But Do They Work?: The Complicated Role for Evidence of Effectiveness in EdTech Products

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Summary

In recent years, there has been a proliferation of new technologies aimed at improving education. However, unlike in other areas of development and investment, relatively little attention has been paid to demonstrating the effectiveness of new instructional products through generally accepted methods (such as assessing improvements in student test scores or other evidence of student learning). As a result, it's possible – even likely – that time (of students and teachers) and money (from investors and taxpayer funded schools/districts) are being wasted on products that are not actually effective in enhancing student learning.

This report seeks to further our understanding of how stakeholders (investors, developers, established vendors, and others) define the effectiveness of products and value evidence of such effectiveness. The goal is to increase thoughtful attention to the role of research in the development, investment, and procurement processes.

In this report, we provide:

- background on the current study;
- key literature that grounds our thinking;
- our methodology;
- three key findings related to (1) to what extent stakeholders view proof of a product’s efficacy as important, (2) how should effectiveness be judged and (3) what voices are trusted in judging effectiveness; and
some suggestions about implications and further possible work in this area.

**Background & Context for This Report**

This report was written as part of a coordinated effort by the University of Virginia’s Curry School of Education, Digital Promise, and the Jefferson Education Accelerator to bring together stakeholders from across many aspects of educational technology (hereafter “EdTech”). Ten working groups were established to consider critical issues related to the effectiveness of Ed Tech and to understand the perspectives of various interested parties.

In recent years, there has been a proliferation of new instructional technologies aimed at improving education. Unlike in other areas of development and investment, relatively little attention has been paid to demonstrating the effectiveness of new products. As a result, it’s possible – even likely – that time (of students and teachers) and money (from investors and schools/districts) are being wasted on products that are not actually improving learning or performance. We wanted to bring together diverse perspectives to understand whether there were ways to improve attention to how and under what conditions instructional tools work. To that end, we began with three questions to frame our research:

1.) How do educational technology investors, developers, and established vendors value evidence on products?
2.) How should effectiveness be judged?
3.) What voices are trusted in judging effectiveness?

The tentative findings presented below represent our attempt to answer these questions based on the responses from a range of stakeholders to a survey and to semi-structured interviews. In short, we found that most stakeholders understand a product’s efficacy to be related to both educational outcomes and to market potential, and that they do value research that speaks to effectiveness. However, what is characterized as valued research varies; worthy research is not necessarily available; and it is not yet clear that a case can be made for more expensive, rigorous research. The research, education, development and investment communities will benefit from continued collaboration in order to develop research approaches that are valid, valued and available.

**Relevant Literature**

What does prior research tell us about how to determine whether something is “effective” or not?

- At its core, research on “efficacy” and “effectiveness” (related but not synonymous terms) is conducted to try to figure out whether a given intervention – be it a textbook lesson, an EdTech product, a medical treatment, or a new policy
implementation – does what it is supposed to do.¹

- One particularly clear way of thinking about these two related but different types of studies appears in the healthcare literature where the ideas originated: “Efficacy can be defined as the performance of an intervention under ideal and controlled circumstances, whereas effectiveness refers to its performance under ‘real-world’ conditions.”²
- Educational researchers often report conducting research on both the efficacy and effectiveness of interventions in schools³, and many teachers and administrators rely on this research to make pedagogical and procurement decisions.⁴ However, even the best-intentioned individuals can be tripped up by vague or confusing statements (mis)attributing effects to the product or lack of statistical significance of available findings.⁵

What does prior research tell us about how technology products are built and grown?

- The literature on investment decision-making suggests that most decisions about investments in new products are multifaceted, incorporating elements of financial analysis (mostly calculations of likely returns on investment), benchmarking, and assessments of other success factors.⁶
- A recent study of 30 tech startups (not specifically education technology) found that funding decisions of the investors were based not only on data collected as part of the company’s research and development function, but also on less salient factors such as the location of the company headquarters and the educational experience of its founders.⁷

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Relative to other sectors, technology investors may be less attentive to research when making decisions. One possible reason for this is that leaders in mature sectors (like energy, manufacturing, or healthcare) are likely to have decades of data on the key indicators of difficulty or success in a given area (in terms of known risks, regulation, etc.). Meanwhile, the technology sector remains relatively young in this regard. If historical data does not exist, interest in research may develop over time as an industry matures.

What does prior research tell us about the role of research in the adoption of EdTech products?

- One of the authors of this report indicated in an op-ed recently that, “No responsible investor would invest in a health-care-technology product that wasn’t thoroughly researched by top medical scientists. No one would invest in energy technology whose potential was unsupported by the studies and practices of relevant experts. Yet when it comes to education technology, the logical connection between evidence of effectiveness and the wisdom of investment decisions is often ignored.”
- According to Digital Promise, research would make important contributions: “...developers using research to create and evaluate their products can be more confident that their approach will address real-world education problems, and make it easier for purchasers to reach that conclusion.”
- Consistent with reports about the broader role of evidence in the adoption of technology innovations, schools and districts may not have sufficient research available to them about what could be useful given a school’s specific curriculum challenges and funding dynamics. Technology Analysis & Strategic Management, 1-13.

8 Madda, M.J., (2016, August 10). *Did that edtech tool really cause that growth? How to watch out for faculty efficacy studies.*


objectives and other contextual factors.\textsuperscript{12} Indeed, school leaders who make decisions about procurement value research that speaks to their organizational context in terms of size, demographics, and urban versus rural locality\textsuperscript{13} but relatively little such research is available\textsuperscript{14}.

Broadly, then, the research on relevant areas indicates that (1) there are existing approaches that could – and should – be more consistently applied to the study of EdTech products, (2) developers and investors do not rely as heavily on such evidence when working with technology products in general as they do in other areas, and (3) schools and education leaders would like to have more evidence on which to base their pedagogical and procurement decisions but do not have access to sufficient data.

**Methodology**

In order to understand this dynamic better, we set out to explore (through a survey and semi-structured interviews) how various stakeholders – from developers to investors to users – describe what it means to them for an EdTech product to be “effective,” how they value various types of research in making that assessment, and how they think about the sources of evidence for understanding product effectiveness.

**Survey**

**Instrument**

The working group designed a survey intended for individuals involved with education technology who identified as investors, entrepreneurs, product developers, researchers, philanthropists, k12 and higher education administrators, k12 teachers and faculty. The survey instrument asked questions to understand (1) how respondents assessed a product’s potential worth; (2) how should effectiveness be judged; and (3) what voices are trusted in judging effectiveness.

**Sample**

Using the existing networks of the symposium members and members of other working groups, we distributed the survey to 147 unique individuals across 28 companies and institutions. There were 75 respondents - a 51% response rate – and respondents included researchers (23%), higher education leaders/faculty (20%), school/district personnel (15%), investors (14%), and entrepreneurs/developers (19%) (rates that were relatively consistent with the broader sample to whom the instrument was sent). Given

\begin{itemize}
\item\textsuperscript{12} Bower, J. (2005). Why We’re Better off without EETT. *THE Journal (Technological Horizons In Education)*, 32(10), 56.
\item\textsuperscript{13} Tseng, V. (2012). *The uses of research in policy and practice*. Washington, DC: Society for Research in Child Development.
\item\textsuperscript{14} Bower, J. (2005). Why We’re Better off without EETT. *THE Journal (Technological Horizons In Education)*, 32(10), 56.
\end{itemize}
the small sample and its reliance on individuals involved in a project seeking to improve the utility of EdTech-related work, we acknowledge that participant responses are not representative of the field but may be indicative of perspectives of individuals who have given the relevant issues significant thought.

*Figure 1: Primary Roles of Survey Respondents*

**Semi-Structured Interviews**

**Instrument**
The interview questionnaire focused on research methods, processes, and use of findings; efficacy studies in relation to sales; budgeting for efficacy and research work; and whether or not companies knew if research enhanced sales.

**Sample**
The criteria for interview participants included (1) a company that produced a web-based product and/or application utilized in an academic setting and (2) claims on behalf of the company that they were engaged in research about the effectiveness of the product. Individuals who fit these criteria and who were known to the researchers were contacted. During interviews, “research” was not defined since we wanted to know each company’s conceptualization and approach to research. We identified a range of companies to accurately reflect the instructional EdTech product landscape and talked with two large publishing companies that employ 5,000+ people, four EdTech companies that employ between 100 and 1,000 people, and three EdTech companies that employ 100 or fewer people. We interviewed the most senior person at each company who could talk about efficacy research, budgeting, and sales. In the end, our sample overrepresented large established companies and underrepresented small start-ups.
Findings

Question 1: To what extent do stakeholders view proof of a product’s efficacy as important?
Survey respondents viewed evidence about EdTech product’s educational value as important. However, their responses about the range of reasonable purposes varied.

Overall, survey respondents reported that they valued some evidence of a product’s ability to influence educational outcomes (increased student learning, increased student engagement, improved teacher satisfaction, improved teacher efficiency, increased access to materials). (See Figure 3.) However, researchers and other education-related stakeholders reported viewing this sort of evidence as being far more important than did those in the technology and investment sectors.

Figure 3: Importance of Various Outcomes in Determining Effectiveness, by Primary Role
(10=very important; 1=not at all important)
<table>
<thead>
<tr>
<th>Role</th>
<th>Increased student learning</th>
<th>Increased student engagement in the learning process</th>
<th>Improved teacher satisfaction when using the product</th>
<th>Improved efficiency of teacher time</th>
<th>Increased ease of student access to learning materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Researcher</td>
<td>10.0</td>
<td>8.3</td>
<td>6.9</td>
<td>7.5</td>
<td>7.3</td>
</tr>
<tr>
<td>Higher Education Leader/Faculty</td>
<td>8.5</td>
<td>8.3</td>
<td>6.3</td>
<td>6.0</td>
<td>6.8</td>
</tr>
<tr>
<td>School/District Personnel</td>
<td>6.7</td>
<td>6.7</td>
<td>5.6</td>
<td>5.9</td>
<td>6.0</td>
</tr>
<tr>
<td>Investor</td>
<td>5.5</td>
<td>5.1</td>
<td>4.6</td>
<td>5.1</td>
<td>4.5</td>
</tr>
<tr>
<td>Entrepreneur</td>
<td>4.5</td>
<td>4.8</td>
<td>4.5</td>
<td>4.3</td>
<td>4.1</td>
</tr>
<tr>
<td>Philanthropist</td>
<td>3.4</td>
<td>3.2</td>
<td>2.1</td>
<td>2.7</td>
<td>2.6</td>
</tr>
<tr>
<td>Product Developer</td>
<td>3.1</td>
<td>2.7</td>
<td>2.1</td>
<td>2.3</td>
<td>2.4</td>
</tr>
</tbody>
</table>

It is clear that ‘educators’ or those in the educational establishment—from researchers, to instructors, to administrators—appear much more interested in measurable educational improvements than those more clearly in Ed Tech fields, such as developers and entrepreneurs. This is not at all surprising, but the divide demonstrates dramatically the gap that this symposium is intended to bridge. Educators are under pressure for improved performance from policymakers, parents and taxpayers; Ed Tech participants are a step removed from that pressure. We can assume that most of the latter group hope their instructional products make positive contributions, but realize consumers have the responsibility to make that happen. The relatively low ratings from, in particular, philanthropists and product developers suggest that they prioritize effectiveness research below other factors in their work.

When looking at evidence of market-related outcomes (see Figure 4), there is more agreement across roles: survey respondents in both the education and technology/investment sectors viewed usage rates as being quite important to their decision to move forward with a product.
Figure 4: Importance of Various Factors in Making Investment Decisions, by Primary Role
(10=very important; 1=not at all important)

<table>
<thead>
<tr>
<th>Role</th>
<th>Revenue potential</th>
<th>Usage Rates</th>
<th>Proven Leadership Team</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investor</td>
<td>6.1</td>
<td>6.5</td>
<td>4.9</td>
</tr>
<tr>
<td>Entrepreneur</td>
<td>4.1</td>
<td>5.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Higher Education Leader/Faculty</td>
<td>3.4</td>
<td>7.4</td>
<td>6.1</td>
</tr>
<tr>
<td>Product Developer</td>
<td>3.4</td>
<td>3.4</td>
<td>3.5</td>
</tr>
<tr>
<td>Researcher</td>
<td>2.9</td>
<td>9.0</td>
<td>6.4</td>
</tr>
<tr>
<td>Philanthropist</td>
<td>1.9</td>
<td>3.1</td>
<td>2.8</td>
</tr>
<tr>
<td>School/ District Personnel</td>
<td>1.4</td>
<td>6.8</td>
<td>4.6</td>
</tr>
</tbody>
</table>

The interview data in this area add some additional nuance. The EdTech world respondents do view proof of a product’s contribution to student learning as important. But they have a multitude of reasons and needs for data on learning, indicating that ‘effectiveness’ for them may be a multifaceted measure, including and going beyond student learning to encompass customer satisfaction. The interest in usage rates may illustrate this complex definition; if customers use a product a lot, they are presumably happy with it, even in the absence of definitive evidence about the product’s contribution to learning. Interview respondents’ interest in effectiveness data fell into the following categories:

- First, they want to know how a product is working because they use results data to continue to improve the product. They use embedded assessments; some use external assessments; some even commission external evaluations. But a primary purpose is to make a better product that customers will like.
- They report that customers are more satisfied when they get evidence of positive results. A respondent said, “Keeping good data on student learning lowers customer service costs.” It’s expensive to keep refining products that are not
showing results and also costly to incur greater technical assistance or professional development costs if products disappoint. Several respondents mentioned positive results as important in getting renewals for subscriptions or sales.

- The mention of customer service indicates that keeping a customer happy has many aspects; the better functioning a product is in the eyes of the user, the more the developer or the company benefits as well.
- Most respondents thought that evidence of effectiveness did influence sales but their evidence was mostly anecdotal. One said that the sales force reports back that effectiveness is one of the top two questions buyers have; another was experimenting with revised marketing materials that highlight effectiveness data. A third said “(our) Sales team doesn’t feel like they can comfortably sell without showing academic growth on a third party assessment.” Most would like to gather more concrete evidence on the relationship between data and sales.

**Question 2: What measures matter to stakeholders?**

Data from a variety of sources can be used to measure a product’s effectiveness. Key sources include studies designed specifically to measure a product’s effectiveness, whether designed as randomized-controlled trials or case studies, data on student behavior available from the learning analytics functions of the product itself, and data about student outcomes like grades and test scores available from administrative data systems.

We asked survey respondents for their views on how important measures like these were in determining whether a product was effective, as well as how easy data from such measures was to obtain.

As shown in Figure 5, there is general agreement that data on student engagement from the product’s learning analytics function can play an important role in assessing whether a product works. And, for many stakeholders, the prospect of data about product outcomes from randomized controlled trials (RCTs) is also promising – with the exception of entrepreneurs. Those responsible for funding products (philanthropists, investors, and entrepreneurs) view data from case studies as being nearly as useful to them as data from RCTs or data about student engagement, while educators and product developers do not view case studies as being as important a source of data.
Figure 5: Measures Viewed by Relative Importance for Assessing Efficacy, by Role
(10=very important; 1=not at all important)

<table>
<thead>
<tr>
<th></th>
<th>Data from RCTs about Product Outcomes</th>
<th>Data on Student Engagement from Product Analytics</th>
<th>Academic Performance Data from Administrative Systems</th>
<th>Data from Case Studies about Product Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educators (K12, Higher Ed, Researchers)</td>
<td>6.6</td>
<td>6.8</td>
<td>5.4</td>
<td>5.5</td>
</tr>
<tr>
<td>Product Developers</td>
<td>7.4</td>
<td>6.0</td>
<td>5.9</td>
<td>4.8</td>
</tr>
<tr>
<td>Entrepreneurs</td>
<td>4.6</td>
<td>7.5</td>
<td>5.8</td>
<td>6.6</td>
</tr>
<tr>
<td>Investors</td>
<td>7.6</td>
<td>7.7</td>
<td>5.6</td>
<td>7.0</td>
</tr>
<tr>
<td>Philanthropists</td>
<td>8.2</td>
<td>7.7</td>
<td>6.4</td>
<td>7.2</td>
</tr>
</tbody>
</table>

Figure 6 indicates the types of measures from which stakeholders report that data is easily available to them when assessing a product's effectiveness. Data from a product's learning analytics function, from administrative data systems, and from case studies is seen by most to be relatively easily available to most stakeholders. All stakeholders report that getting data from RCTs is relatively difficult.

Figure 6: Measures Viewed by Relative Ease for Assessing Efficacy, by Role
(10=very easy; 1=not at all easy)

<table>
<thead>
<tr>
<th></th>
<th>Data from RCTs about Product Outcomes</th>
<th>Data on Student Engagement from Product Analytics</th>
<th>Academic Performance Data from Administrative Systems</th>
<th>Data from Case Studies about Product Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educators (K12, Higher Ed, Researchers)</td>
<td>3.6</td>
<td>5.6</td>
<td>6.2</td>
<td>5.7</td>
</tr>
<tr>
<td>Product Developers</td>
<td>4.3</td>
<td>5.6</td>
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<td>5.9</td>
</tr>
<tr>
<td>Entrepreneurs</td>
<td>2.4</td>
<td>5.7</td>
<td>4.6</td>
<td>5.9</td>
</tr>
<tr>
<td>Investors</td>
<td>4.0</td>
<td>6.2</td>
<td>6.4</td>
<td>8.0</td>
</tr>
<tr>
<td>Philanthropists</td>
<td>3.3</td>
<td>6.6</td>
<td>6.0</td>
<td>5.9</td>
</tr>
</tbody>
</table>
Figure 7 illustrates the relationship between these two sets of reports (with red indicating a large difference between how important stakeholders view data from these measures to be in comparison to how easy they think they are to access).

**Figure 7: Difference between Relative Ease and Relative Importance of Product Information**

<table>
<thead>
<tr>
<th></th>
<th>Data from RCTs about Product Outcomes</th>
<th>Data on Student Engagement from Product Analytics</th>
<th>Academic Performance Data from Administrative Systems</th>
<th>Data from Case Studies about Product Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educators (K12, Higher Ed, Researchers)</td>
<td>3.0</td>
<td>1.2</td>
<td>-0.8</td>
<td>-0.2</td>
</tr>
<tr>
<td>Product Developers</td>
<td>3.1</td>
<td>0.5</td>
<td>-0.6</td>
<td>-1.1</td>
</tr>
<tr>
<td>Entrepreneurs</td>
<td>2.2</td>
<td>1.8</td>
<td>1.2</td>
<td>0.7</td>
</tr>
<tr>
<td>Investors</td>
<td>3.6</td>
<td>1.5</td>
<td>-0.8</td>
<td>-1.0</td>
</tr>
<tr>
<td>Philanthropists</td>
<td>4.9</td>
<td>1.1</td>
<td>0.4</td>
<td>1.3</td>
</tr>
</tbody>
</table>

The interviews added further explanation and nuance to the survey's findings.

- Interviewees suggested, for example, that RCTs were not only difficult and expensive to conduct, but also that they were not necessarily as ideal for the desired purpose as researchers might assume: testing these products in a vacuum, outside of the “real world” context in which they would ultimately be used counteracted such studies’ upside in demonstrating educational value (more data/quotes to be added here).
- Further, the interviewees were not sure the consumers sufficiently distinguish between more and less definitive research. Not only were they likely to be interested in testimonials from other users (preferably known ones), but they care about the experience of users most like them, even if it’s only in descriptive form.
- A number of respondents complained that others in the field misused research, claiming more rigor and generalizability than their data permitted. The customers are not sophisticated enough to distinguish, so our “competitors use little rigor and claim results.” Said another, “I am really dismayed by my broader group of colleagues who are either not championing quality research/efficacy studies to support products and/or are misleading the public to drive sales.”

Thus, the survey and interview data suggest two broad ways in which evidence about a product’s effectiveness might be improved: the education community (including researchers and practitioners) might work to help the technology and investment communities understand why educational researchers place such a heavy value on more
strenuous, expensive methods, and the technology and investment communities might work to help educators understand the reasons that they attribute value to evidence collected through other methodologies.

**Question 3: Whose research speaks the loudest?**

Our data suggests that individuals stakeholder groups value data that is provided by members of the same stakeholder group. For example, researchers trusted other researcher organizations when looking for reliable information (See Figure 8).

- Members of the educational community overwhelmingly value traditional “academic” research in their decision-making. However, it is expensive and not always available, and members of the technology and investment communities do not value it as highly and are thus less incentivized to fund or otherwise support it.
- Our survey revealed that people most trust evidence that is generated by someone like them—researchers want to see work done by other researchers; schools value evidence from other schools
- However, it is also clear from Figure 8 that investors and developers differ a bit. Developers are happy with information they provide internally, or with external research. But investors and entrepreneurs are comparatively more interested in the schools’ data; they care predominantly about the user experience (and about existing or potential sales). This finding reinforces a strategy many who care about efficacy endorse: working on the demand end to improve interest in and sophistication about research.

The interview respondents generally supported the idea of third party, researcher-led evaluations, and a number had commissioned them. But they did note the expense, and even though they had funding in their budgets for research, lacking evidence of definitive impact on sales and appreciating the willingness of buyers to take word of mouth about as seriously as data, increasing research spending could be challenging.
Figure 8: Reliable Information Sources by Role

- Red: The vendor/developer
- Yellow: Research/research organizations
- Green: Schools
- Blue: The press
- Purple: Other

Limitations
This project was exploratory in nature and has a number of limitations. Participants in both the surveys and the interviews were chosen via a convenience sample of individuals already interested in this topic and thus are likely to be demonstrate more prior thought in the area and perhaps different responses than the relevant population. Further, the instruments were developed for the purpose of this exploratory study.

Implications & Suggestions for Further Work
Digital Promise suggests that guidelines and examples are needed to help companies develop and evaluate research-based products, and to educate consumers so they make better decisions. That is true, but standards are hard to interpret by those untrained in research and we should also explore interpersonal efforts to bring research and practice together in the name of EdTech effectiveness.

Bridging the gap between research and practice in the field of EdTech effectiveness requires working on several fronts:

- Researchers need to clarify the costs and benefits of various research approaches. They should clarify the contributions of effectiveness studies (qualitative, close up studies of products in use in varied contexts) as well as of definitive efficacy studies (large scale trials aimed at definitive statements of a product’s value added); use mixed methods; and produce reports that address various items of concern to users (such as ease of use) along with results data.

- Schools and districts would benefit from having resident experts or available consultants who can liaise between researchers and developers to identify what would be useful and effective given a school’s curriculum objective and other contextual factors. Such experts would also help with responsible use of federal funds for EdTech. Currently, schools are spending the majority of their funding on hardware with little consideration of software and classroom-level support for implementation of software.

- Investors and philanthropists should direct early investments – especially for younger companies – toward determining educational value before product development. After reliable evidence on potential effectiveness through pilots, funders can then explore whether or not the product warrants additional funding for development and implementation. In general, funders should invest in mission driven companies that value efficacy research.

- Buyers, investors and philanthropists should raise critical questions about evaluations: Who conducts them? How valid are the inferences? How generalizable are the figures? In addition, they can partner with universities to help sort through various claims.

- All groups should undertake educational efforts, through product materials and sales as well as through testimonials and research reports, to inform on the merits
of various research approaches. What can you learn from a case study? From a large-scale trial? What questions should buyers ask?
Endnotes


