

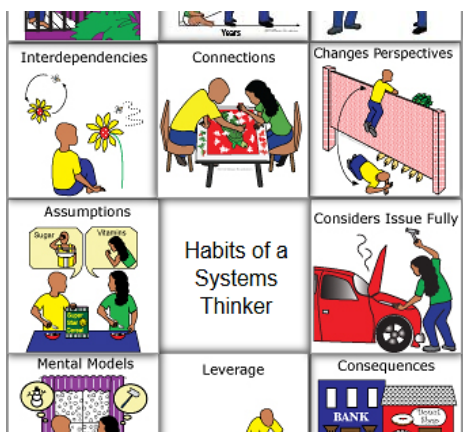
Critical Thinking & Problem Solving

“College is too late to teach problem-solving and other skills they’ll need to be a successful employee someday. But high school is a great place for developing those skills.... At the end of the day, these students have learned how to learn. They know how to break down a problem and solve it using their own skill sets, as well as being able to identify what skills are needed but not available in their group, and then they find a way to learn that needed skill.”

—Ron Fortunato, of [A World Bridge](#), which offers real-world, real-time, high-tech projects for HS students¹

Brief description:

- This MyWays competency is defined as the “ability to analyze and reason effectively, and use systems thinking and design thinking, toward solving problems in varied settings.”
- Addressing this competency includes helping students²:
 - Identify and define problems and propose creative and appropriate solutions.
 - Develop analytical thinking approaches, including applying logical reasoning, as well as analytical, reflective, evaluative, and metacognitive skills.



Waters Foundation ([interactive version](#))

- Develop systems thinking approaches, including consideration of a holistic perspective, connections, relationships, integrated concepts, and emphasis on synthesis.
- Develop design thinking approaches to problem solving, focused on principles of human-centered design, embrace of ambiguity, iterative redesign, and tangibility.
- Note: Design thinking is also included in the Creativity & Entrepreneurship competency.

Where to look for ideas:

- Project-based, inquiry-based learning, service learning, and other active, deeper learning models** that provide complex learning challenges promote higher-level thinking and problem solving. For a model based on design thinking, see the [One Stone Story](#).
- Youth development (YD) programs** that link students to authentic learning do the same. See [The Possibility Project](#), [Wyman TOP](#), and other exemplary YD programs featured in the “Problem Solving Practices” section of [Preparing Youth to Thrive](#), as well as in [A World Bridge](#) and [Educurious](#).
- Two Rivers Public Schools** is building out five components of Critical Thinking & Problem Solving. Rubrics and assessments for effective reasoning and problem solving are in its [Deeper Learning Assessment folder now](#); creativity, schema development, evaluation, and metacognition are due soon. See more at [Learn with Two Rivers](#) and in this [EdSurge MyWays series article](#).
- In countries like Switzerland**, where secondary education includes apprenticeships, youth and employers cite the “knotty, unexpected, and complicated problems that arise every day in every workplace” as “precisely the sort of thing that can only be learned on the job.”³
- Higher education and the professions** are also incorporating aspects of critical thinking and problem solving into their curricula; see [Making Design Thinking Part of Medical Education](#).

Additional resources as food for thought:

- P21, [What We Know About Critical Thinking](#) (The 4Cs Research Series).
- EdLeader21, [The Leader’s Guide to 21st Century Education](#) (“Appendix 3 — Critical Thinking Resources”).
- The [Critical Thinking Community’s](#) website and resources, and the Waters Foundation’s [Systems Thinking in Education](#) website and resources.
- Stanford d.school’s [K12 Lab Network](#), including the [K12 Lab Wiki](#) for many helpful resources on design thinking.
- Charles Fadel et al., [Four-Dimensional Education](#).
- For a collection of Critical Thinking & Problem Solving tools such as learning objectives, rubrics, skills integration maps, and performance assessments, see the 4Cs Practice Resources box earlier in this report.

FOR MORE RESOURCES, see the [MyWays website](#).

Creativity & Entrepreneurship

“The future belongs to a very different kind of person with a very different kind of mind — creators and empathizers, pattern recognizers and meaning makers. These people... will now reap society’s richest rewards and share its greatest joys.”

—Daniel Pink, [A Whole New Mind](#)⁴

“Creativity is as important in education as literacy and we should treat it with the same status.”

—Sir Kenneth Robinson, in his famous TED talk [“Do Schools Kill Creativity?”](#)⁵

Brief description:

- This MyWays competency is defined as “the imagination, inventiveness, and experimentation to achieve new and productive ideas and solutions.”
- Addressing this competency includes helping students⁶:
 - Think creatively, using a range of idea-creation techniques, and elaborating, refining, and evaluating the resulting ideas, including through design thinking.
 - Work creatively with others, be open and responsive to new ideas, and see failure as a way to learn.
 - Implement innovation, including taking risks and following through in the real world.
 - Develop additional entrepreneurial skills and mindsets, including the necessary business and financial concepts and processes, as well as Habits of Success that support new value creation.

Where to look for ideas:

- **Address creativity within core subject areas.** For starter strategies, see these Edutopia blogs from an [English teacher](#) and a [science teacher](#).
- **Promote creativity through the arts.** The visual and performing arts provide a natural way to help students develop creativity and agency, which can then extend to other parts of their lives. See the [Boston Arts Academy](#), [Kettle Moraine’s competency-based KM Perform high school](#) and this article on [making + art for creativity](#).
- **School models** include Philadelphia’s [Workshop School](#); the [Incubator School](#) in Los Angeles (and [this NPR report on it](#)); the [Boston Collaboratory School](#); and [Design Tech HS](#). Also see [this review](#) of global and US models.
- **Co-curricular activities can excel at developing creativity and entrepreneurship.** [Odyssey of the Mind](#) and [Destination Imagination \(2m video\)](#) develop creativity through STEM, service learning, and fine arts.



OECD Progression in Student Creativity in School

Entrepreneurism is fostered in programs like [DECA](#), [4H](#), and [Junior Achievement](#). See also [creativity challenges](#) and [HS entrepreneurship clubs](#).

- On sparking creativity through design thinking, see this [introductory video](#) (2m) for LAUNCH, a design thinking process adapted for K-12 by A.J. Juliani and John Spencer. In LAUNCH’s added final step, students “launch” their work to an authentic audience.
- **International models.** OECD’s [Entrepreneurship in Education: What, Why, When, How](#) features progression models from the UK, Denmark, Sweden.

Additional resources as food for thought:

- **Creativity resources:** P21, [What We Know About Creativity](#) (The 4Cs Research Series); EdLeader21, [The Leader’s Guide to 21st Century Education](#) (“Appendix 3 — Creativity Resources”); and the National Education Association’s [An Educator’s Guide to the “Four Cs”](#) (the “Creativity and Innovation” section).
- **Entrepreneurship resources:** [Entre-Ed](#), the National Consortium for Entrepreneurship Education, offers [national content standards](#) that are also in the [Department of Labor Competency Model tools](#); also see the [Youth Entrepreneurship Framework](#).
- **For a collection of Creativity tools** such as learning objectives, rubrics, skills integration maps, and performance assessments, see the 4Cs Practice Resources box earlier in this report.

FOR MORE RESOURCES, see the [MyWays website](#).

Communication & Collaboration

“Amir knows that he has to keep working on the habit of collaboration. He reports, “My next step for the future is to not distract my crew. If I have a question, just ask, but don’t get off topic with it.”

And I would love to keep sharing ideas. I love getting my voice out and heard.”

—Amir, student at the K-8 EL Education Odyssey School in Denver, Colorado⁷

Brief description:

- This MyWays competency is defined as “oral, written, and visual communication skills, as well as the ability to work effectively with diverse teams.”
- Addressing this competency includes helping students⁸:
 - Articulate thoughts orally, in writing, non-verbally.
 - Listen effectively to decipher meaning.
 - Use communication for a range of purposes, including to inform, instruct, motivate, and persuade.
 - Communicate in diverse environments.
 - Work effectively and respectfully in diverse teams.
 - Show flexibility, willingness to help, and the ability to compromise to reach common goals.
 - Assume shared responsibility and value individual team member contributions.
- Communication & Collaboration are intertwined with Information, Media & IT literacy, as well as with Problem Solving. (See this [EdSurge article](#) on the 2015 addition of collaborative problem solving to the international PISA assessment; in the exam, students use a chat pool to talk to team members and solve a problem together).

Where to look for ideas:

- Begin addressing Communication & Collaboration** through the CCSS [speaking and listening anchor standard](#).
- This discussion of **“Procedures for Classroom Talk”** focuses on English language learners and touches on accountable talk and effective collaborative discussions.
- Da Vinci Communications HS** has a wealth of leading practices here, including its Critical Friends’ Group Protocol and other materials. Students discuss collaboration in this Da Vinci [video](#) (10m).

- The EL Education [case study](#) on Amir’s project (see earlier quote) focuses on collaboration, agency, reflection, and peer feedback. Here is an excerpt from Amir’s critique:

Name of Group Member	Collaboration Successes	Collaboration Challenges
Yourselves	• Involved in my job and I was flexible because I didn't want to switch off, but I did.	• got distracted because I want to see other groups big.
Francesca	You were flexible with jobs and volunteered to find when other people had the not-so fun jobs.	When one of the other groups caught something interesting he went away when we were in the middle of identifying one.

[Don't Just Talk About Character; Teach Habits](#)

- The **Internationals Network for Public Schools** leverages both communication and collaboration by teaching recent immigrants through experiential projects in which they need to work together and make themselves understood to get things done. See a description of the magic in this [CompetencyWorks blog by Chris Sturgis](#).

Additional resources as food for thought:

- P21, [What We Know About Communication](#) and [What we Know About Collaboration](#) (The 4Cs Research Series); P21, [Skills for Today: What We Know About Teaching and Assessing Collaboration](#); EdLeader21, [The Leader's Guide to 21st Century Education](#) (“Appendix 3 — Communication & Collaboration Resources”); and the National Education Association’s [An Educator's Guide to the “Four Cs”](#) (“Communication & Collaboration” section).
- For a full set of beginner to expert progressions for subskills within communication and collaboration, see CIE and EPIC’s [Essential Skills and Dispositions](#) (ES&D) developmental frameworks.
- The 4Cs Practice Resources box earlier in this report includes learning objectives, rubrics, skills integration maps, and performance assessments on creativity.

FOR MORE RESOURCES, see the [MyWays website](#).



Developmental Progressions from CIE and EPIC’s [ES&D frameworks](#)

Information, Media, & Technology Skills

“As computers successfully take over routine tasks, humans are left with the jobs they do best, often using computers as assistive tools to take their products to new heights, instead of being replaced by them.”

—Charles Fadel, *Four-Dimensional Education*⁹

Brief description:

- This MyWays competency is defined as “the ability to access, evaluate, manage, create, and disseminate information and media using a wide variety of technology tools.”
- Addressing this competency includes helping students¹⁰:
 - Develop information and media literacy, including: analyzing media messages to understand how and why they are constructed, how individuals interpret them with different points of view, how media influences behavior, and ethical/legal issues.
 - Create media products, including: understanding and using the most appropriate creation tools and effectively using the tools for appropriate expression in diverse, multicultural environments.
 - Develop technology literacy, including computational thinking (rather than programming languages), and the ability to understand and leverage the growing capabilities of augmented reality, virtual reality, big data, robots, artificial intelligence, and novel technologies as they appear.
 - Note on equity: Disadvantaged youth and those with learning limitations, who could most benefit from access to technology, are still the least likely to have that access.¹¹ Educators must address this need so that technology does not serve to widen the gap further.

Where to look for ideas:

- On developing info and media literacy: See the links in “media literacy” resources below for a range of standards, lesson plans, and other resources from PBS, Common Sense Media, Newsela, and media literacy organizations. For an alternative, see [Tribeworthy](#), a “crowd contested” site linked to the [Global Critical Media Literacy Project](#) that lets students review news articles for bias, credibility, logic, etc., and contribute to a public rating.
- On **creating media and tech products**: Getting Smart flags [Kearny High School of Digital Media & Design](#) for its student-centered PBL stressing productive Habits of Mind. Extracurriculars — such as student film festivals, school and cable TV production opportunities, [First Lego League](#), and robotics — offer excellent opportunities.



[Aitrends](#)

- On promoting tech literacy:
 - Look at Excel Public Charter School’s [Computational Thinking curriculum](#), which focuses on solving problems, designing systems, and understanding human behavior by drawing on computer science concepts, including a lesson on featuring a LeBron James play and various other topics (3m [video](#)).
 - Tackle tech literacy through real work; see [Generation Yes](#), which aims to scale the successful student-run HS help desk model (also found in individual schools like [Burlington HS](#)). Such an understanding of tech application and human-tech interaction is invaluable.
 - Finally, there isn’t much opportunity for students to work directly with AI today, but this [three-step list](#) offers guidelines on what educators can do to start implementing AI education in schools right away.

Additional resources as food for thought:

- On **media literacy**: See these EdWeek articles on [media literacy](#) and [fake news](#) for a roundup of numerous resources on tackling these topics; also, this [EdWeek blog](#) overviews the National Council of Teachers of English Framework on information literacy.
- On **media creation**: Listen to George Lucas discuss teaching visual literacy and communications ([video](#), 4m) and discover the learning outcomes possible from visual media arts, even for students with disabilities.
- On **tech literacy**: For more on computational thinking, see this Edutopia [blog](#), and this [free online Google course](#) to help educators integrate computational thinking into their humanities, math, science, and computing curricula.

FOR MORE RESOURCES, see the [MyWays website](#).

Practical Life Skills

"It's mostly life skills, the kinds of things most people learn about by messing up. I'm pretty stoked to learn that."

It's weird that in the school system they don't teach something that everyone should know."

—Ford, 17, on his High Tech High 12th grade end of year program (He's particularly interested in personal finance.)¹²

Brief description:

- This MyWays competency is defined as the “ability to understand and manage personal finances, health and fitness, and emotional, spiritual, and other aspects of personal wellbeing to enable and support a productive, effective life.”
- Addressing this competency includes helping students¹³:
 - Manage personal finances, including: spending, saving, credit, and debt; employment and income; investing; risk and insurance; financial decision-making.
 - Manage one’s own health and fitness, including: obtaining, interpreting, and using basic health information and services to enhance health; obtain and act on diet, nutrition, exercise, risk avoidance, and stress reduction guidelines; establish and monitor health goals.
 - Attend to one’s own emotional and spiritual needs, and to other aspects of wellbeing, including: mindfulness, heartfelness, and positive mental health.
 - Address practical tasks that are rapidly evolving, including how to shop, find housing, and get around.

Where to look for ideas:

- **High Tech High 12th graders** take [end of year courses](#) in cooking on a budget, sewing, personal finance (how credit card balances work, renting an apartment, etc.).
- **Da Vinci Communications HS** started a “Grit Course” focused on practical skills needed for the transition from HS; their students call it “Adulthood class.” Students from across the economic spectrum are looking for similar guidance, as evident in this NPR [piece](#) and the box below.
- **Practical can start early:** DC Public Schools is [teaching its 2,000 second graders to ride a bike](#), promoting exercise, safety, and independence through this life-long skill. [Magnolia Montessori for All](#)’s elementary students

Urban Dictionary defines “**adulthood**” as “to do grown up things and hold responsibilities such as a 9-5 job, a mortgage/rent, a car payment, or anything else that makes one think of grown ups.” In the past year, the term “**adulthood**” has increased in usage by 700 percent on Twitter. Jun 20, 2016

[Urban Dictionary](#)

Note to Urban Dictionary: your definition of what grownups do needs updating. See the kinds of gig work, variable work schedules, mix of working and learning, and Uber-oriented lifestyles that responsible young (and even not-so-young) workers are living these days, as described in the Part A reports in this series.

are responsible for planning and leading small-group Field Studies in their local communities. Their [chaperone guide](#) is a delightful window into how to build resourcefulness.

- **Financial, HR, and training literacy for the Gig economy** includes personal finance competencies and programs (see the “Additional resources” links below). To see how even these approaches need to be updated, see [Serving Workers in the Gig Economy: Emerging Resources for the On-Demand Workforce](#), especially the list of responsibilities now on individual shoulders on p. 3.
- **Nutrition, exercise, and well-being:** [A helpful blog](#) by a Summit Public Schools teacher about facilitating mindfulness for the first time (with links to a [list of benefits](#)). Edutopia offers mindfulness [resources](#), including school-wide and afterschool programs and [a video](#) (7m) on how meditation is lowering truancy and suspensions.
- **The Johns Hopkins Center for a Livable Future** offers [a free curriculum](#) for teaching the food system to empower students to make healthy and responsible food choices.

Additional resources as food for thought:

- **For Personal Finance:** See JumpStart [national standards in K-12 Personal Finance](#) and the [Education HS Financial Planning Program](#) (HSFPP) Standards and Outcomes, which align with JumpStart and five other national standards sets (links to all are on the HSFPP website).
- **For health, fitness, and well-being:** See Shape America’s standards, including the [Whole School, Whole Community, Whole Child](#) model from the Center for Disease Control and Prevention (CDC) and the ASCD.

FOR MORE RESOURCES, see the [MyWays website](#).

Endnotes

¹ Quoted in Catherine Wedgwood, [Building a World Bridge to College, Career, and Life Readiness](#), blog, *Getting Smart*, March 30, 2017. See also the [World Bridge website](#).

² The Critical Thinking and Problem Solving competency description draws on treatments of critical thinking, problem solving, systems thinking, and design thinking, including those in EdLeader21's book by Ken Kay and Valerie Greenhill, [The Leader's Guide to 21st Century Education: 7 Steps for Schools and Districts](#), Pearson Education, 2013; Fadel, Bialik, and Trilling, [Four-Dimensional Education](#); and the Partnership for 21st Century Learning (P21)'s, [What We Know About Critical Thinking](#), part of The 4Cs Research Series, 2015.

³ Nancy Hoffman, [Let's Get Real: Deeper Learning and the Power of the Workplace](#), Students at the Center Deeper Learning Research Series, 2015, p. 6.

⁴ Daniel Pink, [A Whole New Mind: Why right-brainers will rule the world](#), 2006, p. 1.

⁵ Ken Robinson, "[Do Schools Kill Creativity?](#)" TED Talk, May 16, 2011.

⁶ The Creativity and Entrepreneurship competency description draws on treatments of creativity, entrepreneurship, innovation, and design thinking, including those in EdLeader21's Kay and Greenhill, [The Leader's Guide to 21st Century Education](#); Fadel, Bialik, and Trilling's [Four-Dimensional Education](#); and P21, [What We Know About Creativity](#), part of the 4Cs Research Series — as well as from entrepreneurship competencies covered in the frameworks and reports listed under entrepreneurship in this primer's "Additional resources" section.

⁷ Liza T. Eaton and Cyndi D. Gueswel, "[Don't Just Talk Character: Teach Habits](#)," *UnBoxed: A Journal of Adult Learning in Schools*, Issue 10, Spring 2013.

⁸ The Communication and Collaboration competency description draws on treatments of communication and collaboration, including those in Fadel, Bialik, and Trilling's [Four-Dimensional Education](#) and P21's [What We Know About Communication](#) and [What we Know About Collaboration](#), parts of the 4Cs Research Series.

⁹ Fadel, Bialek, and Trilling, [Four-Dimensional Education](#), p. 27.

¹⁰ The Information, Media, & Technology Skills competency description draws on treatments of information, media, and technology in the National Education Association's [Preparing 21st Century Students for a Global Society: An Educator's Guide to the "Four Cs,"](#) 2012; Fadel, Bialek, and Trilling's [Four-Dimensional Education](#); and the media literacy, tech literacy, and computational thinking sources listed under this primer's "Additional resources" section.

¹¹ Stephanie Malia Krauss, Karen J. Pittman, and Caitlin Johnson, [Ready by Design: The Science \(and Art\) of Youth Readiness](#), The Readiness Project, 2016.

¹² Quoted in Matt Krupnick, "[High Schools try to make better use of something often wasted: Senior Year](#)," *The Hechinger Report*, May 11, 2016.

¹³ The Practical Life Skills competency description draws on treatments of practical life skills, personal finance competencies, health and fitness competencies, and well-being and mental health competencies including: for personal finance - JumpStart [national standards in K-12 Personal Finance](#) and the [Education HS Financial Planning Program](#) (HSFPP) Standards & Outcomes, aligned with JumpStart and five other other standards (see links on HSFPP website); for health, fitness, and well-being - [Shape America's standards](#), including the Centers for Disease Control and Prevention (CDC) and ASCD's [Whole School, Whole Community, Whole Child model](#) (WSCC), and Shape America's excellent [Position Statement on WCCC](#).

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