NGLC MyWays

# Content Knowledge for the Life Students Will Lead

## Report 9 of the MyWays Student Success Series

October 2017

Grace Belfiore and Dave Lash
for Next Generation Learning Challenges

## The MyWays™ Student Success Series

All reports in the series are available for download at myways.nextgenlearning.org/report.

**Visual Summary**

**Introduction and Overview**

### *Part A: Adolescence in an Age of Accelerations*

Summarizes specific real-world realities and conditions confronting today's young people.

*Report 1:* **Opportunity, Work, and the Wayfinding Decade**

*Report 2:* **5 Roadblocks to Bootstrapping a Career**

*Report 3:* **5 Decisions in Navigating the Work/Learn Landscape**

*Report 4:* **5 Essentials in Building Social Capital**

*Report 5:* **Preparing Apprentice-Adults for Life after High School**

### *Part B: Broader, Deeper Competencies for Student Success*

Provides a composite definition of student success in learning, work, and life.

*Report 6*: **Welcome to the MyWays Student Success Framework**

*Report 7*: **Habits of Success — for Learning, Work, and Well-being**

*Report 8*: **Creative Know How — for a Novel, Complex World**

*Report 9*: **Content Knowledge — for the Life Students Will Lead**

*Report 10*: **Wayfinding Abilities — for Destinations Unknown**

### *Part C: Redesigning the Learning Experience for the MyWays Competencies*

Brings the broader and deeper competencies of the MyWays Student Success Framework into educational practice.

*Report 11:* **Learning Design for Broader, Deeper Competencies**

*Report 12:* **Assessment Design for Broader, Deeper Competencies**

## About this report

**Report 9, *Content Knowledge — for the Life Students Will Lead***, considers the Content Knowledge domain of the MyWays Student Success Framework, including why the domain focuses on big understandings and extends into authentic application, key principles for implementation, and the state of play in the field, as well as offering resources and essential one-page primers for each competency.

Report 9 is the fourth of five reports in Part B of the *MyWays Student Success Series*. **Part B, "Broader, Deeper Competencies for Student Success,"** provides a composite definition of student success in learning, work, and life, drawing on over 25 highly-regarded frameworks and the literature in the education, work, and human development fields.

The ***MyWays Student Success Series*** examines the through-line of four essential questions for next generation learning and provides research and practice-based support to help school designers and educators to answer these questions. The series consists of 12 reports organized into three parts, plus a Visual Summary and Introduction and Overview.

The **primary researchers and authors** of the *MyWays Student Success Series* are Dave Lash, Principal at Dave Lash & Company, and Grace Belfiore, D.Phil., Principal Consultant at Belfiore Education Consulting.

**MyWays is a project of Next Generation Learning Challenges**, an initiative of the non-profit EDUCAUSE. MyWays is supported through a grant from the William and Flora Hewlett Foundation with additional support from the Bill & Melinda Gates Foundation, the Barr Foundation, and the Oak Foundation.

NEXT GENERATION LEARNING CHALLENGES

nextgenlearning.org

REPORT 9

# Content Knowledge – for the Life Students Will Lead

## Introduction

Students, of course, continue to need Content Knowledge. MyWays defines this domain as "subject area knowledge and organizing concepts essential for academic and real-life applications." See the individual competency sets incorporated in this domain in the box to the right. Although Content Knowledge might seem like the most familiar and traditional of the four domains, don't be fooled. Whether core math or English, the sciences or the arts, ***to assume the new goal-line Content Knowledge looks like traditional curriculum would be to overlook critical changes in the nature of the knowledge competencies that today's students need.***

**Content Knowledge**

***Subject area knowledge and organizing concepts essential for academic and real-life applications***

Content Knowledge competencies:

- **English Core**
- **Math Core**
- **Science, Social Studies, Arts, Languages**
- **Interdisciplinary & Global Knowledge**
- **Career-Related Technical Skills**

In this report, we will provide an overview of the domain by covering the following:

- Why the Content Knowledge domain is so important
- An overview of the five Content Knowledge competencies
- Three key principles for addressing Content Knowledge
- A brief summary of the state of play in Content Knowledge learning and assessment
- A quick resource dive for Content Knowledge (highlighting starter resources, competency frameworks, and school models that address this domain)
- Five Content Knowledge competency primers (Primers are generally one-pagers; in this domain, the English Core and Math Core are combined on one page, and the Science, Social Studies, Arts, Languages competency is given two pages.)

In researching this domain, we encountered a number of apparent contradictions. The Content Knowledge goal line needs to be broader, yet traditional mile-wide curricula need to be pruned and honed to align with learning science and to make way for new future-ready subjects, skills, and habits. Learning needs to be more interdisciplinary, yet as Marc Tucker points out, "that knowledge will do you little good unless you first understand the disciplines themselves, not just superficially, but at a deep conceptual level." Fortunately, practitioners and researchers alike have been working on how to address these paradoxes by (as the vignettes on the following page suggest) mastering key concepts and moving earlier to real-world applications — as well as following the other key principles discussed in this report.

## Mastering Key Concepts and Real-World Applications

If you are tempted to skim over this report on the Content Knowledge domain, we invite you to spend a few minutes reflecting on the following thoughts from Charles Fadel, of the Center for Curriculum Redesign, recorded in a fascinating 2016 interview with Marc Tucker. From eighteenth century land surveyors to brand new medical school curricula, these nuggets provide a glimpse of the vital challenges we all face in discerning what to include in a broader, deeper curriculum — and, as importantly, what to "curate from it." The rest of the report explores content areas to include and key principles for how to address them.

"Without deep conceptual mastery of disciplines, it is very hard to learn much of what our students will need to know. … [N]otwithstanding the availability of an enormous amount of information on the internet, it is still essential that students have in their heads very complex knowledge structures as well as the knowledge that gets hung on those structures**. The question is not whether we need facts and structures in our heads but which facts and which structures.**

***When the country was much younger and mariners and land surveyors and builders needed trigonometry, it made sense to require trigonometry in the math curriculum. But today it might make much more sense to drop many topics in trigonometry from the mathematics curriculum and put in math modeling, statistics and probability instead."***

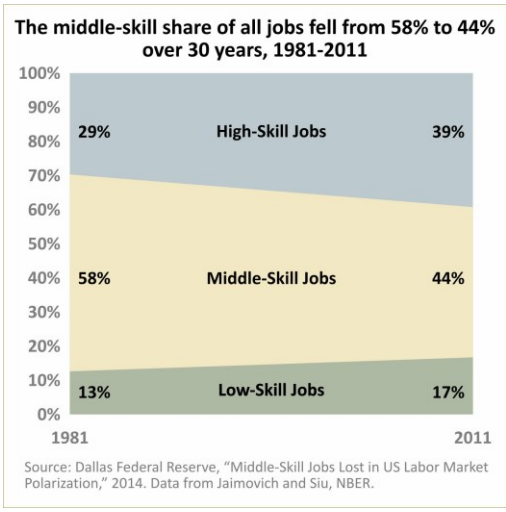
"If you look at the new medical curriculum, started at McGill and later adopted by Harvard, they made huge changes in the instruction of medical education. Much the same thing has happened in engineering and other professions**. They still include classes in the underlying disciplines, but students move to applied work much more quickly, and the questions that come up in the applied work shape the way the students learn the underlying disciplines**. The argument for this kind of education is that the student learns how to learn from the very beginning. The education of these professionals still includes classes in the traditional subjects, but they don't last as long, or go as deep as they used to.

***Is this the way to create schools that produce students with a deeper conceptual mastery and, at the same time, much more capacity to apply what they know to real world problems?"***

"If we don't sort out the "what" properly, we will never get to the "how" part right. How time is allocated between the traditional disciplines and interdisciplinary work is very important. How time is allocated between mastering the content and applying it is no less important. Creating school experiences that successfully blend both is crucial. **Part of this…is a matter of making wise decisions about which topics to include in the curriculum and which to curate from it. We won't get universally to learning new disciplines such as robotics, entrepreneurship, etc. without dropping something we are now teaching**. That will require simplification of a high order, with careful curation – a scalpel analogy comes to mind, not a chainsaw.

***I asked my cousin who is a zoologist: if you had to teach zoology in two weeks, what would you teach? He jokingly quipped: it would take 40 years to answer that question! But lo and behold, the next day he sent me an email of nine bullet points about the essential concepts in zoology. It is perfectly possible to take any discipline, and extract the essence of it. Having done that, we must make sure students deeply absorb these concepts, for life."***

## Why Content Knowledge is so important




One of the strongest reasons for the continued, and we would argue increased, importance of Content Knowledge is the "brawn to brains" shift in labor market skill levels described in Report 1. Over the past 30 years, technological change has shifted jobs in two directions: toward high-skill, abstract, non-routine work on the one hand and, to a lesser extent, to non-routine, manual work (low-skill jobs) on the other. The middle-skill share of all US jobs fell from 58% in 1981 to 44% in 2011 (graph) with enormous impacts on clerks, tellers, office assistants, travel agents, bookkeepers, mail carriers, drivers, and cooks — jobs that could be offshored or replaced by technology. Middle-skill jobs remain, for now, the largest segment of the labor market; however, high-skill jobs are growing most quickly and the skill level required of middle-skill workers is continually rising. Both skill levels will require an increased ability to work with artificial intelligence and the abundance of information it will make available, as well as with increasingly complex, multi-cultural systems and economies.

For more on this and other challenges in the labor market, postsecondary education, and the development of social capital for today's students, see Part A, "Adolescence in an Age of Accelerations." In each of these realms, learners find that "more is on them" (individually) to create successful pathways;[1] as a result, the importance of reading and research skills, math and analytical skills, and knowledge of key concepts in other academic, cultural, global, and technical knowledge areas only increases. Students might ask:

> **Do I have a strong, fundamental knowledge and skill set, an ability to see connections across fields as they change and evolve, and hands-on experience of applying career-related technical skills**, that will serve me well in an uncertain economic and employment future?
>
> **Do I have knowledge of human cultures, systems, languages, and histories as well as global themes** to understand, empathize, connect, and work with others?
>
> **Am I able to use my reading, writing, research, and math skills, and overall content knowledge**, to develop my aspirations, strengths, and marketable competencies; hone my competitive advantage; and help me adapt to workplace change through lifelong learning and renewal? Am I able to construct a *workview* and *lifeview* about my place in the world and to power my navigation through the work/learn landscape of postsecondary learning and early employment?[2]
>
> **Can I apply this understanding and knowledge** to help myself, my loved ones, and my communities adapt to change and leave the world a better place?

As David Perkins notes in *Future Wise: Educating Our Children for a Changing World*:

> It hasn't passed anyone's notice that we live in a complicated era. The information explosion, digital worlds, globalization, looming limitations of resources such as petroleum and water, the shift from manufacturing to service industries in many quarters, the information economy, and dozens of other factors make today's world more demanding of rich knowledge and sophisticated thinking and collaboration than the world in which our parents grew up. These trends seem likely to continue to shape tomorrow's world in ways not so readily forecast. ***Truly, we need to educate for the unknown***.[3] [Emphasis added.]

In many ways, this is a conundrum that applies to all. How does one educate for the unknown? "Our sense of what's worth learning is a bet, not a sure thing, but we can make good bets rather than poor ones. We can imagine what [learners'] lives and what our world are mostly likely to be like, and we can hedge our bets by looking towards learning that promises payoffs in diverse circumstances."[4]

Content Knowledge is also important because of its role as a force multiplier driving a widening opportunity gap between students of varying socioeconomic backgrounds. When brawn counted as much as brains, the lack of third grade literacy, or English and math proficiency in high school, did not preclude a meaningful job in manufacturing or the trades that could support a middle-class living. Today, English, math, science, and social studies are essential tools of lifelong learning and the acquisition of new, marketable competencies is critical as technology disrupts some occupations and creates new ones.

In the modern postsecondary-centered economy, we are making modest gains in closing the academic achievement gap, while the opportunity gap in postsecondary degree attainment, employment, and income is widening rapidly and turning us into a two-tier nation.[5] Empowering every child with strong Content Knowledge competencies is now an essential tool in economic mobility.

## An overview of the Content Knowledge competencies

Today's students need the opportunity to engage with and develop mastery in a wide variety of content areas, both to address the range of knowledge relevant to the complex and fast-changing world, and to provide them with a diversity of routes to engagement and the development of personal strengths. The broad range of subject areas covered in this domain may seem overwhelming, but remember that the MyWays framework provides a comprehensive rosetta stone from which choices are made and individual paths created. Certainly, some of the content areas included below should be considered core and common. However, it is important to pair this description of the Content Knowledge competency landscape with two of the key principles for addressing these competencies: first, that in each discipline, the K-12 curriculum focuses on fewer, "high-leverage" concepts to be learned more deeply and durably, and second, that learners (like workers in today's economy) combine breadth of knowledge across topics and disciplines with true depth of expertise in one or more areas of interest. We will talk about these principles more in the

following section, but it is useful to keep them in mind while overviewing the content knowledge that MyWays groups within five broadly-defined competencies.

The ***first two competencies*** are core to developing all the others. The "mile wide" ELA and math competencies of the No Child Left Behind (NCLB) era shifted, in Common Core and similar state standards, toward a smaller number of deeper learning objectives. Today, they continue to evolve, with particular attention to the relevance of developmental trajectories, key concepts, and application.

### English Core

Deep English learning application across settings, aligned with the Common Core and similar standards.

Addressing this competency includes helping students to: master key components of English language learning such as reading with comprehension, writing for different purposes, speaking and listening for communication and collaboration, and language conventions and effective use; to interpret and create both fiction and informational text; and to develop the capabilities or habits of mind of a literate individual.

### Math Core

Deep math learning and application across settings, aligned with the Common Core and similar standards.

Addressing this competency includes helping students to: master key components of math learning such as number and quantity, algebra, functions, modeling, geometry, statistics, and probability; demonstrate procedural skill and math understanding; and develop varieties of expertise through mathematical practice or habits of mind.

*See three additional competencies just below. For expanded descriptions, see the competency primers*.

The ***third competency*** emphasizes the benefits of a broader range of traditional subject knowledge. These subjects, less prominent under NCLB, are being prioritized once again. This shift is supported by evidence from the learning sciences that shows both their importance and efficacy; the connection of these subjects to real-world pursuits in an increasingly global and technological society; and renewed attention to the importance of educating the whole person, including social and cultural expression.

### Science, Social Studies, Arts, Languages

Active learning of core disciplinary concepts and their application in a broad selection of liberal arts and sciences, and language and performing arts.

Addressing this competency includes helping students to: **in science**, develop disciplinary core ideas, understand crosscutting concepts, and engage in scientific practices across the physical, life, and earth and space sciences, and engineering applications; **in social studies,** develop key concepts within the subjects of civics, economics, geography, and history and relate them to social studies themes by applying social science practices; **in the arts**, develop increasing competence within one or more arts areas, such as dance, media arts, music, and theater and visual arts, through applied artistic processes; **in languages**, develop the competence to communicate effectively and interact with cultural understanding in a second language in real-world settings.

*For an expanded description, see the relevant competency primer at the end of this report*.

The ***fourth competency*** targets interdisciplinary learning and future-ready themes. From bioengineering, robotics, and entrepreneurship to behavioral economics, wellness, and social systems, interdisciplinary learning has been shown to increase the development of critical thinking skills and improve learner engagement in the deeper understanding and application of traditional knowledge. Meanwhile global and cultural literacies and themes will enable students to develop the capacities and dispositions to interact with diverse audiences and act on issues of global significance.

## Interdisciplinary & Global Knowledge

Integrated interdisciplinary thinking and empathetic development of global, cross-cultural, civic, environmental, and economic literacies.

Addressing this competency includes helping students to: develop knowledge and skills related to interdisciplinary thinking, and apply approaches from multiple disciplines to real-world problems; develop the capacity to understand and act on issues of global significance; and demonstrate knowledge of and the ability to apply civic, environmental, and economic literacies to personal decisions and societal challenges.

*For an expanded description, see the relevant competency primer at the end of this report.*

Through the ***fifth Content Knowledge competency***, MyWays asserts the value of ***all*** learners gaining career-related technical knowledge as part of their K-12 learning experience. Whether headed to a four-year college, straight into the job market, or, increasingly, combining elements of working and learning over their twenties, our research shows that all learners benefit from developing a set of career-related skills, and getting the exposure to adults and rapid change that exposure to the real world entails, even if their ultimate career choice differs from this first exposure to the work/learn landscape.

## Career-Related Technical Skills

The integration of academic, technical, and employability skills in at least one existing career area or emerging problem space of personal interest.

Addressing this competency includes helping students to: gain knowledge and skills in one or more career clusters or pathways (such as health sciences or human resources clusters or visual arts or national security pathways); within a cluster or pathway, gain competency in the necessary academic knowledge, demonstrate professional or trade practices, and illustrate understanding of organizations, ethical issues, and potential careers; and refine, through developmental experiences, broad career-ready skills that employers expect.

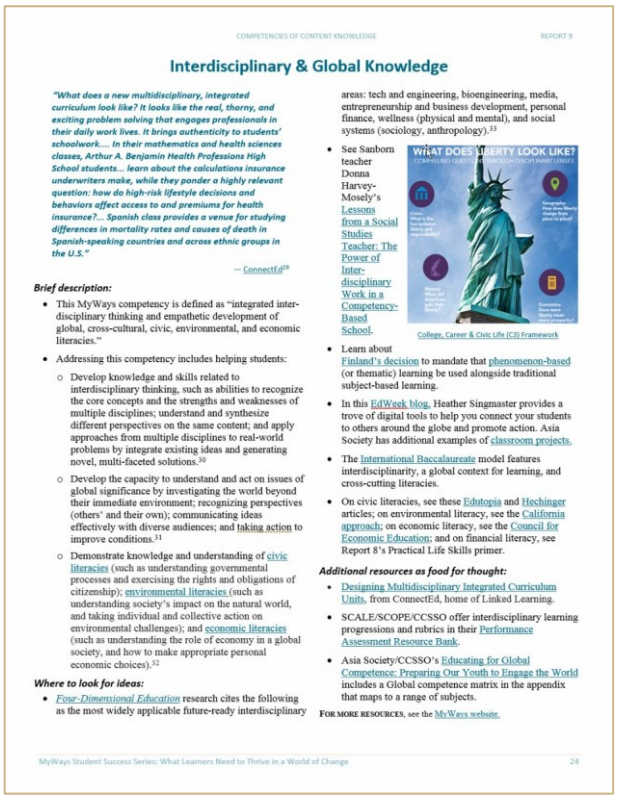
*For an expanded description, see the relevant competency primer at the end of this report.*

## *Content Knowledge competency primers*

**For more on each of these competencies, be sure to see the primers at the end of this report.** We have included primers for the five competencies (combining ELA Core and Math Core on one page to enable Science, Social Studies, Arts, Languages to have two pages). As indicated in the sample provided here, these primers briefly cover**:**

- what the competency covers;
- where to look for guidance on addressing the competency; and
- additional resources.

The primers are intended to provide a brief introduction to the most important aspects of each competency. They offer only a taste of the research and activity in each area, but we've tried to ensure that they include many of the key issues and resources. We hope that our MyWays Community of Practice and other educators will help add to and update these resources over time.



COMPETENCIES OF CONTENT KNOWLEDGE REPORT 9

**Interdisciplinary & Global Knowledge**

*"What does a new multidisciplinary, integrated curriculum look like? It looks like the real, thorny, and exciting problem solving that engages professionals in their daily work lives. It brings authenticity to students' schoolwork.... In their mathematics and health sciences classes, Arthur A. Benjamin Health Professions High School students... learn about the calculations insurance underwriters make, while they ponder a highly relevant question: how do high-risk lifestyle decisions and behaviors affect access to and premiums for health insurance?... Spanish class provides a venue for studying differences in mortality rates and causes of death in Spanish-speaking countries and across ethnic groups in the U.S."*

— ConnectEd[29]

***Brief description:***

- This MyWays competency is defined as "integrated inter-disciplinary thinking and empathetic development of global, cross-cultural, civic, environmental, and economic literacies."
- Addressing this competency includes helping students:
  - Develop knowledge and skills related to interdisciplinary thinking, such as abilities to recognize the core concepts and the strengths and weaknesses of multiple disciplines; understand and synthesize different perspectives on the same content; and apply approaches from multiple disciplines to real-world problems by integrate existing ideas and generating novel, multi-faceted solutions.[30]
  - Develop the capacity to understand and act on issues of global significance by investigating the world beyond their immediate environment; recognizing perspectives (others' and their own); communicating ideas effectively with diverse audiences; and taking action to improve conditions.[31]
  - Demonstrate knowledge and understanding of civic literacies (such as understanding governmental processes and exercising the rights and obligations of citizenship); environmental literacies (such as understanding society's impact on the natural world, and taking individual and collective action on environmental challenges); and economic literacies (such as understanding the role of economy in a global society, and how to make appropriate personal economic choices).[32]

***Where to look for ideas:***

- *Four-Dimensional Education* research cites the following as the most widely applicable future-ready interdisciplinary areas: tech and engineering, bioengineering, media, entrepreneurship and business development, personal finance, wellness (physical and mental), and social systems (sociology, anthropology).[33]
- See Sanborn teacher Donna Harvey-Mowely's Lessons from a Social Studies Teacher: The Power of Inter-disciplinary Work in a Competency-Based School.



College, Career & Civic Life (C3) Framework

- Learn about Finland's decision to mandate that phenomenon-based (or thematic) learning be used alongside traditional subject-based learning.
- In this EdWeek blog, Heather Singmaster provides a trove of digital tools to help you connect your students to others around the globe and promote action. Asia Society has additional examples of classroom projects.
- The International Baccalaureate model features interdisciplinarity, a global context for learning, and cross-cutting literacies.
- On civic literacies, see these Edutopia and Hechinger articles; on environmental literacy, see the California approach; on economic literacy, see the Council for Economic Education; and on financial literacy, see Report 8's Practical Life Skills primer.

***Additional resources as food for thought:***

- Designing Multidisciplinary Integrated Curriculum Units, from ConnectEd, home of Linked Learning.
- SCALE/SCOPE/CCSSO offer interdisciplinary learning progressions and rubrics in their Performance Assessment Resource Bank.
- Asia Society/CCSSO's Educating for Global Competence: Preparing Our Youth to Engage the World includes a Global competence matrix in the appendix that maps to a range of subjects.

FOR MORE RESOURCES, see the MyWays website.

MyWays Student Success Series: What Learners Need to Thrive in a World of Change 24

Sample competency primer (See primers starting on page 21.)

While many of the next generation frameworks we analyzed assume that educators are familiar with content knowledge coverage and choose instead to concentrate on the skills, habits, and other "broader, deeper" competencies, we were intentional about including a re-visioned set of Content Knowledge competencies in the MyWays Student Success Framework. Indeed, one of the guiding requests from our practitioner network was to provide a "whole person" framework that enabled them to see the whole picture together.

In addition, we provide a complete, re-configured Content Knowledge domain because:

- we believe strongly in every element of the broader set of content knowledge competencies introduced above (see alignment with a selection of experts in the following box), and
- there is insufficient acknowledgement to date among practitioners that, in order to adjust to a super-abundance of information and the reality of an uncertain and complex future, the nature of the content to be learned within each of those subjects also needs to be very different. We recommend addressing this challenge with the guidance of the key principles addressed in the next section.

## Converging Ideas on Next Generation Content Knowledge

As the *Introduction and Overview of the MyWays Student Success Series* describes, we distilled the MyWays four-domain goal-line from over 25 existing competency frameworks. Once the goal-line took shape, we saw echoes of this synthesized approach to Content Knowledge in two constructs from researchers who have made the future direction of learning their life's work: the **Six Beyonds,** from Harvard Project Zero's David Perkins in his book, *Future Wise: Educating Our Children for a Changing World*; and the **CCR Knowledge Framework** from Charles Fadel and the Center for Curriculum Redesign (CCR) team in their book, *Four-Dimensional Education: the Competencies Learners Need to Succeed* (a successor to their influential P21 book, *21st Century Skills: Learning for Life in Our Times*).

### Six Beyonds

Perkins cites six "beyonds" that push past the conventional to what's worth learning and that map strongly to the competencies and ethos of our Content Knowledge domain. These six areas focus on the ways in which educators are pushing:

- beyond mastering content (helping students learn to think about the world *with* content and take action accordingly);
- beyond traditional disciplines (through renewed, hybrid, and less-familiar disciplines);
- beyond discrete disciplines (to interdisciplinary and transdisciplinary topics and problems);
- beyond regional perspectives (to global perspectives, problems, and studies);
- beyond prescribed content (to much more individual agency in the choice of what to study); and
- beyond traditional basic skills (which leads into MyWays Creative Know How and other domains).[6]

### CCR's Knowledge Framework

CCR's Knowledge Framework includes many of the same subject areas and knowledge concepts encompassed by the MyWays Student Success Framework, albeit organized in different ways, in part because it is international. The CCR Knowledge Framework includes three key areas:

- Traditional knowledge: traditional disciplines, but with "more interdisciplinarity."
- Modern knowledge: technology and engineering, media, entrepreneurship and business, personal finance, wellness, social systems, vocational subjects, and even more extensive "interdisciplinarity."
- Themes across both of these knowledge categories, including global and environmental literacies.
- The use of concepts and meta-concepts, methods and subject branches, similar to the next key principle.[7]

## Key principles for addressing Content Knowledge

A Content Knowledge approach that "educates for the unknown" is distinguished by **three key principles,** helping students to:

1. **Focus on a few "high-leverage" constructs** in each subject that are central to the structure of the discipline, transfer, and continued learning in a world of change.

2. **Engage with content through learner-driven, purposeful, real-world experiences**, which improve learning while preparing students for life.

3. **Attain balance by developing "T-shaped" knowledge, pursuing appropriate breadth while also developing depth** of expertise in chosen areas.

These qualities make the MyWays framework's Content Knowledge quite different from the traditional Content Knowledge that schools have focused on in the past. Let's explore each of them in more detail.

### *KEY PRINCIPLE 1:* Focus on a few "high-leverage" constructs in each subject that are central to the structure of the discipline, transfer, and continued learning in a world of change.

Start with the need for significantly broader content competencies, as introduced above. Add the fact that new knowledge is increasing exponentially in many of these subject areas. The resulting "crowded garage" effect in the Content Knowledge domain begins to hit a critical level. At the same time, learning science has confirmed that mile-wide and inch-shallow coverage doesn't produce deep and durable learning; instead, we now know that higher-level thinking and the ability to transfer and use knowledge requires in-depth study and real-life application. What's a next generation educator or learner to do?

Fortunately, being strategic about focusing on a select number of high-leverage concepts — that is, the "less is more" approach — helps learners:

- **develop a rigorous and robust understanding of key concepts** and the architecture to hold new knowledge that can be sourced at any time in our information rich age; and
- **unlock the time needed to learn the key content in deep and durable ways by** actively constructing knowledge, as well as the time to integrate the other competency domains (Creative Know How, Habits of Success, and Wayfinding Abilities) in their learning experiences.

To identify these "key structural concepts" and "big understandings," we look for:

- **Concepts that are central to continued learning in the discipline and beyond**. These concepts are part of a discipline's "structure of knowledge" and "ways of thinking." They provide the necessary foundation for those who specialize in the subject, and offer everyone else the core ideas required to understand the discipline as part of a broad knowledge base and to make connections from their own areas of expertise. We thus cover fewer key concepts, but cover those concepts rigorously so that, as Charles Fadel suggests in his third nugget at the start of this report, students "deeply absorb these concepts, for life."
- **Concepts that develop higher-level thinking and application**. Along with a focus on key structural concepts, we need to focus on topics and approaches that are complex and adaptable enough to foster higher level, deeper thinking. By inviting learners to apply concepts much earlier in the learning process, we introduce naturally a level of complexity and variability that increases challenge and the level of thinking.
- **Concepts relevant to transfer — in the real world of today and tomorrow**, in the lives our students will lead. At the moment we continue to teach too much that is neither part of big understandings nor useful in critical thinking and application; in addition, more and more, "much

> of what we typically teach," as Perkins notes, "most likely won't matter to learners' lives. It doesn't offer very good return on investment… [On the other hand] there is much we don't typically teach that likely would matter a lot — [and thus offer] better return." [8]

The following box offers some powerful thinking on high-leverage concepts and — critically! — on how you can make the time (or room in your mental garage) to explore them.

## Understanding "High-leverage Concepts"

The idea of high-leverage concepts is both central to next generation competency definition and applicable across all content subjects. While a few learning models have focused on these types of concept over the years, a growing number of educators are now highlighting their relevance to next generation learning. In our view, the nature of the knowledge students need today is best captured in three characteristics that David Perkins describes his book *Future Wise: Educating Our Children in a Changing World* — knowledge that is **lifeworthy, lifeready,** and based on **big understandings**.

### Learning that is lifeworthy and lifeready

In both traditional and new subject areas, Perkins recommends that we carefully choose content that is "lifeworthy" and "lifeready."

**Lifeworthy.** This type of knowledge correlates with what he and others call, variously, "big ideas," "enduring understandings," "metaconcepts," "understandings of wide scope," and "keystone concepts" — that is, key concepts and topics that yield insight and implications in many circumstances, and are likely to be meaningful in the lives that learners will live.[9] Charles Fadel and his coauthors target the same type of knowledge when they talk about "ideas students will carry with them throughout their lives, either due to direct practical value or enrichment of worldview" and "reshaping the learning goals from a focus on covering all of the content in a subject or topic, to understanding the key aspects in a meaningful way that will improve comprehension, retention, and the learning experience of students."[10]

**Lifeready.** Imagine the benefits of students spending more of their time on lifeworthy topics! However, as Perkins points out, even lifeworthy knowledge is insufficient if students think only *about* that information and not *with* that information. To think *with* knowledge, students also need learning that is *lifeready*— that is, knowledge they can use to solve problems, weigh options, make decisions, and better understand their world. Perkins boils this down to knowledge that 1) helps orient us, 2) helps us deliberate, and 3) provides a foundation for future learning.[11]

***Mahatma Gandhi's train was pulling off when one of his sandals fell. "So he took off his other sandal and tossed it next to the first one. He explained to startled companions that a poor person might find the one sandal, but what good would that do? Two sandals might be very helpful to such a person."***

-Told by David Perkins

*Continues on the next page >*

## Big understandings

One way of testing whether a topic is likely to be both lifeworthy and lifeready is whether it fits Perkins' four-part definition of a big understanding — that is, a topic that is big in four areas:

1. *Big in insight*: it helps reveal how our physical, social, artistic, or other worlds work.
2. *Big in action*: it empowers us to take effective action professionally, socially, politically, or in other ways.
3. *Big in ethics*: it urges us toward more ethical, humane, caring mindsets and conduct.
4. *Big in opportunity:* it is likely to come up in significant ways in varied circumstances.

**Insight.** To maximize insight, teachers must determine which concepts are what David Conley, channeling Grant Wiggins, in this *Education Week* blog, calls the *keystones*: "If students can go deep in those areas, they can gain insight into disciplinary thinking, the way experts in that subject go about applying their content knowledge." But, they note, "this strategy requires teachers to be much clearer and intentional about what is truly important in their class. They must be ready to determine which topics don't warrant the time being devoted to them… They must be able to identify keystone content and concepts that unify the discipline and enable students to gain greater insight into the subject area…."

**Action and ethics.** The bias toward action and ethics is illustrated in Perkins' story of Gandhi's "second sandal":

> *As Mahatma Gandhi was boarding a train, one of his sandals fell, and because the train had started to move he could not retrieve it. So he took off his other sandal and tossed it next to the first one. He explained to startled companions that a poor person might find the one sandal, but what good would that do? Two sandals might be very helpful to such a person.*

As Perkins notes, this was not just a charitable act but also a knowledgeable one: "Notice how Gandhi's gesture reflects understanding of a range of circumstances: the way the lives of poor people depend on precious moments of opportunity, the utility of a pair of sandals compared to just one, the difficulties of retrieving the lost sandal with the train in motion… Not bad for a few seconds stepping onto a train!"

Perkins argues that Gandhi demonstrated "big understanding" in this instance, taking action to advance an ethical outcome. While he admits that cultivating this kind of wisdom is a tall order for schools, he suggests that "maybe a reasonable aspiration for education, even pre-university education, is not so much wisdom but knowledge on the way to wisdom."[12]

**Opportunity.** The criterion related to opportunity stipulates that content under consideration should be likely to come up in significant and varied ways in the lives of those studying the content. One example is Charles Fadel's argument on the first page of this report that statistics generally may have more value in today's world than trigonometry. If you are interested in what qualifies as a big understanding — and what might not — see the extended analysis of topics such as mitosis, ecological fit, quadratic equations, and democracy in Perkins' book.[13]

## Lifeworthy and Lifeready in Practice

Influential educators have long promoted various aspects of a focus on lifeworthy, lifeready learning — from John Dewey and Maria Montessori to the Coalition of Essential Schools and the organizations mentioned in the Relevant Learning Models box below.

Among others, Grant Wiggins put forward in this ASCD blog the idea of "a diploma worth having," suggesting that "education toward such a diploma might involve a version of civics with emphasis on civic action, how a bill becomes law, and lobbying. US and world history might get taught backward chronologically from currently pressing issues. Mathematics could focus principally on probability and statistics and mathematical modeling."

Some of these approaches focus on high-leverage concepts within disciplines, while others organize around interdisciplinary themes or real-world problems (Finland, known for its recent high-profile push on phenomenon-based learning, actually balances both). What is clear is that, given the challenges posed by the explosion of knowledge and the need to address the uncertain world ahead, the scales have tipped in favor of some kind of intentional, meaningful redesign of Content Knowledge goals for our students, and the principles of lifeworthy and lifeready provide promising guiderails.

Schools that adhere to the Hewlett Deeper Learning principles provide further examples of learning that is aligned to the principles discussed in this report. As Jal Mehta notes in a "Learning Deeply" blog, an example of knowledge that is both lifeworthy and lifeready might be the study of why civilizations rise and fall — an essential question that was posed in a High Tech High project featured in the documentary *Most Likely to Succeed.* As Mehta explains, "This kind of question forces [content] coverage, as students look across the Greeks, Romans, Mayans, and others, but it also puts students in the role of historical social scientists as they seek to develop theories, weigh evidence, and consider context. Such an examination could also clearly connect to contemporary questions about whether America is a civilization in decline… It might also help students to remember some of what they learned in the longer term, as specific historical events in history would no longer seem like a string of facts but rather part of a pattern or thesis that the student had developed."

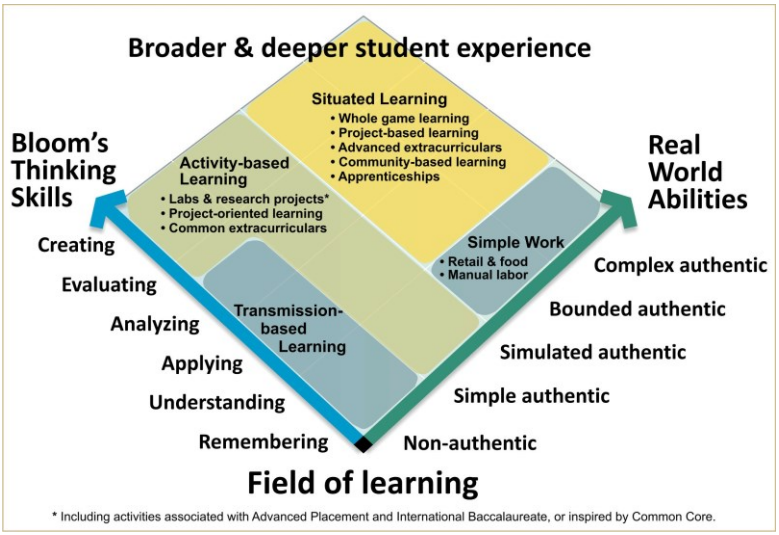
The gear constructions in this High Tech High project were designed by the students to represent their theories of the rise and fall of civilizations.

***KEY PRINCIPLE 2:***

**Engage with content through learner-driven, purposeful, real-world experiences, which improve learning while preparing students for life.**

Starting with lifeworthy, lifeready content knowledge is critical, but to ensure that content is both mastered and acts as the springboard for further inquiry and learning, it is also necessary to consider how students experience that learning. Learning that is active, interest-based, connected to the real world,

socially situated, centered around challenging real-world problems, and otherwise authentic and meaningful has been shown to improve durable retrieval, deeper understanding, and prospects for transfer. It also offers opportunities to integrate development of all four MyWays competency domains. For a more extensive consideration of this kind of learning experience, see Report 11, *Learning Design for Broader, Deeper Competencies*, especially sections on the Field of Learning (see the graphic to the right), Whole Learning, Levers for Capability and Agency, and the Wider Learning Ecosystem.




While these approaches are often essential for enabling students to develop Creative Know How, Habits of Success, and Wayfinding Abilities (which clearly aren't suited to traditional "book learning"), they are also the key to learning Content Knowledge in the way we've been defining it: as "mastery of key concepts and application." In addition to the benefits we described above, these more authentic approaches (including project-based, problem-based, service-based, self-directed, and place-based learning, internships, and apprenticeships) can create, in the words of an EL Education teacher, "a richly designed learning experience — both creative and intellectual — [that] can sear a student's memory and forever alter his understanding of the world."[14]

For a window into how these authentic learning approaches promote meaningful learning of lifeworthy and lifeready content in an integrated way with the broader competencies, see the box below on the High Tech High middle school Mayan project, which has been used to provide a worked demonstration of a number of the self-assessment tools in the MyWays Toolset.

## "I have never seen them be so careful with their writing, their research…"

High Tech High's Maya Community Project website provides a window into the authentic, project-based approach taken by High Tech High Schools, as documented in Ted Dintersmith's documentary *Most Likely to Succeed.*

HIGH TECH HIGH®

MyWays used the (authentic, holistic) Whole Learning principles outlined in Report 11, *Learning Design for Broader, Deeper Learning* and the authentic, multiple measures assessment principles outlined in Report 12, *Assessment Design for Broader, Deeper Competencies* to analyze a book creation project on the Mayan civilization carried out at a High Tech High middle school.

### Reflections of teacher Heather Lovell

"The Mayan Community Project is always an adventure and, to me, illustrates the fun and chaos possible from PBL.

## The Mayan Community Project

**Essential Questions:**

- Why is it important to learn about the Mayan civilization?
- How are books published and marketed?
- What is life like currently for people of Mayan descent?

After doing extensive individual and group research on current and ancient aspects of Mayan culture, students will summarize information from their research to write and illustrate a children's book, A-Z: What we learned about Mayan Culture.

Each student will be responsible for creating his/her own page with illustrations to contribute to the class book. The book will be bilingual and each student will have a chance to translate parts of their work into Spanish with help from the Spanish teacher.

As a class, students will produce, promote, publish, and sell the book, operating as a business with committees and job positions. All proceeds from book sales will go to sending impoverished children to school for a year in the Mayan towns near Lake Atitlan in the highlands of Guatemala.

"The beginning is very researched based and somewhat controlled, but as the project moves toward completion, the students take over in their committees, and I feel more and more in the shadows of their work. What always strikes me most about their work is how authentic it is and how all the students revel in it.

"This year, every single student submitted several drafts of their text, several drafts of their illustration, and an attempt at Spanish translation. Every student wants to be in a real published book… My students really tuned into the fact that they had the power to help others and ran with it. I had never seen them so careful with their writing, their researching, their fundraising, or their attitudes."

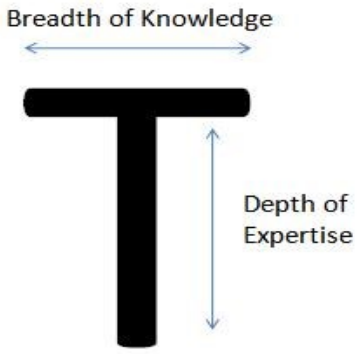
From the Mayan Community Project site.

We also recommend the following **video resources** because experiential learning is one of those things you really need to see in action to understand its benefits:

- **A Learn with Two Rivers Learning Expeditions** video (5m) on bringing authentic context to learning from the community of practice site of Two Rivers Public Charter School in Washington, DC.
- **The Illuminating Standards** video collection from Ron Berger (EL Education) and Steve Seidel (Harvard Graduate School of Education). "They speculated that long-term, interdisciplinary, arts-infused, community-connected projects may well be one of the best ways to actually see what state standards look like when fully realized in the things students make in school — to make the standards visible." As an example see the "The Eye of the Storm Learning Expedition" video (6m) from Casco Bay High School, Portland, Maine.
- **For more practice videos, see our Next Generation Learning Challenges blog** "Embracing the Hard Parts: 8 Video Resources for Authentic Learning Design." It includes descriptions of and links to a range of other video resources including the Teaching Channel Deeper Learning series. (For more on the alignment between MyWays and experiential learning, see also the first of this two-part blog, "Hard to Do Well: Project-Based Learning and Authentic Learning Design.")
- **For video reflections on special considerations for ensuring equity** in the design and implementation of experiential learning watch these Deeper Learning Conference 2017 preview videos from Tony Simmons (3m) of the High School for Recording Arts in St. Paul, MN and Jose Garcia (3m) of New Tech Network. Listen especially for their references to educators making themselves vulnerable in order to provide students with a safe space to be vulnerable, learn, and become agents of change through real-world learning.

### *KEY PRINCIPLE 3:* Create balance by developing "T-shaped" knowledge, pursuing appropriate breadth while also developing depth in chosen areas.

The concept of T-shaped education captures an intentional combination of breadth and depth:




*Simple representation of the two dimensions of T-shaped learning*
*Darren Negraeff, The importance of T-shaped individuals*

- **Within disciplines**, the "T" represents strong foundational and practical knowledge across a domain, paired with deep knowledge within a strand of that domain.
- **At the higher level**, a focus on big understandings can provide a solid "expert amateur" grounding in a broad range of traditional and new disciplines, enabling learners to work across them; this is matched with the development of deep expertise in one or more disciplines.

The T-shaped approach lets learners reap the benefits of both — developing appropriate breadth across content knowledge and much greater depth in a few areas chosen to coincide with interests, passions, potential career pathways, or life missions.

In addition to its benefits within the educational realm, this approach provides a good parallel to the concept of a T-shaped employee or professional — an approach thought to foster the diverse connections and adaptability required both in working within cross-functional teams and shepherding one's own portfolio career. The concept of workplace contributors with T-shaped skills has been promoted by, among others, IDEO, a leading design firm famous for its innovation based on cross-disciplinary project work and design thinking.

For more on the concept's continuing evolution in the education world, see the box on the next page.

***With the range of topics exploding, and brain science insights into the importance of depth for understanding and durable retrieval, we are paying increasing attention to the vertical component.***

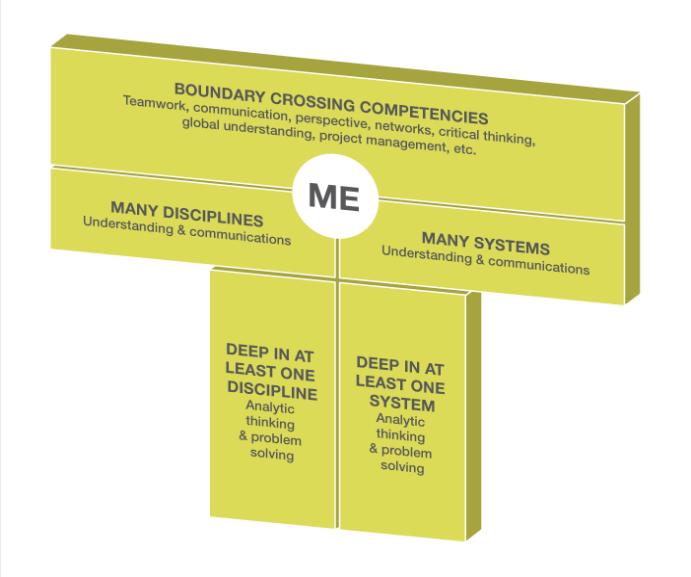
## T-shaped Education: Crossing boundaries, diving deep, and keeping learning agile

The basic T-shape involving breadth and depth within a traditional academic content knowledge is a familiar concept in education. As Jal Mehta of the Harvard Graduate School of Education describes it, "when I teach a course in Education Policy, I tell students that they should be able to come out of it able to hold their own in a policy conversation on most of the major contemporary topics [based on understanding the high leverage concepts in each area], as well as to become deeply knowledgeable about one. Concretely, that means that the majority of the course time moves through readings and topics... to help students understand the range of topics and perspectives in the field, but that the student is also pursuing a longer term project on a topic of interest to them."[15] As discussed above, with the range of topics exploding and brain science insights into the importance of depth for understanding and durable retrieval, many educators are paying increasing attention to the vertical component.

"Instead of encouraging students to be 'well-rounded,'" says Jeff Selingo, author of *There* is *Life After College*, we should be encouraging them... to "have a deep understanding of one subject matter paired with the knowledge necessary to apply that information across multiple other subjects," as well as the "balance and the agility to pick and choose from a set of knowledge and skills as they are needed."[16]

But the "T-shape" idea continues to evolve. Increasingly, educators are incorporating interdisciplinary work (in the breadth component), and career technical education (often in the depth component). Take, for example, this interpretation by Mehta: "This is what many people call the 'T-shaped' curriculum, a curriculum that goes very deep in one [technical] area, but sits on top of a very strong liberal arts foundation that provides the flexibility for the entire workforce to keep learning and changing occupations throughout their entire life."

### *"The T" in higher education*




Others are adding the competencies involved in Creative Know How and Habits of Success that apply across disciplines and across careers and global problem areas. Researchers at Michigan State, along with partners from IBM and other companies have built out the concept of the T-shaped individual that higher education should be producing to include these "boundary crossing competencies" as well as understanding of "systems" that are aligned in many ways to the broad career areas MyWays advocates that every high school learner address in a career technical component of their learning. By inserting "me" at the intersection of the horizontal and vertical, Michigan State's model even incorporates learners' Wayfinding Abilities – the MyWays competency domain through which learners apply all the other competencies to their own direction in life. Michigan State has run a "T-Academy" for the past three years, providing working sessions for campus teams to design learning environments that foster T-shaped abilities. Areas of emphasis in the sessions echo much of what's in the

MyWays concepts covered in the Parts B and C reports in this series – opportunities for students to address purpose, confidence, and awareness, experiential learning, and appropriate assessment approaches. This fascinating set of abstracts from the T-Summit 2016 sessions provides food for thought for K-12 education designers, as well as a window into the higher education world into which their students will be heading.

### *T-shaped goals in K-12*

Among the K-12 innovators embracing "T-shaped" students is AltSchool, the experimental "microschool" system based in San Francisco that has recently announced their first round of national partner schools.[17] School designers say that the idea of a T-shaped student is the basis of AltSchool's teaching platform. "Most high schools and colleges, they are looking for students that have a really broad base of knowledge but also can go deep in a particularly passionate topic," says head of marketing Deborah Kelson.[18]

## The state of play in Content Knowledge

Addressing the issues raised above requires a radical re-think of Content Knowledge, so educators ready to jump in should also be aware of the "state of play" in the field. Across the four MyWays domains, the extent of consensus on which competencies to include, the evidence for learning/instructional strategies, and the maturity level of assessment options varies — in some cases substantially. Following are a few notes to inform your thinking and prompt you to investigate further as you design learning models and experiences to address this domain.

### *The state of competency definition and learning strategies*

Summary: Core ELA and math competencies are largely defined by accountability measures. Broader traditional subjects and interdisciplinary approaches lost ground under NCLB, but are now re-emerging due to the growth of project-based learning and focus on the whole child; and career-related skills often continue to be ignored or provided only in separate paths.

- **The research base** for core content definition is mature but overly influenced by content's role in accountability assessments; in some cases, it is being redefined (e.g., in the fewer, deeper learning goals of Common Core) and reconsidered in the face of changing needs (e.g., a shift of emphasis from calculus to statistics as more pertinent to the lives most students will lead). Evidence for the importance of broader traditional subjects, including the arts and languages, continues to mount. Consensus is also beginning to coalesce around a set of the most relevant and widely applicable interdisciplinary knowledge areas, such as the list currently being researched by the Center for Curriculum Redesign. Meanwhile, experience from Switzerland and California's Linked Learning models are building the evidence base for the value of integrating academic and vocational knowledge and skills.

- **The learning strategies** used to support mastery of key content and its application across the expanded range of Content Knowledge competencies include project-based and other experiential forms of Whole Learning. For more, see Report 11, *Learning Design for Broader, Deeper Competencies*. These active, authentic learning experiences connect learners to real-world problems, introduce the "desirable difficulties" that brain research shows are necessary for durable retrieval and deep understanding, and provide the varying contexts that promote transfer.

## *The state of assessment*

*Summary:* Content Knowledge is intensely measured or over-measured, often in compartmentalized ways; however, there are encouraging moves away from memory-based testing and toward application of concepts and more authentic performance assessments.

**The range of assessment approaches** includes the following:

- **Traditional assessment**, including teacher-designed tests, quizzes, essays, research papers, and labs.
- **Increasing attention to formative assessment**, in the form of more frequent, granular checks for understanding and the provision of real-time, high-quality feedback (or, a definition we like, "using [insights into] student thinking as a basis for teaching and learning"[19]).
- **Performance assessments for formative and summative purposes**, particularly in the form of more authentic curriculum-embedded performance assessments, including in project-based or other experiential learning.
- **Increasing use of tech-enabled assessment to contribute to diagnostic, formative, and individualized mastery purposes, including:**
    - Diagnostic and formative assessments: MAP, or computer adaptive assessments, in math and reading; OECD test for schools; tech-enabled, quick feedback assessment, such as Poll Everywhere, Google Forms, Gooru, FlexiQuiz; and other ways to help check for understanding.
    - Approaches amenable to student-managed and adaptive courseware (such as Summit Public Schools' playlists).
- **Moves toward knowledge application and performance assessment within accountability measures include the following:**
    - Mixing application of knowledge with on-demand tasks or bounded performance assessment (Common Core PARCC/SBAC assessments).
    - Pilots with curriculum-embedded performance assessment for accountability (New Hampshire's PACE state waiver, the New York Performance Assessment Consortium, California Performance Assessment Collaborative).

**Ongoing challenges** in Content Knowledge assessment include ensuring that assessment for learning is prioritized over assessment for accountability, and that assessments are focused on key organizing ideas and higher-level thinking. For performance assessment, the challenge is to ensure that attention is given to building educator capacity (which includes having educators organize thoughtful calibration and social mediation), and enabling students to separately collect evidence on progress related to Content Knowledge, Creative Know How, and Habits of Success.

For more on Content Knowledge assessment, see the Content Knowledge competency primers at the end of this report; Report 12, *Assessment Design for Broader, Deeper Competencies*; and two recent external publications — the Center for Curriculum Redesign's *Evolving Assessments for a 21st Century Education* and the National Academies Division on Behavioral and Social Sciences and Education's *Supporting Students' College Success: The Role of Assessing Intrapersonal and Interpersonal Competencies*.

## A quick dive into Content Knowledge resources

Because the purpose of the MyWays Student Success Framework is to provide a rosetta stone for thinking about the broader, deeper, future-ready goal-line for today's learners, we have focused on describing that goal-line in conceptual terms. We also believe deeply that school designers, educators, and individual learners need to invest in constructing and evolving their own goal-lines within the broader framework described.

In doing this work, educators may find the following resources helpful:

### Starter Resources for Content Knowledge

- David Perkins, *Future Wise: Educating Our Children for a Changing World*
- Rebecca Gotlieb, Review of Perkins' *Future Wise*
- Charles Fadel, Maya Bialik, and Bernie Trilling, *Four-Dimensional Education: The Competencies Learners Need to Succeed*
- Grant Wiggins, *What Is a Big Idea?*
- Jal Mehta, *Breadth and Depth: Can We Have It Both Ways?*
- David Conley, *Breadth vs. Depth: The Deeper Learning Dilemma*
- VIDEO: David Perkins discusses what's worth learning in this 21Foundation video (3m), and considers how we teach our students for the unknown using understandings of wide scope.

### Relevant Competency Frameworks

Full competency frameworks with strong attention to this domain (see further information provided with the matrix in the *Introduction and Overview of the MyWays Student Success Series*) include:

- Center for Curriculum Redesign, Four-Dimensional Education Framework
- Hewlett Foundation, Deeper Learning Competencies
- Partnership for 21st Century Learning, P21 Framework for 21st Century Learning
- ACT, Holistic Framework for Enhancing Education and Workplace Success
- ConnectEd, College and Career Readiness Framework
- Advance CTE, The Common Career Technical Core

We know from our beta piloting work with next generation educators that those interested in and inspired by the MyWays Student Success Framework are also thirsty for practitioner tools, as well as other implementation descriptions and documentation. In some cases, practitioners may be tempted to latch onto

tools (such as the MyWays Whole-Student Competency Plot of the 20 competencies) and use them without the internal mindset-changing and learning-model-revising work required for successful implementation; we caution against this! We also realize that many thoughtful developers and practitioners simply want and need to see more concrete exemplars and tools in order to better understand the broader, deeper goal-line and to help them work through their own approach. As the MyWays Community of Practice grows, more pathways for use of the tools will arise, along with deeper levels of support and advice on building good practice around your own locally customized version of the MyWays Student Success Framework.

In addition to the resources listed above, the primers on each of the five Content Knowledge competencies that follow provide links to existing tools, such as standards, rubrics, or learning progressions. Such tools can help educators decide what to include or exclude in next generation student competency goal-lines and how best to shape them. Note that MyWays and Next Generation Learning Challenges do not endorse any specific tools for assessment or curriculum planning — particularly in ways that are incompatible with authentic Whole Learning (see Report 12, *Assessment for Broader, Deeper Learning* for more on this approach). This set of EdSurge resources offers case studies of schools using MyWays, and Next Generation Learning Challenges' report, *Measures that Matter Most*, reviews some of the tools used by next generation schools to measure their progress in addressing the broader, deeper range of competencies.

## The Content Knowledge one-page competency primers

The one page primers that follow provide a brief introduction to the most important aspects of each competency, with pointers to why the competency is important (given students' developmental needs and the challenges of today's rapidly changing world), further description of what the competency entails, where to look for inspiration and guidance, and additional resources. These primers provide only a taste of the research and activity in each area. We hope that our MyWays Community of Practice and other educators will help add to and update these resources over time. To meet the Community of Practice members and share your ideas see our Community of Practice page on the MyWays website. To receive updates on MyWays, join our mailing list.

# English Core and Math Core

(The first two Content Knowledge competencies are addressed on this page.)

***"[A]spirations for deeper learning pose a multi-pronged challenge to current practice. At minimum, they suggest the importance of a long-called-for but thus far unachieved increase in the cognitive demand of the tasks that most students, particularly high-poverty students, are asked to complete.***

***From this vantage point, the kind of rigor present in the Common Core... is a critical step for realizing deeper learning because those standards increasingly call for fewer topics, more depth on each topic, and more opportunities to integrate knowledge and make conceptual connections than previously has been the case."***

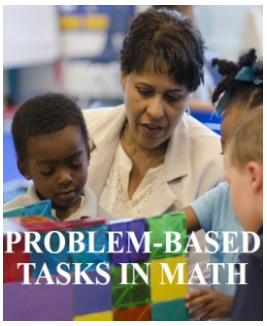
—Jal Mehta and Sarah Fine[20]

### *Brief description:*

- These MyWays competencies are defined as "deep English learning and application across settings, aligned with the Common Core and similar standards," and "deep math learning and application across settings, aligned with the Common Core and similar standards."
- Addressing the **ELA Core** includes helping students[21]:
  - Master key components of the ELA standards: reading (text complexity, growth of comprehension); writing (text types, responding to reading, research); speaking/listening (communication, collaboration); and language (conventions, effective use, vocabulary).
  - Develop the abilities to interpret and create a range of text types, including fiction and informational text.
  - Develop the seven "capabilities of the literate individual," including demonstrating independence, comprehending as well as critiquing, and coming to understand other perspectives and cultures.
- Addressing the **Math Core** includes helping students[22]:
  - Master key components of the math standards: number and quantity; algebra; functions; modeling; geometry; statistics; probability.
  - Demonstrate procedural skill and math understanding.
  - Develop varieties of expertise using the eight Mathematical Practices, including making sense of problems and persevering in solving them, and reasoning abstractly and quantitatively.

### *Where to look for ideas:*

- Jeff Heyck-Williams, Director of Curriculum and Instruction at Two Rivers, a high-performing, competency-based EL Education school in Washington, DC, transformed math learning at the school through a culture change that leverages many forces, including the Common Core and its emphasis on conceptual knowledge and mathematical habits of mind. See Problem-based Tasks in Math Deep Dive: "sharing the CCSS mathematical practices... helps us name important expectations, such as making sense of problems, persevering, and effectively critiquing one another's reasoning" and the workshop "Cultivating a Love of Math in the Era of the Common Core."




- High Tech High supported its teachers' transition to Common Core, asserting that doing so "helped to structure our conversation"; it also provided resources to support this transition.
- See how projects can inspire and address Common Core ELA and math standards by using the Buck Institute for Education's Project Search offering, which you can refine by school network and Common Core topics.

### *Additional resources as food for thought:*

- Bob Lenz, et al.'s *Transforming Schools Using Project-Based Learning, Performance Assessment, and Common Core Standards* is an excellent source for how to "honor the whole" learning experience while covering standards.
- *Crosswalk Analysis of Deeper Learning Skills to CCSS*, by David Conley and EPIC, for the Hewlett Foundation.
- Learning progressions and rubrics for CCSS ELA and Math are available in SCALE/SCOPE/CCSSO's Performance Assessment Resource Bank.
- Some CCSS ELA performance tasks, rubrics, and sample student work are available in the EPIC College & Career Readiness Task Bank.
- Check out this video playlist of deeper learning and CCSS from the Teaching Channel and the Hewlett Deeper Learning Network.

**FOR MORE RESOURCES**, see the MyWays website.

# Science, Social Studies, Arts, Languages

(This third Content Knowledge competency is presented over two pages.)

***"[M]uch is made of the need to help our students grow up into adults who are creative and innovative. But what does it take to do that? Experts in creativity... think that one of the major wellsprings of creativity consists of the application of the conceptual framework from one field or discipline to the problems being worked on in another field or discipline. That only works, though, for people who have a deep knowledge of both fields.... But where does the deep understanding of the concepts and frameworks from these fields come from? The answer, of course, is the kind of understanding that lies at the heart of a sound education in the liberal arts."***

— Marc Tucker[23]

***"The Arts must be at the heart of every child's learning experience if...they are to have a chance to dream and to create, to have beliefs, to carry a sense of cultural identity."***

— James D. Wolfensohn[24]

***"Note too that a faithful study of the liberal arts humanizes character and permits it not to be cruel."***

— *Ovid*[25]

### *Brief description:*

- This MyWays competency is defined as "active learning of core disciplinary concepts and their application in a broad selection of liberal arts and sciences, and language and performing arts."
- Addressing this competency includes helping students[26]:
  - **In science**. 1) Develop disciplinary core ideas across four domains (the physical, life, and earth and space sciences, and engineering, technology, and applications of science); 2) understand crosscutting concepts (such as patterns, cause and effect, and stability and change); and 3) engage in practices – the behaviors that scientists engage in when doing scientific inquiry and engineering design (the Next Gen Science Standard's three dimensions of learning).
  - **In social studies**. Develop an understanding of key concepts across the **subjects** of civics, economics, geography, and history (as well as beyond, to anthropology, psychology, sociology). Relate that understanding to social studies **themes** such as culture; time, continuity and change; individual development and identity; and power, authority, and governance. Approach this by 1) developing questions and planning investigations; 2) applying disciplinary concepts and standards to ensure that teachers understand how to link science standards and core concepts across other disciplines and tools; 3) gathering, evaluating, and using evidence; and 4) working collaboratively to communicate conclusions and take informed action. (See 10 themes in the National Curriculum Standards for Social Studies, and the four process dimensions in the College, Career, and Civic Life (C3) Framework.)
  - **In the arts**. Develop increasing competence within one or more arts area (dance, media arts, music, theater, and visual arts) through the artistic processes called out by the National Core Arts Standards: 1) creating (generating, organizing, and refining work); 2) performing, presenting, and producing (selecting, developing, and conveying meaning through the presentation of artistic work); 3) responding (analyzing, interpreting the intent of, and evaluating artistic work); and 4) connecting (synthesizing personal experiences to make art, and relating artistic ideas to cultural and historical contexts).
  - **In languages**. Develop the competence to communicate effectively and interact with cultural understanding in a second language in real-world settings, in alignment with standards such as the American Council on the Teaching of Foreign Languages (ACTFL) "World-Readiness" Standards for Learning Languages. The 11 standards are clustered within the Five C's goal areas: communication, cultures, connections, comparisons, and communities.

### *Where to look for ideas:*

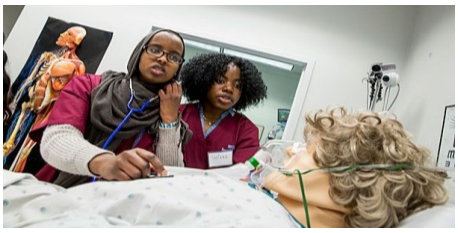
**Science**

- Read this Getting Smart blog on the Barrington, RI P21 exemplar school, which boasts a student-led iCreate Lab that develops products to serve local business needs. The author says that the Next Generation Science Standards (NGSS) have helped the school bring the "shift to inquiry-based instruction to their classrooms... Performance expectations are built right into these."
- The NGSS provide an excellent example of a next gen Content Knowledge approach. Besides the three dimensions of learning mentioned above, the NGSS also uses phenomena as the starting point to raise questions, and is built on the notion of learning as a developmental progression.

*Continues on the next page >*

(***Where to look for new ideas*: Science**, continued from previous page.)

- Check out the hands-on (simulated) learning taking place at Harvard Medical School with students from the Urban Science Academy through HMS MEDscience HS STEM program.



Rose Lincoln/Harvard Staff Photographer
*Harvard Gazette*

- NGSS plays well with the maker movement.

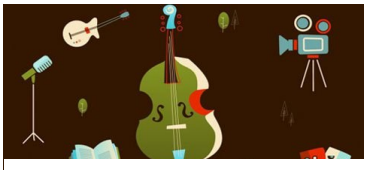
**Social Studies**

- Place-based education (PBE) serves many disciplines, with social studies as a natural focus. In City High School's 9th grade Self and Place module, students learn about urban development by investigating Tucson's city plans. For more, see Getting Smart's PBE initiative.
- The National Council for the Social Studies' C3 framework incorporates many elements of the Content Knowledge approach highlighted in this report: the framework is composed of "deep and enduring understandings, concepts and skills from the disciplines," and includes an "inquiry arc" with four dimensions. It is also linked to action, inter-disciplinary application, and the integration of the arts.


College, Career & Civic Life (C3) Framework

**The Arts**

- Two Rivers Public Charter School's video (6m) Arts Integration: Deepening Understanding of Core Content explores deeply how this leading EL Education school integrates art through the curriculum, including expeditions. Alexandra Eaton (NAfME) writes that music education is what students want and the workforce needs.



Arts Integration Resources, *Edutopia*

- Explore the connection between the performing arts and maker mindsets in this blog by Mary Ryerse, who notes how performing arts "fosters cross-curricular learning and builds an innovation mindset — combining effort, initiative, and collaboration. Specifically, the notion of the arts developing maker mindsets stood out because, through powerful experiences, students learn that they can take the initiative to create something special."

**Languages**

- Howard County Public Schools built a world language program that targets communication skills and intermediate proficiency for all students by graduation.

gradyreese/Getty Images, In Language Classrooms, Students Should be Talking, *Edutopia*

For dual- and two-way immersion program examples, see these *Edutopia* and *Hechinger Report* blogs.

- See the P21 blog on Student Voice and Choice in Language Learning.

***Additional resources as food for thought:***

**Science**

- In addition to the framework mentioned earlier, NGSS offers the 3 Dimensions video series and a sample science grade-level progression.
- See a wealth of science rubrics and performance tasks available for science in SCALE/SCOPE/CCSSO's Performance Assessment Resource Bank.
- EPIC's College & Career Readiness Task Bank offers science performance tasks, including procedures, student prompts, scoring rubrics, and student work samples.

**Social Studies**

- Find Next Steps Resources at C3 Literacy Collaborative.
- See examples of performance tasks and rubrics for history and social studies in SCALE/SCOPE/CCSSO"s Performance Assessment Resource Bank.
- EPIC's College & Career Readiness Task Bank offers social studies performance tasks, including instructor procedures, student prompts, scoring rubrics, and student work samples.

**The Arts**

- The National Core Arts Standards Matrix provides a unified view of the standards for the five arts disciplines, helping educators throughout the nation work toward common ends by recommending worthy goals for students as they progress.

**Languages:**

- The ACTFL World-Readiness Standards encourage equity and access for all students.

**FOR MORE RESOURCES**, see the MyWays website.

# Interdisciplinary & Global Knowledge

***"What does a new multidisciplinary, integrated curriculum look like? It looks like the real, thorny, and exciting problem solving that engages professionals in their daily work lives. It brings authenticity to students' schoolwork.... In their mathematics and health sciences classes, Arthur A. Benjamin Health Professions High School students... learn about the calculations insurance underwriters make, while they ponder a highly relevant question: how do high-risk lifestyle decisions and behaviors affect access to and premiums for health insurance?... Spanish class provides a venue for studying differences in mortality rates and causes of death in Spanish-speaking countries and across ethnic groups in the U.S."***

— ConnectEd[27]

***Brief description:***

- This MyWays competency is defined as "integrated inter-disciplinary thinking and empathetic development of global, cross-cultural, civic, environmental, and economic literacies."
- Addressing this competency includes helping students:
  - Develop knowledge and skills related to interdisciplinary thinking, such as abilities to recognize the core concepts and the strengths and weaknesses of multiple disciplines; understand and synthesize different perspectives on the same content; and apply approaches from multiple disciplines to real-world problems by integrate existing ideas and generating novel, multi-faceted solutions.[28]
  - Develop the capacity to understand and act on issues of global significance by investigating the world beyond their immediate environment; recognizing perspectives (others' and their own); communicating ideas effectively with diverse audiences; and taking action to improve conditions.[29]
  - Demonstrate knowledge and understanding of civic literacies (such as understanding governmental processes and exercising the rights and obligations of citizenship); environmental literacies (such as understanding society's impact on the natural world, and taking individual and collective action on environmental challenges); and economic literacies (such as understanding the role of the economy in a global society, and how to make appropriate personal economic choices).[30]

***Where to look for ideas:***

- *Four-Dimensional Education* research cites the following as the most widely applicable future-ready interdisciplinary areas: tech and engineering, bioengineering, media, entrepreneurship and business development, personal finance, wellness (physical and mental), and social systems (sociology, anthropology).[31]
- See Sanborn teacher Donna Harvey-Mosely's Lessons from a Social Studies Teacher: The Power of Inter-disciplinary Work in a Competency-Based School.

College, Career & Civic Life (C3) Framework

- Learn about Finland's decision to mandate that phenomenon-based (or thematic) learning be used alongside traditional subject-based learning.
- In this EdWeek blog, Heather Singmaster provides a trove of digital tools to help you connect your students to others around the globe and promote action. Asia Society has additional examples of classroom projects.
- The International Baccalaureate model features interdisciplinarity, a global context for learning, and cross-cutting literacies.
- On civic literacies, see these Edutopia and Hechinger articles; on environmental literacy, see the California approach; on economic literacy, see the Council for Economic Education; and on financial literacy, see Report 8's Practical Life Skills primer.

***Additional resources as food for thought:***

- Designing Multidisciplinary Integrated Curriculum Units, from ConnectEd, home of Linked Learning.
- SCALE/SCOPE/CCSSO offer interdisciplinary learning progressions and rubrics in their Performance Assessment Resource Bank.
- Asia Society/CCSSO's Educating for Global Competence: Preparing Our Youth to Engage the World includes a Global competence matrix in the appendix that maps to a range of subjects.

**FOR MORE RESOURCES**, see the MyWays website.

# Career-Related Technical Skills

***"College and work are not an either/or option. They are intertwined. We truly want to take all levels of students and set them on a pathway that gives them the option to go straight into the workforce better prepared, with industry credentials, and with the skills that can help them earn high wages. This may involve postsecondary education, too — a two-year or a four-year path. And, it may not. We value all pathways."***

— Shane Haggerty, Tolles Career Center, Ohio[32]

### *Brief description:*

- This MyWays competency is defined as the "integration of academic, technical, and employability skills in at least one existing career area or emerging problem space of personal interest."
- Addressing this competency includes helping students[33]:
  - Gain knowledge and skills in one or more career clusters (see Advance CTE's Common Career Technical Core (CCTC) 16 clusters, from Health Sciences to STEM, each with specific pathways such as Therapeutic Services and Engineering & Tech).
  - Know and be able to demonstrate competencies within a cluster or pathway; those competencies include necessary academic knowledge; demonstration of practices and use of systems; understanding roles within an organization; evaluating hazards and ethical issues; and familiarity with potential careers.
  - Refine, through developmental experiences, broad career-ready skills that employers expect (and that overlap with skills required for higher education and life). See Advance CTE's 12 Career-Ready Practices, such as acting as a responsible and contributing citizen and employee; considering the environmental and social impact of decisions; and modeling integrity, ethical leadership, and effective management.

### *Where to look for ideas:*

- CTE pairs well with competency-based learning efforts. The Every Student Succeeds Act (ESSA) facilitates the implementation of high-quality CTE through use of a number of approved funding routes.
- P-TECH has more than 60 schools and is showing highly promising results while costing no more than other high schools. It is a grade 9-14 model, where students take college courses beginning in grade 10 while completing high school, and work their way through industry-recognized associates degrees at their own pace. Graduates are first in line for positions with IBM and other companies. It includes mentoring, paid internships, and rigorous academics and workplace skills.
- California's Linked Learning (LL) is a proven approach that integrates rigorous, college-ready academics with sequenced, high-quality CTE, work-based learning, and support to help students stay on track. The LL website offers an excellent summary of its core components, guiding principles, and the characteristics of successful LL pathways.

Linked Learning

- Leadership High School Network focuses on developing leaders in architecture, construction, and engineering (ACE), health, technology, and entrepreneurship.
- National Academy Foundation offers career academies in finance, hospitality, IT, engineering, and health.
- Mature practice from other countries with "dual systems," where, starting at age 15 or 16, most young people learn about, prepare for, and experience the workplace. In Switzerland, for example, 70% of teenagers move between workplace and school and are paid for three-year apprenticeships.

### *A few additional resources as food for thought:*

- *Creating Pathways to Prosperity: A Blueprint for Action* and related resources from Jobs for the Future.
- MDRC's *New Pathways to Careers and College: Examples, Evidence, and Prospects* provides an excellent overview of dual college and career initiatives. See Appendix A's comparative analysis of the top 12 models.
- Advance CTE's CCTC includes knowledge and skills, plans of study, and relevant credentials for its career clusters and pathways.
- Videos: In Linked Learning: The Documentary, see The Story of Whoa (2m) and Pathways Overview (1m)

**FOR MORE RESOURCES**, see the MyWays website.

# Endnotes for Report 9

[1] Thomas L. Friedman, *Thank You for Being Late: An Optimist's Guide to Thriving in the Age of Accelerations*, Farrar, Strauss and Giroux, 2016. His "more is on you" statement is on p. 229.

[2] The terms *workview* and *lifeview* are introduced in Bill Burnett and Dave Evans, *Designing Your Life: How to Build a Well-Lived, Joyful Life*, Knopf, 2016, p. 31.

[3] David Perkins, *Future Wise: Educating Our Children for a Changing World*, Jossey-Bass, 2014, p. 225.

[4] Ibid., p. 229.

[5] See explanations of the academic achievement gap, as well as the opportunity gap in postsecondary degree attainment, employment, and income in three of the earlier reports in this series: Report 1, *Opportunity, Work and the Wayfinding Decade*, Report 2, *5 Roadblocks to Bootstrapping a Career*, and Report 3, *5 Decisions in the Work/Learn Landscape*.

[6] Perkins, *Future Wise*, pp 2-3.

[7] Charles Fadel, Maya Bialik, and Bernie Trilling, *Four-Dimensional Education: the Competencies Learners Need to Succeed*, Center for Curriculum Redesign, 2015, pp 71-104.

[8] Ibid., p. 226.

[9] Perkins, *Future Wise*, pp. 7-25

[10] Fadel, Bialik, and Trilling, *Four-Dimensional Education*, pp. 77, 81.

[11] Perkins, *Future Wise*, pp. 97-122.

[12] Ibid., pp 223-4.

[13] Ibid., pp. 49-69 for big understandings. See also pp. 36-46 for analysis of topics that might fit the concept or not, and why.

[14] Bob Lenz, Justin Wells, and Sally Kingston, *Transforming Schools Using Project-Based Learning, Performance Assessment, and Common Core Standards*, Jossey-Bass, 2015, p 97.

[15] Jal Mehta, "Breadth and Depth: Can We Have It Both Ways?," Learning Deeply blog, *Education Week*, July 14, 2015.

[16] Jeffrey Selingo, "The myth of the well-rounded student? It's better to be 'T-shaped'," Grade Point blog, *The Washington Post*, June 2, 2016

[17] Charles Taylor Kerchner, "Mass Personalization' Drives Learning Experiment at AltSchool," On California blog, *Education Week*, June 29, 2017. "New Leadership Hires at AltSchool Point to Charter, Public School Ambitions," *EdSurge,* April 6, 2017.

[18] "A New Style of Education: New tech-based school to open in Palo Alto for 2015 school year," *Verde Magazine*.

[19] "Formative assessment is more of a mindset on using student thinking as the basis for teaching and learning rather than a quick checklist or a list of strategies." From David Wees, "Formative Assessment: More than just an exit ticket," blog, *The Reflective Educator* (undated).

[20] Jal Mehta and Sarah Fine, *The Why, What, Where, and How of Deeper Learning in American Secondary Schools*, Jobs for the Future, December 2015, p. 6.

[21] The English Core competency description draws on the Common Core ELA standards, as linked in the section.

[22] The Math Core competency description draws on the Common Core Math standards, as linked in the section.

[23] Marc Tucker, "The 'T-Shaped Curriculum': Liberal Arts, Technical Education, or Both?," Top Performers blog, *Education Week*, June 18, 2015.

[24] James D. Wolfensohn, former chairman of The Kennedy Center, quoted on the website of Arts for Learning, the Indiana Affiliate of Young Audiences.

[25] Ovid, *Epistulae Ex Ponto* (*Black Sea Letters*), II, ix, l. 47.

[26] The Science, Social Studies, Arts, Languages competency description draws on the disciplinary curriculum standards and other documents from national disciplinary associations, as linked in the section.

[27] ConnectEd, *Designing Multidisciplinary Integrated Curriculum Units*, 2010. p. 2.

[28] The interdisciplinary elements of the Interdisciplinary & Global Knowledge competency description draws on Elizabeth Spelt et al., "Teaching and Learning in Interdisciplinary Higher Education: A Systematic Review," *Educational Psychology Review*, vol. 21, no. 4, 2009, pp. 365–378, as quoted in Elizabeth Spelt et al., "A Multidimensional Approach to Examine Student Interdisciplinary Learning in Science and Engineering in Higher Education," *European Journal of Engineering Education,* Aug. 17, 2016; *Essential Competencies for Interdisciplinary Graduate Training*, prepared by Abt Associates for the National Science Foundation, 2013; Tami Carmichael and Yvette LaPierre, "Interdisciplinary Learning Works: The Results of a Comprehensive Assessment of Students and Student Learning Outcomes in an Integrative Learning Community," *Issues in Interdisciplinary Studies*, vol. 32, 2014, pp. 3–78; "Why Teach with an Interdisciplinary Approach?" on the Starting Point: Teaching and Learning Economics website, a National Science Foundation funded project developed in collaboration with the Science Education Resource Center at Carleton College.

[29]The global and cross-cultural elements of the Interdisciplinary & Global Knowledge competency description draw on Asia Society/CCSSO, *Educating for Global Competence: Preparing Our Youth to Engage the World*, 2011, pp. 11–12.

[30] The civic, environmental, and economic elements of the Interdisciplinary & Global Knowledge competency description draw on the Partnership for 21st Century Learning (P21) frameworks elements on civic literacy, environmental literacy, and financial, economic, business, and entrepreneurial literacy.

[31] Fadel, Bialik, and Trilling, *Four-Dimensional Education,* p. 94.

[32] Shane Haggery, "It's Time We Talk About Career-Tech," blog, *Getting Smart*, January 13, 2016.

[33] The Career-Related Technical Skills competency description draws on *Common Career Technical Core*, National Association of State Directors of Career Technical Education Consortium/National Career Technical Education Foundation, 2012; and *Transforming Education for All Learners through Career Technical Education*, press release, Advance CTE, 2016.