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POLICY BRIEF 2012-05

Harnessing Technology to Improve K–12 Education

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Harnessing Technology to Improve K–12 Education

Innovation has spurred great increases in productivity in many sectors of the American economy, reducing costs and improving quality. In the American educational system however, policymakers, parents, teachers and other stakeholders are concerned that despite significant amounts of spending per student, we have flat measures of achievement and attainment, in terms of test scores and completion rates in K-12. There is significant potential to apply one of America's signature strengths, innovation, to this important weakness in K-12 education. Harnessing innovation for students and teachers by creating a transparent and functioning market for education technology could help our nation overcome these serious educational challenges.

In a new paper for The Hamilton Project, Aaron Chatterji of Duke University and Benjamin Jones of Northwestern University propose the establishment of a third-party ratings organization for education technologies. Leveraging the pervasiveness of the new Common Core State Standards and the power of information technology, the proposed EDU STAR organization would bridge the information gap between sellers and buyers, providing reports on the effectiveness of various software-based learning tools. Such an organization could help establish a transparent and therefore more dynamic market for the technologies, encouraging innovation in the sector and providing new ways to help students learn.

The Challenge

Education technologies exist in many forms, including programs that help teachers manage classrooms and whiteboards that allow for interactive lessons. Instructional software—programs that teach content or skills to students—can offer personalized learning for students and can complement a teacher's skills, allowing her to focus on higher-level skills and maximizing the value of classroom time.

Educational software should be a prime target for entrepreneurs; the demand for educational improvement is high, and writing instructional software has very few startup costs. However, education technology has seen relatively little innovation relative to other sectors. In contrast, Apple and Android saw more than 80,000 companies creating more than 300,000 mobile applications within two years of the introductions of their operating systems.

Participants in the market for education technology face a fundamental challenge: the effectiveness of learning

technologies is rarely known. First, schools have no good way of knowing how well a given product works, and it is costly—in terms of time and money—to collect information or to try out many different products. Second, sellers have no way of signaling that their products work since there is no trusted third-party evaluator to verify their claims or to confirm results of the sellers' evaluations.

This issue is compounded by the fact that each school or district makes its own purchasing decisions based on often idiosyncratic procurement rules. Since there is little information on effectiveness, buying decisions are based on other criteria, like habit or the seller's ability to meet bureaucratic purchasing guidelines. The lack of objective information on what works in combination with a complex patchwork of purchasers make it difficult for innovators to enter the market, despite the low start-up costs for product development.

A New Approach

One approach to solving credibility and information issues is to create a trusted third-party agency that can provide ratings or other measures of effectiveness. These organizations exist in many other places; one well-known example, the publication *Consumer Reports*, evaluates consumer products and then publically reports the results. Another organization, the U.S. Green Building Council in Energy and Environment Design, rates whether buildings are environmentally sustainable.

To bridge the gap between innovators and consumers in education technology, Chatterji and Jones propose the establishment of a new nonprofit organization, EDU STAR, that would connect with market suppliers and schools, test instructional technologies, and disseminate information on effectiveness. This organization would create transparency in the market, allowing the best technologies to emerge and allowing schools to maximize the returns to their investments in education technologies.

EDU STAR would begin by focusing on instructional content, software that aims to teach discrete skills in short periods. In doing so, the authors build on the work done to create the Common Core State Standards—a set of learning objectives that have been agreed to by forty-five states, the District of Columbia, and three U.S. territories—unifying demand for instructional content around a set of well-defined, discrete skills. EDU STAR would evaluate each product on the basis of one or more of these standards.

The organization would perform the following four key functions:

- 1. **Link with Market Suppliers.** EDU STAR would work with entrepreneurs who want to test their products, screening the products before they go in to schools to ensure that they meet basic design criteria and providing initial feedback before formal testing. It would work with product designers as companies use results from evaluations to improve their products. For innovators, a third-party ratings organization will make it easier to signal effectiveness and thus lower the costs of marketing. Small and new businesses that have not yet established themselves will especially benefit.
- 2. **Build a Test Bed.** To test products, EDU STAR will partner with a group of schools or school districts to test new technologies. Each school would put aside time for students to participate in digital learning, during which they would log on to the EDU STAR system and work with the products that are being evaluated. The online EDU STAR platform would allow each school flexibility in terms of time and place of use, and teachers would be able to use it for their classes with no special training or expertise.

As a rule of thumb, Chatterji and Jones estimate that one large school district would be sufficient to provide useful results. If there is not enough initial interest from schools, EDU STAR may offer schools incentives to participate, such as discounts on software or even compensation. Chatterji and Jones note, however, that existing efforts to better use technology in school, including Gates Foundation-sponsored initiatives, School of One in New York City,

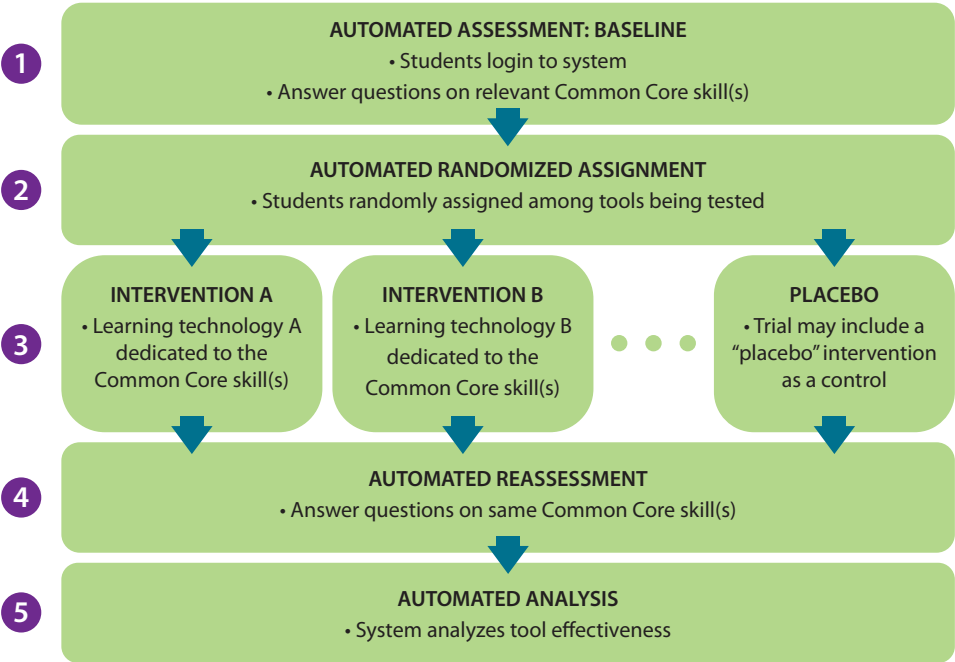
and Digital Promise’s League of Innovative Schools, demonstrate an eagerness for such initiatives and may even be willing to partner with EDU STAR themselves.

- 3. **Evaluate Products.** During her time at the computer, each student will log on to an automated system, where she will be given a quick baseline assessment, after which she will be randomly assigned among different products that teach the same Common Core objective. Some students will also be assigned to learn about another topic as a control. After completing the program, students will undertake a quick closing assessment; the results from different programs can be compared to give the relative effectiveness of each intervention.

For the product evaluations to be effective and trusted, randomization is necessary to ensure that differences in test scores reflect the effects of the program and not underlying differences in the types of students who are taking each test. EDU STAR will first focus on easily testable skills and on instructional content given over a single class period, online lectures, and other digitally delivered content. Together, these two features will allow EDU STAR to rapidly produce automated, low-cost, rigorous evaluations of educational software.

In the future, the authors suggest that EDU STAR can explore expanding its platform to incorporate other promising types of education interventions, including summer reading programs or classroom management software. As the evaluation platform outlined above extends beyond short-run interventions it would still greatly lower costs by creating and automating pre- and post-intervention assessments.

FIGURE 1.
The EDU STAR Evaluation System



4. Disseminate Results. EDU STAR would be responsible for creating easily accessible reports on the effectiveness of various products and publishing these reports online. The organization would give each technology a rating of between one and five stars, measured by its performance over the control case, where the students learn a different topic. Consumers would be able to browse products for different learning standards, with products that teach multiple standards rated within each standard.

The website would also include information on how many students have used the software, how it was tested, user ratings from both students and teachers, and how the product works for different types of students. (For example, one software tool may be especially effective for students who start off with lower baseline achievement.) EDU STAR would also publically list all products that had been submitted for evaluation so that sellers cannot cherry-pick above-average results.

Implementing EDU STAR

Chatterji and Jones propose that EDU STAR be established as a 501(c)3 nonprofit organization drawing on funding from a diverse group of entities including the U.S. Department of Education, foundations, and private-sector partners. They estimate that the organization would require \$5 million to start. EDU STAR could launch its platform within eighteen months. Start-up costs, including the technical costs of creating the platform and the website and buying servers, would be temporarily higher; however, the ongoing costs of screening products, maintaining the technical apparatus, and communicating with schools, should be relatively low. Eventually, EDU STAR would cover the costs of running the organization with user fees: it would charge companies per product on a sliding scale, with lower prices for small businesses.

Government and private grants could provide initial funding. The U.S. Department of Education administers the Investing in Innovation (i3) fund, a \$150 million program that provides money for planning, validating, and scaling up new approaches to improving education. EDU STAR could also fit under the umbrella of the proposed, but not yet funded, Advanced Research Projects Agency–Education (ARPA-ED), whose mission would be to create breakthrough innovations at all levels of education.

Private foundations, such as the Gates Foundation, the MacArthur Foundation, and the Broad Foundation, have already made significant investments in educational innovation and could be potential partners. Private companies such as Google and Amazon already perform similar randomized control evaluations, and these and other technology companies may be willing to donate support or equipment.

EDU STAR would have five full-time employees: an executive director, a director of research, a chief technical officer, a

Roadmap

- A consortium, potentially including the U.S. Department of Education, private foundations, and private sector partners, would launch EDU STAR, a 501(c)3 organization to evaluate instructional content technologies.
- EDU STAR would seek \$5 million in start-up funding, from a combination of U.S. Department of Education grants such as the Investing in Innovation fund and foundation grants. The organization would gradually transition to being financed by user fees paid by the technology companies.
- At launch, EDU STAR would have five full-time employees: an executive director, a director of research, a chief technical officer, a director of development, and an office manager.
- The advisory board of ten members would include leading teachers, entrepreneurs, IT professionals, educational policy experts, education researchers, and school officials.
- EDU STAR would work with schools or districts that choose to participate to create a test bed, where students would spend a small amount of time each week working on the EDU STAR platform.
- An automated online platform would randomly assign students to different products and would test students before and after using each product.
- A website would publish the information on each product evaluated, including effectiveness in terms of skill improvement, how many students have used the software, how it was tested, user ratings from both students and teachers, and how the product works for different types of students.
- The EDU STAR platform initially would be limited to instructional software that is tied to specific Common Core standards and that is appropriate for a typical class period. One year after the platform's launch, EDU STAR staff and board would consider including more types of educational interventions.

Learn More About This Proposal

This policy brief is based on The Hamilton Project discussion paper, “Harnessing Technology to Improve K–12 Education,” which was authored by

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Additional Hamilton Project Proposals

Staying in School: A Proposal to Raise High School Graduation Rates

By Derek Messacar and Philip Oreopoulos

The gap between educated and uneducated Americans is larger than ever. And yet, the high school dropout rate is almost as high today as it was 50 years ago. Economic evidence strongly supports the idea that students who are compelled to attend school longer earn higher wages and are otherwise better off as a result of their extra schooling. This paper presents a strategy for reducing the dropout rate through a carrot-and-stick approach that combines stricter and better-enforced school-attendance laws with programs that have been statistically proven to prevent disengagement among at-risk students.

Learning from the Successes and Failures of Charter Schools

By Roland Fryer

Because many successful charter schools represent a radical departure from traditional public schools, they often embody a black box to educational reformers. However, new evidence is beginning to shed light on what makes certain charter schools effective, and on how this can be applied to traditional public schools. In particular, experiments in Houston public schools have proven that five concrete reforms—increased time at school, better human capital practices, more student-level differentiation, more data-driven instruction, and a culture of high expectations—can bring some of the benefits of high-achieving charter schools to a broader student population.

director of development, and an office manager. The executive director would be responsible for assembling an advisory board of stakeholders and experts, including teachers, entrepreneurs, IT professionals, education policymakers, and school officials. The director of development would conduct outreach to schools and innovators, while the director of research would set criteria for evaluations. The chief technical officer would coordinate development of the technology infrastructure for EDU STAR, and the office manager would handle administrative functions.

The organization would also require an institutional review board (IRB) to oversee testing and evaluation procedures and to ensure that all research is conducted ethically. All data collected from students will be anonymous, and EDU STAR will take steps to fully inform and engage parents in the process.

Finally, EDU STAR must be designed to prevent conflicts of interest and the appearance of conflict. In addition to publically listing all products submitted, EDU STAR will not accept free samples, advertising, or other payments from any organization with a financial stake in the evaluations. As with *Consumer Reports*, employees will follow strict rules regarding participation in industry-sponsored events, ownership of stocks, and so on.

Costs and Benefits

As described above, the costs of EDU STAR are estimated to be relatively low, and it is projected to be self-sustaining in the long run. EDU STAR can create a more dynamic and transparent market for education technologies where effective products are more likely to be created and adopted. Entrepreneurs, especially those with little market presence, will gain a valuable marketing tool, while others who may previously have chosen not to enter the market will create new products. Schools will benefit from being able to better discriminate between products and from having a wider variety of products to choose from. Ultimately, EDU STAR can lay the foundation for the emergence of innovative products that dramatically raise student achievement.

Conclusion

Technological innovation could be a potent weapon in the fight against stagnating achievement in the U.S. education system. However, before it can be used, both school systems and entrepreneurs must overcome a proof of effectiveness challenge. School administrators do not know what works, and sellers have no trusted way to signal that their products are effective. This challenge creates daunting hurdles to enter what would otherwise be an attractive market. To bridge this gap, Chatterji and Jones propose the creation of a third-party ratings organization for instructional content technologies—EDU STAR—that can bring the power of innovation to K–12 education.

Questions and Concerns

1. How will EDU STAR impact the classroom environment for teachers and students?

Education technologies, along with textbooks, chalkboards, and prepared worksheets, provide teachers with instructional tools so they can maximize their impact in the classroom. These technologies can also enable personalized learning that helps students move at their own pace. While these technologies are already proliferating, EDU STAR helps ensure that they are actually working for teachers and their students. EDU STAR will work best for technologies that aim to teach discrete and easily measurable skills, such as solving a particular type of equation or spelling a word. These skills, while covering only a limited set of core learning objectives, will provide teachers new tools to help students learn these building blocks, personalize education, and better manage their classroom.

2. How can EDU STAR make sure that the products are being used properly in the classrooms?

If students do not use the software as intended or do not try their best on the tests, then results may not accurately reflect the effect of the software. Chatterji and Jones argue that the system is designed to minimize these concerns. Since most of the process is automated, implementation is relatively straightforward. Teachers will be responsible for making sure that students do not help each other, and in part for keeping students on task. However, EDU STAR will naturally favor products that are fun for students, and so will implicitly incorporate student engagement, an important design consideration, in its ratings.

Highlights

Aaron Chatterji of Duke University and Benjamin Jones of Northwestern University propose a new third-party ratings organization, called EDU STAR, to evaluate education technologies and to create a dynamic market for instructional software where the most-effective products rise to the top.

The Proposal

A consumer report for educational technologies. Innovators face a market where even successful products are often overlooked, and schools often cannot determine which products will give them the highest returns for their limited IT budgets. EDU STAR, a nonprofit organization, would bridge this gap, providing trusted evaluations of instructional software.

Rapid and rigorous evaluations. Students would be randomly assigned to different products teaching the same skills and would be tested before and after using the product. EDU STAR would analyze the results of these trials to see which technologies were more effective.

Online reporting of results. Information on each product would be published in an easily accessible and digestible format. The primary metric would be a rating out of five stars based on measured skill improvement. The website would also include information on how many students have used the software, how it was tested, user ratings from both students and teachers, and how the product works for different types of students.

Benefits

EDU STAR can create a more dynamic and transparent market for education technologies where effective products are more likely to be created and adopted. Entrepreneurs, especially those with little market presence, will gain a valuable marketing tool, while others who may previously have chosen not to enter the market will create new products. Schools will benefit from being able to better discriminate between products and from having a wider variety of products to choose from. Ultimately, EDU STAR can lay the foundation for the emergence of innovative products that will dramatically raise student achievement.



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