VALHALLA FOUNDATION

The Age of AI
What Kids Need to Learn

What do students need to learn in the era of artificial intelligence?

AI's rapid advancement presents urgent questions for educators. Since AI already outperforms humans in analysis and problem-solving, what should knowledge and skills remain important for students to learn? What becomes less important? How can schools prepare students for a dramatically different, AI-enabled future?

K-12 decision-makers—including teachers, school leaders, policymakers and funders—are grappling with these questions. Recent declines in test scores highlight that our education system is not providing over half of students the opportunity to master basic academic skills. It's therefore essential that any changes to K-12 education anchor in delivering on its fundamental purpose: ensuring students master the skills and knowledge needed to thrive as adults. But what will be most important?

To help answer this question, the Valhalla Foundation interviewed 50 teachers, students, and experts in education, economics, psychology, and technology. This report summarizes what we heard, including emerging implications for funders and decision makers. Our aim is to help education decision makers identify the essential skills and knowledge students will need as they consider how AI should be used in education.

It's important to acknowledge that education technology has a long history of unrealized potential. As leaders look to AI, they must avoid unproven or piecemeal solutions that create incoherence for teachers and students or distract from what research tells us about how people learn. To deliver measurably better outcomes for students, the field must invest in user-centered R&D, iterative testing and learning cycles, and the scaling of practices.

We've organized the voices in our interviews into 5 major themes that represent the range of perspectives we heard, outlined below and in the appendices.

The collective ideas that surface point to four potential design challenges for the field to consider. Given the uncertain trajectory of AI, more ideas are needed - we want your feedback on what funders should prioritize. Send us your ideas here: AgeofAiK12.org/contact.

What did we hear?
Five Key Themes for K-12 Education in the AI Era

Our interviews surfaced five key themes outlining what students need to learn on in an age of AI, as well as how we need to acknowledge that the answer to our core question remains uncertain.

1. AI increases the importance of mastering core academic skills. Mastery of reading, writing, numeracy, science, and history by early high school remains a prerequisite for deeper learning. Without these foundations, students will struggle to achieve fluency in the broader skills required in adulthood.

2. Students also need "durable skills"— the broad set of abilities that remain valuable across eras but are often under emphasized in today's classrooms. Interviewees cited capabilities such as critical thinking, communication, collaboration as essential to student success. Interviewees also identified specific skills often overlooked in K-12 today, including moral reasoning, sales, entrepreneurial thinking, and humor.

3. AI makes it more important to cultivate relational qualities like empathy, curiosity, and constructive disagreement. As AI engagement potentially reduces human interaction, schools must prioritize "human skills"—which also include, listening, and questioning. The psychologists we spoke to reiterated that these attributes are developed through relationships with peers, teachers, and mentors.

4. Experts and teachers, and especially students, prioritize "AI literacy" as a newly important skill. Experts and teachers focus on the need for students to understand AI's capabilities and limitations and to evaluate AI-generated content. Many called out the opportunity to shift from teaching coding to teaching AI literacy. Interestingly, students expressed a nearly unanimous desire to learn about the ethics of AI use and cited an urgent need to ensure their skills keep pace with the technology's rapid evolution.

5. Expectations for AI's impact on K-12 should be tempered by history. The K-12 system has long defied predictions, from the advent of the calculator to the creation of the internet, that it will be fundamentally transformed by technology. More recent ed-tech adoption has also not yet improved learning outcomes. By implication the pace and impact of AI on education is extremely uncertain. We also heard well-founded concerns that AI could increase existing inequities in learning opportunities.

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>
> **Tim Knowles**

> "There should be a class that just tells you social stuff, like how to understand how other people feel just by looking at their actions and words, how to say stuff and not get nervous."
>
> **Student, age 13**

> "I feel like I need to be able to learn how to adapt to technology changes."
>
> **Maya Ratliff, 18**

> "The K-12 system has been surprisingly resistant to changes that could have been argued for a century ago."
>
> **Stephen Pinker**

What Now:
Four Emerging Design Challenges for the Field

The uncertainty of how best to use AI in schools makes this a complex moment for education funders and leaders to make decisions about what efforts to support. Based on the feedback we heard, we have sketched out four design challenges for the field to consider, outlined below. Share your response to these initial thoughts and give us your ideas on what the field needs

DESIGN CHALLENGE #1: How can AI integrate into core curricula to help teachers ensure students reach grade-level mastery?

Many interviewees emphasized that schools must prioritize core knowledge and skills, particularly in early-grade math and literacy. With millions of students currently performing below grade-level benchmarks, this is a critical area for AI research and development. While many ed tech products (AI tutors, supplemental tools, etc) are aiming at this challenge, the evidence base around what's working is still thin. And layering supplemental "add-on" tools over existing curricula distracts both teachers and students. How can ongoing education R&D create integrated, effective tools to activate stronger teaching and deeper learning of core skills?

DESIGN CHALLENGE #2: How can AI make it easy to give students more learning experiences that build critical thinking and other durable skills?

Many interviewees highlighted a need for schools to do more to foster durable skills like critical thinking, problem-solving, and collaboration. Strong research already exists on the impact of project based and experiential learning to develop these skills. So how can AI be deployed to make it easier for teachers in varying school contexts to put this research into practice?

DESIGN CHALLENGE #3: How can AI be used to personalize instruction and also strengthen student-teacher and peer relationships?

Several interviewees raised the learning paradox presented by AI: while AI can efficiently personalize learning, increased screen time crowds out the social interaction essential for developing essential human skills. How could AI be designed to balance increased personalization with developing the human connections students need to thrive?

DESIGN CHALLENGE #4: How can we ensure all students develop AI literacy as a core skill?

Many teachers and students we interviewed called for increasing focus on a yet undefined subject, "AI literacy". Currently, competing AI literacy frameworks make it hard for educators to make good decisions about what to pilot. The development of clear standards, curricula and instructional guidance seems like a necessary step. How should K-12 approach teach students to understand algorithms, design and evaluate AI outputs, and navigate ethical use of AI?

We want your input! What skills and knowledge do you think K-12 should prioritize students mastering in the age of AI? What design challenges should we consider sponsoring to ensure AI use in education leads to greater student mastery? Fill out the form at this link to send us your idea(s).

Appendix:
Read More Of What We Heard

Core Academics

Our contributors largely rejected the premise that the advent of AI requires a wholesale rethinking of what should constitute core academic competencies like math, writing, history, science, and social sciences.

“I think the things that kids need to thrive in the age of AI are the things that kids needed to thrive in the age of Aristotle,” said academic, psychologist and author Angela Duckworth. “Maybe you could argue some of these things are even more important than they were.”

Other observers made similar points.

“What needs to change inside children’s heads? I can’t think of anything,” said psychologist and professor Dan Willingham. “I mean, for my own children, I don’t want anything different for them than I wanted 15 years ago.”

Sal Khan, CEO of Khan Academy, said, “These core academic skills, critical thinking as evidenced by math, science, reading comprehension, writing, the ability to write, read well, content knowledge in history and science, I think that’s going to continue to be important.”

Shalinee Sharma, CEO and co-founder of Zearn Math, pointed to the importance of learning math beyond being able to manipulate numbers. “Whatever happens in this AI future, math still has to be in the game. Math is indispensable because when we think about mathematics and we think about building a numerate mind, algebra is the only reasoning course that we all get to take. It’s where we start to learn to break down and solve problems. And we do it on a page and we do it with symbols. And we can extrapolate that to breaking down problems across our whole life.”

And Dagan Bernstein, an 8th grade advisory teacher, said, “The skill of writing is going to be the differentiator in this new world. In the ease of this AI world, we can’t lose sight of quality, original voice. In a world in which we need to value diverse voices, how you can express your own lived experience in a unique way is going to be so key. If we lose that, we’re just all going to become the robots.”

Durable Skills

Interviewees expressed that understanding these core subjects constitutes the necessary scaffold upon which a broad set of durable problem solving skills – what psychologist and professor Dan Willingham called “the difference between knowing and understanding” – must be built. Critical thinking was mentioned most often, but contributors also raised logic, computational thinking, communication, collaboration, self discipline and constructive disagreement as examples of durable skills.

Shavar Jeffries, CEO of the KIPP Foundation said, "At KIPP, what we call the three Cs are absolutely an essential set of competencies that our young people need to thrive in an AI-enabled world. For us, that's content knowledge, that's curiosity, and that's critical thinking. There are going to be a whole host of people who are frankly uncritical recipients and consumers of content and information that's delivered to them by AI. Those who thrive are going to be those who can ask critical questions, probe, and push – who have their own base of content knowledge and their own ability to be a critical thinker, so they can really evaluate the quality of what comes out of an AI enabled device."

Timothy Knowles, president of the Carnegie Endowment for the Advancement of Teaching, said, "In a world when the economy and technologies are changing at warp speed, skills like critical thinking, communication, and collaboration will matter more than ever. They are literally the skills that machines can't replace. These are the skills that are predictive of success, not just in school, but in the workplace and in civic life."

Kaya Henderson, executive vice president and executive director of the Center for Rising Generations at the Aspen Institute, said "We talk about critical thinking being an important skill for young people to have. I think it's going to be even more important now because you've got to be able to analyze and discern whether the things that you're seeing before your eyes are really real, and you need to have skills to know how to figure out how to do that. You can use the tool to summarize things, but the winners are going to be the people who can actually go and read the whole book and come up with some things that Chat GPT didn't."

Wendy Hedeen, who teaches computing to 6th-8th graders in Florida, had an illustrative comparison. "This generation is going to have to become detectives. They're going to have to become truth seekers," she said. "You used to be able to take a photo or a video or something at face value, knowing they could do some editing, but not necessarily fake. But now any app on a phone can create things that never occurred. And so I think we really have to teach them how to look for the truth of things. What kind of sources can they use to help find out, 'Is this true? Is this real? Is this just a soundbite that was smashed together from something else and sensationalized?'"

AI Literacy

While some experts and teachers raised the importance of AI literacy, it was the category of skills most frequently mentioned by students, including learning how to use AI tools, their limitations and their risks.

David Coleman, CEO of the College Board, said "Fundamentally the great question of AI is, 'With this technology tool what new skills do I need to make it solve something urgent and powerful?' We want kids practicing that all year long so they're gaining facility and skill. I want to be careful that we don't try to make it narrow like, 'Write a good prompt,' because AI is developing so quickly – change is the biggest part of it. You want kids constantly adapting to what the new tool can do to the problem that is worthwhile to solve and making sure that we don't get lost in the technology, but in its power to provide a solution."

"Just at a high level I would say students need to learn awareness of the AI and algorithms, mental flexibility, adaptability because the world's changing much quicker now," said Jennifer Carolan, co-founder of Reach Capital and a former public school teacher

Economist and author Tyler Cohen went farther, saying "My view for a while has been, starting in high school, to spend one-third of the whole curriculum, and I do mean a third, teaching people AI. The other two-thirds should be reading, writing, and arithmetic, face-to-face with real strict testing. All of that is completely important. But in a few years, if you don't know AI, in a sense, you won't know anything."

Fifth-grade teacher Denai Rubion said, "I think that we need kids to be educated about what AI is, what it's collecting. How it's being used. And how to be smart with it, showing [students] that it can be wrong, so they know when to question something and not just take it as it is."

Students meanwhile, nearly unanimously said that they need to learn not only about how to use AI as a practical tool, but also "rules of the road" and where the technology is heading.

"One of the most important things you can learn about AI is definitely literacy and understanding how to recognize what AI is, or recognize what AI takes from things, as well as recognizing the ethical uses of it," said Caleb Taft, an 18-year old from North Carolina "There's a lot of gray area around what's considered ethical and unethical about using AI."

F.G, a 13-year old 8th grader from Denver, said "We should learn more about how to properly use specific internet tools and stuff like that. But I feel like we should teach them more about AI safety "[And] prompting. To specifically get what you want from AI, you have to be really, really descriptive with AI prompts and specific keywords."

And Maya Ratliff, an 18 year-old college freshman from Virginia, thought more broadly about what AI literacy would mean. "A class about the changing technologies would be good because we could learn things that might not necessarily apply when we're actually old," she said. "I kind of wish there were more classes about things changing. And being able to adapt to that because a lot of my classes have had the same material for a really long time, which is good for those subjects, but I feel like I need to be able to learn how to adapt to technology changes."

Human Skills

Interviewees repeatedly highlighted the need for K-12 students to develop these innately human skills and capacities, including curiosity, ethical reasoning engagement, motivation,and ethical reasoning and the capacity for productive disagreement. Many expressed concerns about AI's potential to accelerate what they perceive as a decline in these abilities that they attribute to technology.

"I deeply believe that ethics and moral reasoning is a part of learning that should start in K-12 for young people as we see the dawning of AI," said Aimée Eubanks Davis, founder and CEO of the Braven nonprofit. "I feel this passionately first and foremost as a former sixth grade teacher who taught English as well as history, and history often tells us how important ethics and being a moral and soundly moral person means…not only to our country but also to the world."

Psychologist David Yeager said, "Just logically, in a world in which all learning is at your fingertips, the challenge is not, 'Can you get the knowledge from the internet?' It's 'How

do you create the agency where the person goes out and pursues it, and then has the diligence to grow their skills?'"

Sebastian Thrun, an entrepreneur and former CEO of Udacity, said "What makes us successful I think, is three factors. One is curiosity, one is grit and one is empathy. Three factors that I think every kid should have. Curiosity and willingness to be open-minded toward new things, because AI is not going to be the last wave. Grit is the most important – just don't jump like crazy from social media to social media – if you start something, you should finish it. That's a skill that's orthogonal to AI. And then the last one, empathy. I think the future will still be centered around people. And being able to work with people and deal with people is really important."

Psychologist Carole Dweck said, "Excitement about learning isn't usually considered a skill, but it's probably one of the most important qualities that we can have." said "That seeking of learning, that wanting to know more and building expertise, is that a skill? It is. I think it's one of the most important skills, or attributes, let's say, that we can develop."

But L.P., an 8th grader from Denver, may have best captured the challenges students today have when it comes to relational skills. "There should be a class that just tells you social stuff, like how to understand how other people feel just by looking at their actions and words," he said. "Also how to interact with other people, and not just not actually knowing how to interact - how to say stuff and not just get nervous when you're doing something."

Skepticism

Many interviewees emphasized a well founded need to temper expectations about how much AI will ultimately change K-12 education or lead to improved learning outcomes for students. Their reasons for skepticism varied, but made clear that AI should not be seen as a panacea.

"I would say right now, the majority of research, of money, of commercial companies trying to improve traditional education, math, physics, and whatever. My prediction is, that's not going to go anywhere," said education professor Yong Zhao. "If you've been in education long enough, you know we've had great visions of every technology ever invented. You know, since 1913, film was gonna revolutionize education. Then TV, radio, internet, everything. Nothing really has truly changed."

Psychologist and author Steven Pinker said, "It's very hard to predict [how AI will change K-12 education] because as with any new technology we don't really know how people will integrate it into their lives and work. I don't think anyone could have predicted the effects of the internet 30 years ago…so this is just a confession of massive uncertainty, particularly when it applies to the K to 12 level. The K-12 system has been in many ways surprisingly resistant to changes that could have been argued for a century ago."

Psychologist Dan Willingham, said that recent history suggests the promise of AI in education faces a fundamental challenge. "Kids don't have much stomach for learning from screens. This is what's dumbfounding to me. Did we not all learn that during COVID? What was Zoom exhaustion about? And then, there was an actual human on the other side, and still after a while, you get tired of talking to somebody on a screen. So that's another, I'm afraid, a substantial problem in trying to use AI in that way."

Acknowledgements

The Valhalla Foundation would like to thank the following people for so generously sharing your time and insights to make this project possible:

Dagan Bernstein, *K-8 Capstone Coordinator, former music and math teacher, Hawaii Preparatory Academy*

Sam Bidleman, *School Board Director, Bloomsburg Area School District*

Drew Bent, *Education Lead, Anthropic*

Jean-Claude Brizard, *CEO, Digital Promise*

Jennifer Carolan, *Co-Founder and Partner, Reach Capital*

Allen Cheng, *Senior Supervising Superintendent of High Schools and District 79, NYCPS*

Emily Cherry, *12th grade AP Language and Composition teacher, Morro Bay High School, San Luis Obispo, CA*

Tyler Cohen, *Professor of Economics, George Mason University, Faculty Director, Mercatus Center*

David Coleman, *CEO, College Board*

Angela Duckworth, *Professor, University of Pennsylvania; Faculty Co-Director, Penn-Wharton Behavior Change for Good Initiative*

Carol Dweck, *Professor of Psychology, Stanford University*

Jennifer (Jamie) Ervin, *Special Education Teacher, Wyoming Connections Academy, WY*

Aimée Eubanks Davis, *founder and CEO, Braven*

Orly Friedman, *Founder and Head of School, Red Bridge*

Roland Fryer, *Professor of Economics, Harvard University*

Lisa Gevelber, *Global Vice President, Google*

Chong Hau-Fu, *CEO, Leading Educators*

Wendy Hedeen, *Teacher, English and Computer Science, Northside Christian School, FL*

Kaya Henderson, *Executive Vice President and Executive Director, Center for Rising Generations at the Aspen Institute*

Frederick M. Hess, *Senior Fellow and Director, Education Policy Studies, American Enterprise Institute*

Heather Hill, *Professor, Harvard Graduate School of Education*

Margaret Honey, *President & CEO, The Scratch Foundation*

Shavar Jeffries, *CEO, KIPP Foundation*

Sal Khan, *Founder and CEO, Khan Academy*

Timothy Knowles, *President, Carnegie Foundation for the Advancement of Teaching*

Sherry Lachman, *Founder and Executive Director, AugmentED*

Jessica Lamm, *Math and STEAM Department Head*

Jessica Leary, *Teacher, Business subjects, grades 9-12, Depew, NY*

Christina Osborn-Preston, *Computer Science Teacher, K-5, Title I school*

Steven Pinker, *Professor of Psychology, Harvard University*

Jennifer Pratt, *Teacher Lead, grades 6-12, Houston Alternative School, MI*

Denai Rubio, *5th Grade Teacher, Hawaii Preparatory Academy*

Shalinee Sharma, *CEO, Zearn*

Jon Star, *Professor and Faculty Co-Chair, Human Development and Education Program (HDE), Harvard Graduate School of Education*

Sebastian Thrun, *Adjunct Professor, Stanford University; Founder, Udacity*

Daniel Willingham, *Professor of Psychology, University of Virginia*

David Yeager, *Professor of Psychology, University of Texas*

Yong Zhao, *Distinguished Professor in the School of Education, University of Kansas*

Students

A.B., *11th grade, Nashville, TN (age 16)*

F.G., *8th grade, Denver, CO (age 13)*

A.M., *12th grade, Austin, TX, (age 17)*

Laelia Maynor, *freshman, San Francisco State University, McKinleysville, CA (age 19)*

Adora Olise, *junior, University of Maine, Kennebunkport, ME (21)*

L.P., *8th grade, Denver, CO (14)*

Maya Ratliff, *freshman, University of Virginia, Charlottesville, VA (18)*

Spencer Ratliff, *junior, University of Virginia, Charlottesville, VA (21)*

Chloe Root, *gap year, Earlysville, VA (21)*

M.S., *11th grade, Concord, NC (16)*

Caleb Taft, *12th grade (graduated), Warren, NC (18)*

We also thank Learner Studio for organizing the teacher interviews and student focus group.