What does not matter "as long as you learn". CCR profoundly disagrees: why focus the teaching on old content, if better options are available? For example, why waste time learning trigonometric functions that matter to very few, and have been largely automated, rather than data science, which is useful across many disciplines and is in hot demand?

All Four Dimensions Matter:

As a summary, Harvard's Chris Dede summarizes the situation well:[27]
"The current curriculum and high-stakes tests often prioritize fostering skills at which AI excels, such as reckoning skills involving calculative prediction and formulaic decision-making. However, AI cannot easily replicate human judgment, which is a deliberative thought process that is flexible and contextual based on experiential knowledge, ethics, values, relationships, and culture."

As described in our 2015 book *Four-Dimensional Education*, and more relevant than ever, this means paying attention to all four dimensions of Education: **Knowledge, Skills, Character, and Meta-Learning.**[28] The "4D" Model remains robust (with clarifying caveats that will be explained in subsequent chapters, and the appendix):

● Knowledge: (see Chapter Five)
   ● Declarative knowledge is more challenged than ever by LLMs, which is an amplification of historical trends (scripts[29], books, Internet, search engines). As explained earlier, it does not mean that humans do not need base knowledge, it means they need to be a lot more *discriminant about what is essential and **relevant**.*
   Also, and counterintuitively, there is a need for a broader set of declarative knowledge, to respond to the need for versatility. David Epstein, author of "Range,"[30] contrasts "kind" and "wicked" learning environments, explaining that while structured, predictable "kind" environments can favor early specialization, *real-world* "wicked" environments often reward a wide range of experiences. He also stresses that a sampling period, where one explores various

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[27] Cao, L. & Dede, C. (2021). Navigating a world of generative AI: Suggestions for educators. *Harvard Graduate School of Education: Next Level Lab.* https://bpb-us-e1.wpmucdn.com/websites.harvard.edu/dist/a/108/files/2023/08/Cao_Dede_final_8.4.23.pdf

[28] CCR Framework Rev. 1.2: https://curriculumredesign.org/framework/

[29] Bemoaned by Socrates: "Your invention will enable them to hear many things without being properly taught, and they will imagine that they have come to know much while for the most part they will know nothing. And they will be difficult to get along with since they will merely appear to be wise instead of really being so." (Plato. [1925]. *Plato in twelve volumes, vol. 9* Translated by Harold N. Fowler. William Heinemann Ltd.)

[30] "Range: Why Generalists Triumph in a Specialized World" (2019) Riverhead Books Epstein, D. (2019). *Range: Why generalists triumph in a specialized world.* Riverhead Books.

       interests before settling on one, can lead to more career satisfaction and success. Epstein argues against early specialization in education, stating it can limit children's ability to explore their potential and adapt to new situations, and investigates "match quality" - the fit between one's interests, abilities, and their career, and how a broad range of experiences can enhance it. However, it is crucial to state an AND mindset at this stage: Per IBM Research's T-shaped model,[31] it is perfectly possible to build depth AND breadth, not one or the other - Expertise AND Transfer. This is CCR's position, as the subsequent chapters will explore.

- LLMs increase the pressure toward teaching more conceptual knowledge (core concepts) and procedural knowledge (projects). Success at medical, legal and other tests highlights the significant extent to which these tests are based on memorization of declarative knowledge (to be fair, coupled with some deductive capacities).

- Competencies: In Chapter Six we will review in detail the importance of each competency in light of AI, and its likelihood of being automated. But here is a peek preview:
  - Skills: Are both challenged and augmented by AI.
  - Character: Some remain significantly Human (for instance, Ethics), and must be leant on, while others are helped *and* pushed (for instance, Curiosity).
  - Meta-Learning: Learning how to Learn is more critical than ever, as are Metacognition and Metaemotion.

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[31] Demirkan, H. & Clinton Spohrer, J. (2018). Cultivating T-shaped professionals in the era of digital transformation. *IBM Research.* https://research.ibm.com/publications/cultivating-t-shaped-professionals-in-the-era-of-digital-transformation
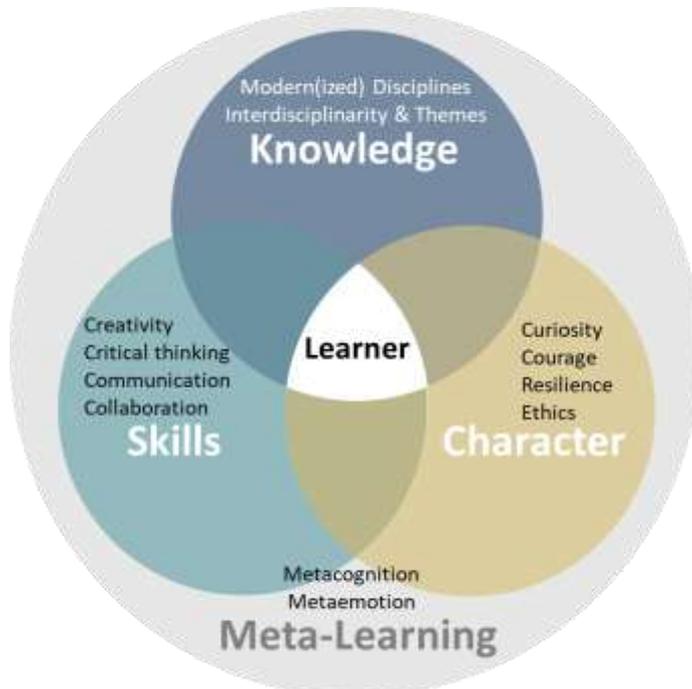
(Source: CCR)

In addition to the goals of a modern education described by the Venn diagram above, there is also a growing need to personalize Education (see Chapter Seven). This personalization comprises four drivers: Motivation, Identity, Agency, and Purpose - of which motivation and purpose will remain quintessentially human:

(Source: CCR)

The How:

There is an enormous amount of experimentation happening worldwide, and large amounts are being invested in essentially two major academic aspects of AI (this book will not cover administrative aspects). AI is being used to automate the:

- Design: By teachers and curriculum developers, of curricula, lesson plans, and assessments, as well as a large number of smaller-impact tools.
- Delivery: Right away, there is a significant emphasis on teacher- and student-led experimentations on AI use in instruction (via Prompts for the most part), which this book will not cover: It is a rapidly shifting field better served by timely blogs.
  Over time, teachers might have an AI assistant that offers personalized learning suggestions for students based on their progress and learning style. Students might also eventually use an Intelligent Tutoring System (ITS) directly.

Chapter Eight will thus focus on the Design aspect first and foremost, showcasing how all the recommendations can be designed together cohesively. Given the extremely dynamic and fluid situations at play, which will decant only over time, this book will not cover the Delivery aspects except for a short section on Adaptive Learning and ITS.

What about "Learning AI"?

This question, bandied around in policy circles, is very imprecise as it mixes AI as a discipline and AI as a tool. One does not need to learn Computer Science to operate a smartphone, and one does not need to learn AI algorithms to use an LLM. The table below shows the difference between AI as a What (at two levels: digital literacy for everyone, and as CS for the specialists) and the How (AI as an education tool).[32]

Level	WHAT (knowledge)	HOW (teaching) [EdTech applies]
HIGH	Learning ICT *itself* (Acquire Disciplines: Computer Science (incl. A.I.) + Electrical Engineering)	Learning through/via/with ICT • Through: Simulations/Gaming, AR/VR, Adaptive Learning/AI
LOW	Learning *about* ICT (Acquire ICT functional knowledge [aka "*digital literacy*"]: e.g. use many apps (e.g. spreadsheets, search, now LLMs and other AI, etc.)	• Via: asynch/synch virtual classrooms • With: use for Problem-solving e.g. GIS/GPS + search; etc.

(Source: CCR)

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[32] **None of which is to be confused with Digital Infrastructure/Access ("plumbing").**

But would all these recommendations be the same if AGI was reached? ASI?

First of all, it is a huge logical leap to state that just because AGI is reached (and at what level, this will be highly debated), all jobs will disappear - this seems very implausible for all the reasons discussed in Chapter Three. But let's play with this scenario anyway:

If AI does take over all jobs, leaving us free from the need to train for employment, what should the focus of education be? Secondary education, typically beyond age 14, is a preparation for tertiary stages like VET or university, which are traditionally job-related. However, in a scenario where jobs are significantly impacted, the high school years could shift focus away from employability. *Assuming guaranteed incomes*, this would allow for more discretionary time for individuals to engage in their epicurean interests. Therefore, education would pivot all the more towards cultivating students' identity, agency, and especially their motivation and purpose for a jobless world. This approach underscores the importance of a broad and deep education that fosters "MIAP" – Motivation, Identity, Agency, and Purpose – as none of these needs would vanish in the absence of traditional employment. And from a psychosocial perspective, it is likely that education requirements would just be re-targeted. So even in this extreme scenario, the aforementioned recommendations remain applicable – voilà! But, considering the human propensity to generate ever more work for themselves, this vision should be viewed with healthy skepticism. IF such shift is truly observed, it may inspire a new perspective, perhaps taking a leaf from the French flair for work-life balance. 🙂

For ASI, all bets are off; the reader's guess is as good as anyone's.