

COLLEGE-READY WORK MONOGRAPHS

Supporting Students

Investing in Innovation and Quality



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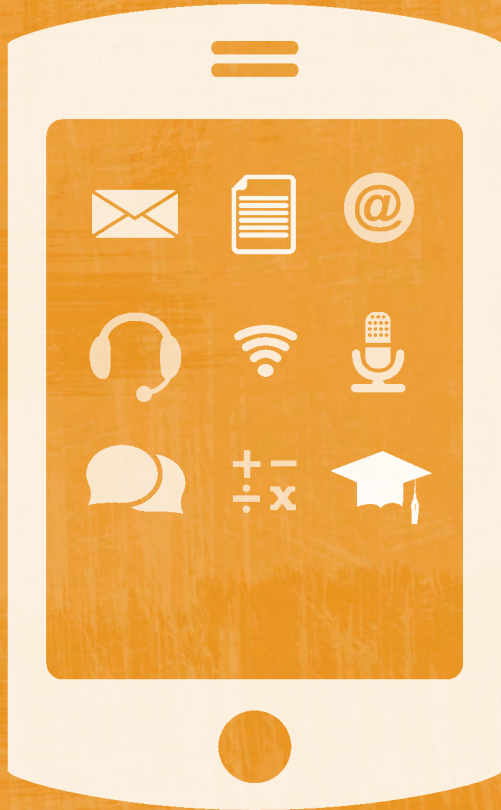
Investing in Innovation and Quality

Much of the current debate over how to improve education focuses on creating high standards and finding fair and reliable new ways to measure student achievement and to assess teacher performance. All of these, in our view, are good things.

Too often, however, the debate stops there and doesn't address the kinds of opportunities and supports that students need to achieve our ambitious goal of 80 percent of young people college-ready by 2025.

The College Ready Work Team at the Bill & Melinda Gates Foundation has focused its investments on supports for both teachers *and* students. In other monographs, we have described our teacher-supports investments. In this monograph, we describe how we have been thinking about student supports.

There is no common definition of *student supports* within the education field. At their broadest, student supports encompass all programs and services that help students navigate their lives—from tutoring programs to life-skills training, such as early parenting classes.



Because the definition is so broad, we have limited our investment scope to academic supports. Our goal is to dramatically increase the number of college-ready students *by focusing on what they need and changing the systems and policies that are preventing schools, districts, and states from producing large numbers of college-ready students.*

We have been thinking in very nontraditional ways. In some cases, this means investing in game-based applications and assessments that can be used anytime, anywhere. In other cases, this means investing in research to better understand college-access and student-persistence issues. In every instance, our intention is the same: to make tools and successful strategies widely available to schools and districts at little or no cost.

The portfolio is evolving as we learn more about scalable solutions from our grantees. This brief monograph describes some of our early thinking and some of our current investments.¹

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Engaging the Disengaged



By any measure, too many students are leaving school without the knowledge and skills they need to succeed and thrive. Some drop out; others graduate but are still far from ready for either college or a career. And within schools, too many students are simply bored and disengaged. They don't see the relevance of their assignments to their lives and rarely have an opportunity to master their schoolwork.

Today's students grow up with cutting-edge technology through the Internet: YouTube, instant messaging, and social networking. They are electronically tethered to information, services, entertainment, and each other.² Yet in their classrooms, too many of them face instructional practices that were outdated even when their parents were in school. It doesn't have to be this way.

At the Gates Foundation, we envision a future where students learn beyond the bounds of traditional classrooms,

where they set their own pace toward college readiness, and get there, at least in part, by pursuing their own interests.

As we consider investing in a dramatically different way of learning, we're asking questions like this:

- How can students engage in solving complex problems that are relevant to their lives?
- How can classroom design lead students to deep and enduring mastery of their schoolwork and skills?
- How can we capitalize on their digital prowess to inspire confidence, curiosity, persistence, and a desire for knowledge?

Many of our grantees have drawn inspiration from the practices and tools used in the professional world, including medicine, the arts, and corporations large and small. Their learning programs are often digital and are marked by being participatory, engaging, cocreative, and highly collaborative.

Design Principles



It is easy to get lost in some of the many new technological possibilities. It is not enough for potential investments to be cleverly engaging; they must also deliver solutions for students that produce high-quality results. We must keep the end firmly in mind: true college and career readiness for our nation's young people.

As the College Ready Work Team has approached investments in student supports, it has developed a set of design principles to guide its decisions. These values are based on research about learning science and include the following:

- 1. Mastery.** Learning solutions—units, courses, and subjects—should have clear progress trajectories from novice through apprentice to mastery. Students should understand how to advance from one level to the next.
- 2. Feedback.** Learning solutions should give students immediate feedback on their performance. The work should offer repeated opportunities to try different approaches, to improve their results, and to demonstrate mastery.
- 3. Subject Immersion.** Learning solutions should immerse students in the discourse, tools, and culture of the subjects studied. For example, students should learn mathematics by using the metrics and analytical tools of mathematicians, and by articulating the choices they make to solve a problem. Science students should be engaged in inquiry, data gathering, and analysis, and should build arguments based on valid evidence. Learning solutions should enable students to learn *to be* mathematicians, historians, or biologists rather than just to learn *about* these subjects.

4. Multiple Experiences. Learning solutions should offer students varied and diverse opportunities to apply knowledge and skills, and to produce—not just consume—content. Learning solutions should be designed for anytime, anywhere learning. A masterful basketball player, for example, moves from drills to scrimmages to one-on-one coaching to competitive games, each exercise providing new ways of developing mastery. This example implies that learning content in one setting—a typical 50-minute-long classroom period—is not sufficient for acquiring, practicing, and applying necessary skills.

5. Multimedia. Learning solutions should employ digital resources—simulations, videos, video conferencing, games, interactive maps, data-analysis software, and virtual worlds—as an integral part of the learning experience. Students should be able to use these digital resources as tools to support their thinking.



A Growing Portfolio



The foundation's portfolio of investments in student supports is intentionally diverse. Some of our work is in promising emerging fields that we are helping to develop. Some of this work is about rigorous academics and some is about the noncognitive skills that students also need to be academically successful. We have organized our investments into four general categories: (1) proficiency-based pathways, (2) game-based assessments, (3) digital course development, and (4) college knowledge³ and academic tenacity.

1. Proficiency-Based Pathways

Education leaders have long talked about setting rigorous standards and allowing students more or less time as needed to demonstrate mastery of subjects and skills. This has been more a promise than a reality, but we believe it's possible with the convergence of the Common Core State Standards, the work on new standards-based assessments, the development of new data systems, and the rapid growth of technology-enabled learning experiences.

The conditions are ripe for creating personalized learning opportunities beyond school—in an anytime, anywhere fashion—that increase students' engagement and effort. We hope these investments will result in a better understanding of how students can benefit from and get credit for anytime, anywhere learning.

There are many terms in this nascent field to describe similar approaches—*proficiency-based pathways*, *mastery-driven instruction*, *standards-based design*, and *competency-based education*.⁴

We are using *proficiency-based pathways* and defining it simply as:

opportunities for students to engage in a learning experience where they can demonstrate mastery of content and skills and earn credit toward a diploma, certificate, or some other meaningful marker.

Although rare in the K–12 world, proficiency-based instructional practices and assessments are routine in professional and vocational training. In healthcare or aviation, for example, it is expected that professionals demonstrate competency in an applied manner. The leaders in proficiency-based pathways come from diverse fields, including information technology, bioscience, energy, and transportation.

The foundation's initial investments have been designed to help a few leading organizations pilot and refine proficiency-based approaches. For example, we have made grants to the Digital Learning Network in Chicago, an online social-networking-based approach engaging inner-

city students; and to the Oregon Proficiency Project, which is not Internet-based.

This field is still emerging. We do not yet have a common language, rigorous evaluation process, or literature base. The field does not have consistent metrics for delivering quality outcomes online. Our investments will support the field and establish indicators for mastering skills and knowledge.

PROJECT MASTERY

We are beginning to invest in place-based efforts designed to support school organizations and offer rich pathways for students to develop and demonstrate mastery aligned to the Common Core State Standards. The Project Mastery initiative will support designs that enable students to show deeper levels of understanding, skills, and knowledge, while moving away from traditional seat-time requirements. Partners include the Asia Society, the School District of Philadelphia, and Adams County School District 50 in Colorado.

2. Game-Based Assessments

Game-based learning has gained the attention of prominent institutions in fields ranging from the military to the sciences and philanthropy. These institutions are funding game-based development and research projects intended to support educational and training efforts. While many games have a behaviorist, skill-and-drill pedagogical methodology, leading designers and scholars are also using experiential methods that immerse learners in complex problem-solving contexts.

These serious games in the healthcare, military, and commercial sectors show that assessments performed using simulations and role-playing offer better parallels to real-world contexts and can better gauge the depth of student learning than more-abstract print-based assessments can.

The Gates Foundation seeks to contribute to the field of games and learning, particularly in developing innovative assessments embedded in the games. We are partnering with other foundations, including the John D. and Catherine T. MacArthur Foundation, which has pioneered and propelled the games and assessments conversation. Game-based learning, while still nascent, has grown to a point where endorsing its potential is no longer sufficient. Makers of educational games should be able to demonstrate learning gains and the reliability of their embedded assessments.

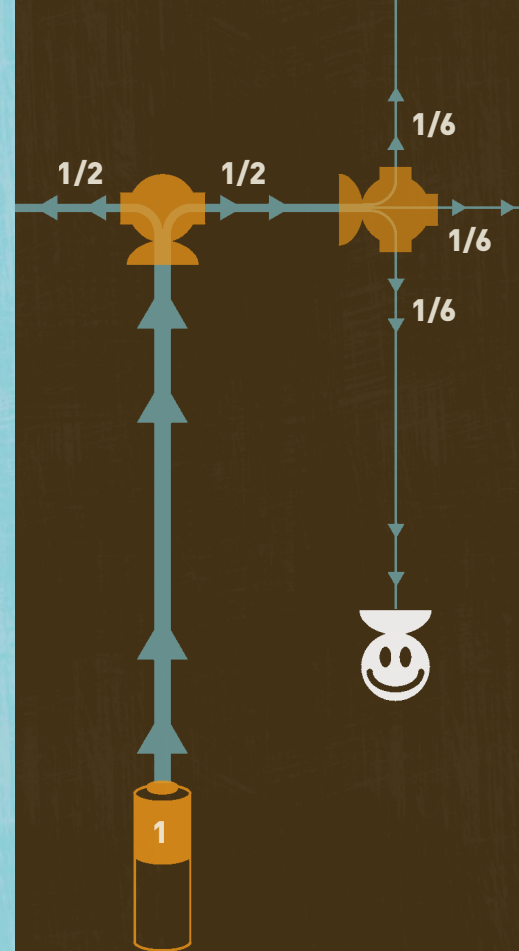
Our game-based investments have informed the design of one of the Learning Challenges⁵ put out by our colleagues on the Next Generation Models team. They are guiding our investments in digital courses, which we describe on the following page. We hope our investments will also be useful for the state-led assessment consortia.

REFRACTIONS

The Refractions project will produce three games that embed pre-algebra in a puzzle-solving environment with dynamically adaptable levels. In Refractions, students will progress by demonstrating mastery of key concepts in algebra readiness. The games will also function as highly sensitive assessment engines that track every action a student takes. They will provide detailed and nuanced assessment data about the efficacy of each proposed learning pathway for each student and will offer optimal pre-algebra learning pathways for large sets of students.

The randomized trial engine upon which the games will be deployed is an adaptive assessment engine that dynamically generates new hypotheses for learning pathways as a student plays the game, and that can be tested within weeks rather than years. Developers will be able to conduct research at a volume and speed that would otherwise be impossible. We expect this work will encourage new ways of gathering data in other subjects critical to college readiness. Hopefully this will lead to faster research findings and quicker deployment of effective content and teaching strategies.

An early prototype of this trial engine was used to create the scientific discovery game Foldit. This game successfully brought proteomics students from the novice to the expert level. The game resulted in a paper written by the student players and published in the journal *Nature*. The article described their novel protein solutions which outperformed all known scientific approaches to the same biochemistry problem.



3. Digital Course Development

The world of digital courses is exploding. Students can study almost anything online, both through their schools and outside the classroom.

We believe it is critical that course material is of the highest quality and appropriately aligned with the Common Core State Standards.

Many of the foundation's teacher-support investments have helped to fund instructional tools for math and literacy to help busy teachers differentiate instructional needs and introduce the new standards through manageable pieces rather than through a full curriculum. The digital course investments will build off of these investments.

Our course-development investments will be guided by the design principles described earlier and will capitalize on the students' use of digital media in and outside of school.

This is a fast-moving field. There is considerable course-development activity by publishers, virtual-schools, and other content-development firms—often with considerable inconsistency in quality. We have been working with the Massachusetts Institute of Technology, which has organized a series of conversations about this issue. Through these ongoing dialogues, we hope to engage the digital course-development field and to define some key metrics for quality learning.

EDUCURIIOUS

The Educurious team is producing three online, common-core-aligned ninth-grade courses that provide highly immersive learning spaces. Students are challenged to solve complex problems through engaging with peers, teachers, and experts. The Educurious courses will:

- look to contemporary challenges as a starting place for content;
- frame content in ways that are relevant to today's youth;
- require students to position themselves as experts capable of solving complex problems;
- ask students to use learning tools (for example computer simulations) endemic to a knowledge domain;
- use high-quality videos and animations to exemplify how a problem works;
- create real-world situations where students can apply disciplinary-based skills and knowledge within a collaborative, challenge-based structure;
- carefully select key standards that drive the curriculum;
- complete designs that require collaboration with field experts who offer guidance and performance feedback;
- embed assessment opportunities within learning trajectories; and
- define clear roles for teachers as facilitators of learning and assessment.



4. College Knowledge and Academic Tenacity

The three categories above focus largely on academic preparedness, which is crucial for finding a good job and for a better life after high school. But we also know that students need competence beyond academics if they are to succeed at higher levels of education. In particular, they need *college knowledge*—understanding how to access, participate in, and succeed in higher education. And they need to have the *tenacity*—the persistence and grit—required for achievement in college and beyond.

College Knowledge

Our goal at the foundation is to support tools and outline specific, actionable strategies that make college access available to all students and families. We define *college knowledge* in terms of:

- **Early Awareness and Planning:** tools that help students and families develop and implement college-going strategies starting in middle school. This process starts with identifying college as a real, attainable possibility, identifying opportunities and obstacles, and adjusting strategies in response to feedback.
- **The Admissions Process and College Fit:** tools that bring clarity and simplicity to the financial-aid process, including helping students understand what types of aid are available and the cost of a postsecondary education with financial aid. These tools help students evaluate how to match an institution to their goals, interests, and achievements, and provide strong guidance throughout the college-going process.
- **Building a College-Going Culture:** tools, including rich digital environments, that help students develop and access a peer culture that supports college-going. This work is critical because it bolsters the relevance and application of college-going to all teens, since teen values and identity are steeped in peer culture.

Academic Tenacity

Academic tenacity helps students to engage in learning and to develop their own beliefs and meet their own aspirations within the academic environment. It encompasses the mind-sets and skills that allow students to look beyond short-term concerns to longer-term or higher-order goals, and to withstand challenges and setbacks. Tenacious students believe that they can achieve (*self-efficacy*), employ effective self-management strategies (*self-regulation*), and have strong social networks (*social capital*).

We have been investing in research that will identify and build academic tenacity in students. We also hope to better understand and invest in learning environments that foster scholastic growth and perseverance.

COLLEGEOLGY

Collegeology is a partnership between the University of Southern California's Game Innovation Lab and Center for Higher Education Policy Analysis to develop two online games for building college knowledge and strategy skills. The Collegeology games will challenge students to develop winning strategies for three key aspects of the college-going process: college awareness and goal-setting, career choice and financial planning (including financial aid and return on investment), and peer support. The games will present the benefits of college-going in real, practical ways. They will feature identifiable characters that help students to feel safe taking risks (and failing) while clearly seeing the relationship between their characters' actions and their own lives, and will embed challenges relevant to their experiences.

Going Forward



This emerging portfolio of student supports is marked by innovation as well as by uncertainty about how it will fit into our traditional education system.

In some cases, our grantees may be challenging traditional learning systems. Many of the innovators in this work are young and new to the field of education. Our goal is to help them create tools that can scale easily and that substantially increase the number of college- and career-ready students. We also want to support schools and districts as they embrace new technologies and tools.

The Bill & Melinda Gates Foundation is committed to investing in tools and strategies that today's teachers and students need to achieve at higher levels, as well as in partners outside of schools. We want to pave the way to a completely different way of thinking about schooling.

Endnotes

- 1) This monograph was collaboratively written by Robert Torres, Emily Dalton Smith, and Carina Wong.
- 2) Studies by the Pew Research Center's Internet and American Life Project report that 93 percent of white, 75 percent of black, and 84 percent of Latino youth between the ages of 12 and 17 access the Internet from home (2011); 97 percent of all youth play video games (2008); and 57 percent (or about 12 million) are creating content for the Internet (2005). John Palfrey and Urs Gasser, authors of *Born Digital* (2008), claim that about 50 percent of YouTube's registered users are under the age of 20.
- 3) We borrow this phrase from the work of David Conley, who has pioneered much of the thinking about college knowledge and defines it more broadly.
- 4) The term *competency-based education* is used by our postsecondary colleagues rather than *proficiency-based pathways*. Our postsecondary partners define *competency-based education* as opportunities for students to engage in learning experiences anchored in recognized quality learning outcomes that are mapped with clear curricular interdependencies, and during which they can demonstrate acquired mastery of content and skills and earn credit toward recognized credentials.
- 5) www.nextgenlearning.org/the-grants



Bill & Melinda Gates Foundation

Guided by the belief that every life has equal value, the Bill & Melinda Gates Foundation works to help all people lead healthy, productive lives. In developing countries, it focuses on improving people's health and giving them the chance to lift themselves out of hunger and extreme poverty. In the United States, it seeks to ensure that all people—especially those with the fewest resources—have access to the opportunities they need to succeed in school and life. Based in Seattle, Washington, the foundation is led by CEO Jeff Raikes and Co-chair William H. Gates Sr., under the direction of Bill and Melinda Gates and Warren Buffett.

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