ASPIRATIONAL PRINCIPLES FOR DESIRED CAPABILITIES AND RESEARCH COLLABORATIONS IN THE EDTECH INDUSTRY

Natalia I. Kucirkova, Hee Jin Bang and Ekaterina Cooper

2024

Suggested citation:
Kucirkova, Bang, & Cooper (2024). Aspirational principles for desired capabilities and research collaborations in the EdTech industry, WiKIT AS,
DOI: 10.13140/RG.2.2.36296.33284/1

Note: Any errors or omissions found subsequent to printing will be corrected in the online version available at : www.wikit.no

Formatted by: Rida Babar.

EXECUTIVE SUMMARY

This report highlights essential principles for intentionally designing EdTech to achieve efficacy and effectiveness, with the goal of improving students' outcomes in learning, social interaction, and overall well-being.

Key principles across three pivotal stages of EdTech growth are outlined:

1. technology design and development
2. implementation and scaling, and
3. validation or experimental evaluation.

Stage 1 requires Edtech's co-creation with teachers and students, while developing and incorporating validated impact metrics into a logic model and theory of change that are based on researched assumptions.

Stage 2 recognizes the cyclical nature of EdTech implementation that necessitates continuous adjustment of initial assumptions, starting with a comprehensive problem analysis that involves engagement and communication with multiple stakeholders to establish the implementation conditions, infrastructure, and fidelity for evaluating EdTech's efficacy and effectiveness in diverse educational contexts.

Stage 3 involves qualified professionals to evaluate outcomes and facilitate robust analysis of impact through correlations and causal links between EdTech's use and its impact on outcomes.

The application of the three principles for capacity building in EdTech is illustrated through a practical example: Age of Learning's integration of efficacy and effectiveness research into curriculum and product development; user design and evaluation research; and marketing and communication efforts.

Introduction

The pandemic disrupted schooling for students around the world. In 2022, when the OECD released the results for the Programme for International Student Assessment (PISA), which measures what 15-year-olds know in mathematics, reading, and science, results indicated a record drop of around half a year to three-quarters of a year of learning (OECD, 2023). There is an urgent need to address this learning loss, and education technology (EdTech) can be leveraged to support accelerated learning for learners with diverse needs across different contexts. EdTech creators, investors, and researchers have a crucial responsibility of ensuring that EdTech solutions adopted for use have positive impact on learners, which necessarily means ensuring that the solutions are grounded in robust research and evidence. Drawing upon both academic literature and practical industry experience, this report presents four aspirational principles to drive the practice of impactful and evidence-based EdTech.

In this report, we define “impactful” as harnessing the potential of EdTech's extensive reach to positively influence millions who are grappling with teacher shortages, learning gaps, and limited access to quality resources and personalised feedback.

“Evidence-based” EdTech refers to solutions supported by robust research demonstrating their ability to enhance students’ outcomes across learning, social, and well-being domains. We focus specifically on effectiveness (evidence that an EdTech works in real-life settings as measured through empirical studies) and efficacy (evidence that an EdTech works in highly controlled settings as measured through experimental studies).

The insights presented in this report are intended for EdTech researchers, providers, designers, and developers, as well as for EdTech leadership teams and decision-makers who play a critical role in developing and scaling EdTech solutions with a meaningful impact. Positive change and implementing a research culture are challenging to achieve without a research mindset throughout the organisation (Moeini, 2020). It is, therefore, necessary for all stakeholders to have a nuanced understanding of the collaborative efforts required between researchers and practitioners to drive meaningful impact in developing, integrating, and scaling EdTech. In particular, it is vital for them to understand the balancing of innovative solutions with rigorous evidence of EdTech's effectiveness and efficacy.

This report builds on international efforts to initiate a shift towards data-driven evidence of effective EdTech practices, urging governments and procurement teams to carefully evaluate the evidence before acquiring or implementing an EdTech tool.

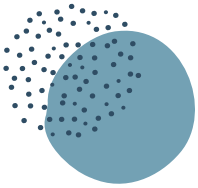
Thus far, many EdTech developments have prioritised feasibility and usability over empirical studies, partly because of the investment in resources required for the different types of studies and partly because of the research capabilities required in executing them to a high standard. While feasibility studies are key to ensuring the EdTech product can be implemented as intended, it is efficacy and effectiveness studies that can elucidate which EdTech approaches work, for whom, and under what conditions. By obtaining and openly communicating this information, EdTech creators contribute to the transparency of the Edtech ecosystem and allow educators to make informed decisions about which technologies to use in the classroom.

Brief definition of scope

Definition of EdTech in this report

Educational Technology (EdTech) encompasses a diverse range of offerings, falling into two primary categories: services and products. Products such as digital devices and educational software applications encompass individual, tangible items designed to enhance learning. Services are platforms like learning management systems and collaborative communication tools, facilitating various aspects of educational delivery. These categories can be further divided into hardware and software solutions.

This report focuses on products and services that were explicitly designed with the intention to support learning and teaching in PK-12 (e.g., online libraries, learning experience platforms). With the growing trend of incorporating generative AI into new EdTech models and an increasing number of EdTech tools integrating AI, the focus on evidence is even more crucial in designing EdTech for positive impact on learners.



Definitions of Effectiveness and Efficacy

While conventional notions in the medical sciences have often regarded quantifiable and experimental effects as the paramount standard of evidence, alternative research paradigms have recently emerged as more appropriate for the education field. Rooted in integrated levels of evidence models that transcend single disciplines (e.g., education, psychology, or engineering), interdisciplinary EdTech research incorporates qualitative, quantitative, and mixed-method approaches. Such holistic evidence models recognise the multifaceted nature of the educational impact and are the preferred framework for EdTech evaluations (Kucirkova, Brod & Gaab, 2023). By acknowledging the nuanced interplay among diverse forms of evidence, these models align with our objective of EdTech driving impactful educational outcomes with effectiveness and efficacy by design.

Effectiveness assesses impact in real-world conditions, typically without a control group and with greater attention to qualitative data, whereas efficacy pertains to controlled conditions, typically with a prevalence of quantitative measurements of change over time or comparisons between groups. Adapted from Singal, Higgins, and Waljee (2014), efficacy pertains to the intervention's performance in ideal and controlled conditions, while effectiveness refers to its performance in real-world settings. In this report, we build on the importance of the weight of evidence, or rigour, in delineating the quality of effectiveness and efficacy studies, as proposed by Kucirkova, Lindroos, and Vackova (2024). This involves paying attention to factors such as internal and external validity of qualitative and quantitative studies, including aspects such as the eligibility criteria for enrolling participants in an intervention study, or the participants' potential to influence the intervention, and the relevant statistical tests undertaken by the researchers.

Our focus on efficacy is compatible with the idea of EdTech companies building a diverse array of evidence, forming an "evidence portfolio," comprised of studies encompassing transparent reviews from teachers, various national certifications, and usability insights from testing in classrooms. The focus on efficacy is also compatible with recent initiatives in learning experience design (LXD) and learning engineering.

Definition of Learning Experience Design (LXD):

"Situated at the crossroads of learner-centred design and UXD, the term LXD can be used to describe design practice, design product, or a discrete field of study. It is concerned with both the effectiveness of designed learning interventions and the interconnected and interdependent relationship between the learner-as-user, the designed intervention, and the learning context" (Schmidt & Huang, 2022, p.143).

Learning engineering is concerned with the human-centred design of EdTech and the relationality required for effective design.

Best practices in efficacy interventions must be embedded into the relationship between a learner, the designed intervention, and the learning context.

Learning engineering is also related to the notion of partnership. It is defined as :

"a partnership between technologists, researchers, and educators to use big data in order to better understand the learning process, develop more effective interventions, and drive evidence-based product innovation" (https://tools-competition.org/your-learning-engineering-plan/).

LXD, learning engineering, and the broader field of EdTech evidence need well-structured, documented, empirical evidence demonstrating positive impact on learners. However, the essential characteristics and optimal practices necessary to effectively guide efforts toward well-documented efficacy or effectiveness of desired learning processes or outcomes have not been clearly defined.

In what follows, we'd like to outline suggested principles for embedding efficacy and effectiveness into EdTech growth. We divide the principles according to three critical stages of EdTech growth:

1) the design or development of the technology;
2) the implementation and scaling of the technology, and
3) the validation or experimental evaluation of an EdTech.

Stage 1: Design of the technology

Four major EdTech quality evaluation frameworks (AERO, ESSA, Nesta, and EEF) recommend a theory of change and logic model as the foundational first step in an EdTech's growth (see Kucirkova, Campbell & Lindross Cermakova, 2023). Most EdTech testbeds (public-private partnerships between schools and the EdTech industry), accelerators, and incubators also recommend a theory of change as a key step in the first stage of an EdTech's development.

A theory of change underscores the importance of building a company's foundation on research-based content and pedagogical principles. It aims to answer the question: If X happens, what is the impact on Y? It outlines the intended impact on learning outcomes and articulates the underlying assumptions driving the vision of Edtech. The logic model also translates the "why" into a concrete "how." It presents a visual flow chart, mapping the journey from input (e.g., content), to activities (e.g., teacher training), to desired outcomes (e.g., improved lesson plans, demonstrably better learning results). By leveraging both tools, EdTech can ensure strategic alignment, a clear path to action, and a greater likelihood of achieving impactful educational change.

Both the logic model and theory of change must be based on research-based assumptions to fulfil the criteria of EdTech evaluation frameworks. In other words, the assumptions embedded in the flow of effects modelled in the logic model and theory of change need to be supported by published, peer-reviewed studies.

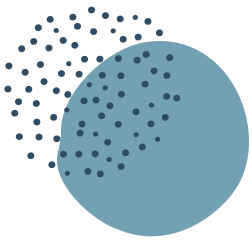
For a logic model and theory of change to feed into a design that can be tested experimentally, some impact metrics must be embedded in the model. To identify these metrics, the estimated inputs-to-outcomes need to be verified considering published research and a thorough review of products. This process requires the expertise of, and collaboration with, qualified (e.g. PhD- trained) researchers who can propose impact metrics that match the specific context (e.g., the use of a reading app in a Canadian Grade 1 classroom) and evaluated for their plausibility of yielding a meaningful change (e.g., measurable, and statistically significant impact on students' reading scores).

A research-based theory of change is also important in determining a company's data collection priorities. Establishing relevant impact metrics is essential in an EdTech company's targeted data infrastructure. Research-based impact metrics need to be matched with the company's data collection plans so that data collected from users can be used for meaningful measures of impact over time.

In addition, a robust theory of change rooted in a literature-based logic model can also specify the kind of research and subject matter expertise that are needed. Throughout a product's lifecycle, experts who can advise on research-based product development, testing, scaling, and validation can add significant value through their recommendations so that the EdTech company can effectively cater to users' learning and educational needs. In the first product development stage, diverse expertise from multiple experts is essential for a robust design that can be tested for its efficacy on a continuous basis.

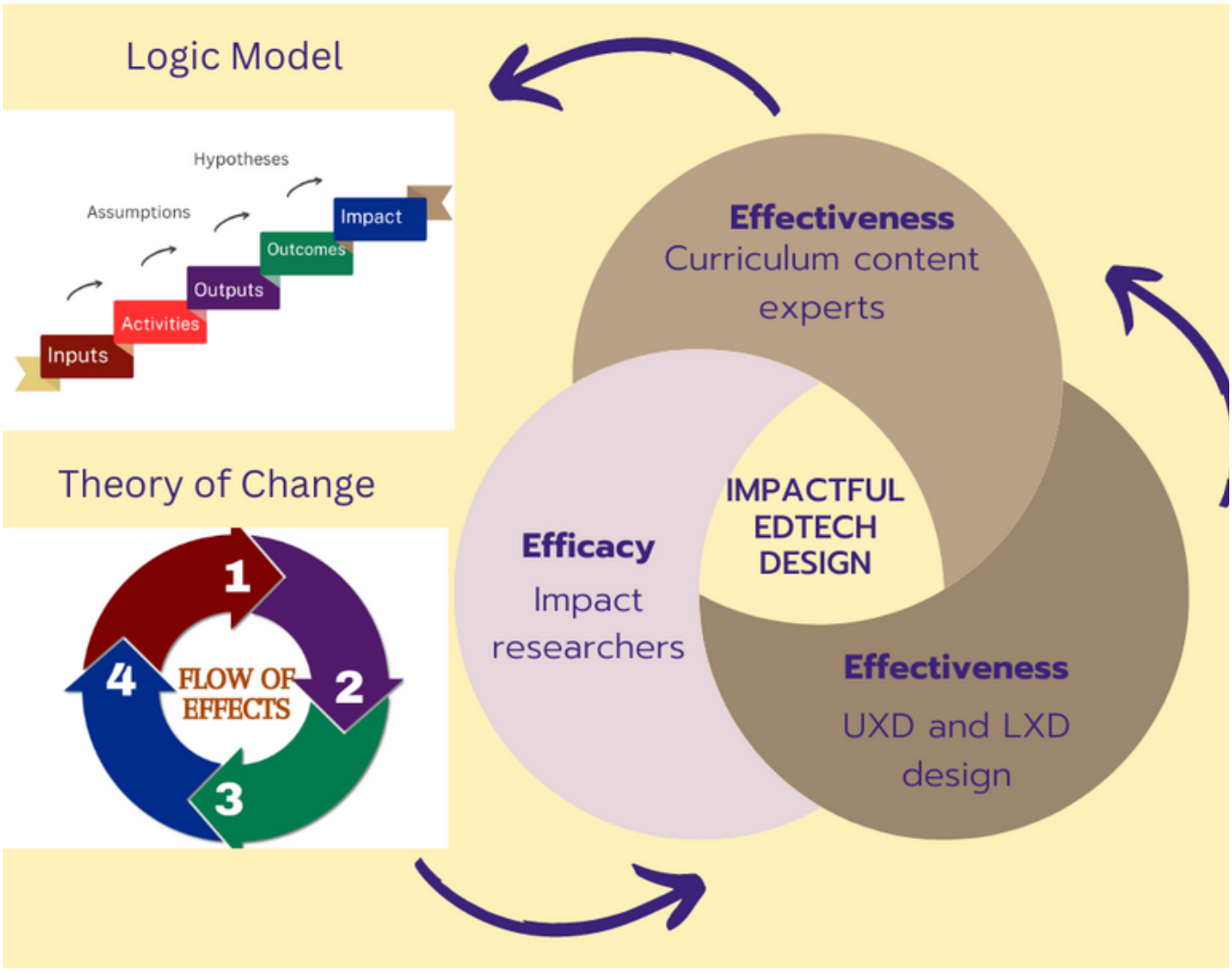
Experts across the areas of UXD, LXD, curriculum, and educational research can advise on how a product interface and content should be designed to align with the principles of learning sciences (Hirsh-Pasek et al., 2015) and research on human development. The learning science principles should be operationalised with the skills or knowledge areas an EdTech aims to target. Subject matter experts and qualified researchers can ensure that the content-related design principles align with the learner's developmental and learning progress (e.g., cognitive maturity level, motor skills) and specific subject imperatives (e.g., cognitive load for a given task). Facilitated workshops with key stakeholders can help identify the root causes for effective or ineffective implementation, and such analysis should be informed by systematic observations and data-driven insights.

A thorough literature analysis may reveal several factors for the varying degrees of effective implementation, such as limited buy-in from educators (e.g., low teacher motivation to incorporate technology in the classroom) or structural factors (e.g., inadequate internet access in the target location). By synthesising existing research findings, EdTech providers can carry out a research-based problem analysis that yields a holistic picture of the conditions and limitations for implementation and effective strategies for addressing them. The results of a problem analysis should be cross-checked and refined through dialogue with key stakeholders involved in the implementation.



In sum, the logic model, the theory of change, and the experts providing content-related recommendations should be activated in the first stage of an EdTech company's growth, as visualised in Figure 1. It is also crucial to engage in co-creation with teachers and students, who are key users of EdTech. This collaboration can be facilitated through various testbeds or arrangements where researchers and educators collaborate to co-develop and evaluate EdTech innovations within authentic environments. These 'testbeds' provide valuable opportunities for trialling emerging education technologies.

Figure 1: First principle for effective and efficacious EdTech at the product design stage



2. IMPLEMENTATION and SCALING

The implementation of EdTech solutions is rarely a linear process with clear beginnings and endings. Typically, the process has a cyclical and iterative nature, where established practices of educational context influence the use of EdTech solutions. Throughout this ongoing dynamic adoption, the initial assumptions about how the solution will achieve its desired learning outcomes undergo constant adjustments, leading to the development of a fluid, adaptive "theory of change" (Green & Ziegler, 2023).

To establish and support the conditions and infrastructure for effective implementation, studies must be conducted to determine contextual variability along with the barriers and enablers for effective implementation. Intervention research typically performs this through several qualitative and smaller-scale quantitative studies. According to the Centre for Evidence and Implementation (https://www.ceiglobal.org/), implementation can be divided into four stages:

- **Problem analysis**
- **Stakeholder engagement**
- **Identifying and planning for the required implementation resources and capabilities**
- **Establishing robust mechanisms for monitoring and course correction**

Problem analysis involves identifying challenges and obstacles that may hinder successful integration. It requires understanding the educational context, organisational structure, and specific needs of educators and learners. This process evaluates technology infrastructure, accessibility, teacher training, and student engagement to develop targeted strategies and solutions. A comprehensive problem analysis ensures effective and sustainable EdTech implementation that is aligned with enhancing teaching and learning experiences.

Conducting problem analysis involves identifying the root causes for effective and ineffective implementation. Such an analysis should be informed by a systematic literature review examining studies conducted in similar contexts to identify impeding factors (e.g., lack of motivation to use technology, limited internet service).

A synthesis of existing research findings and a research-based problem analysis can lead to a holistic understanding of implementation conditions and limitations and effective strategies for addressing them. The results of a problem analysis should again be cross-checked and refined through ongoing dialogue with key stakeholders involved in an EdTech's implementation.

Effective communication is a critical aspect of implementing EdTech solutions in classrooms. It helps to ensure consistency and adherence to standards and procedures. This consistency is essential to achieve fidelity in the intervention.

Fidelity is the extent to which the EdTech solution is implemented as intended and in accordance with best practices. Continuing dialogue between all stakeholders involved in the implementation process is essential to guarantee that the implementation and adoption process is consistent across different contexts (McKenna, Flower, & Ciullo, 2014). Fidelity of implementation is important because it ensures that the EdTech solution is used consistently and accurately. It also allows for meaningful comparisons across different contexts, which is crucial for evaluating the effectiveness of the EdTech solution over time, particularly in relation to replication studies. Fidelity is also necessary for maintaining the rigour of the intervention. When the technology is used in the same way across different contexts, it is possible to draw valid, reliable conclusions about its effectiveness.

Finally, ensuring fidelity requires a shared commitment from both educators and EdTech creators. Educators play a pivotal role by actively engaging with the solution in their classrooms. Simultaneously, EdTech creators are responsible for providing clear implementation guidelines, ongoing professional development, and research-backed best practices to empower educators to achieve fidelity.

Effective stakeholder engagement involves examining attitudes and perceptions, typically through in-depth qualitative studies and interviews. It also consists of using empowering techniques so that the stakeholders feel motivated to contribute and perceive a certain ownership of the proposed intervention. Also important is gathering insights about the context, or local conditions, of implementation through interviews or surveys of users or through reviews of official policy documents that may include commissioned research or direct observations. A thorough analysis of gathered data can feed into monitoring and evaluation (M&E) impact metrics.

Monitoring and evaluation metrics

Establishing robust mechanisms for monitoring and course correction is crucial in all contexts. This process hinges on being data-based, where each indicator is reported at a specified frequency, and the data source is clearly indicated. The EdTech Hub offers an example of monitoring and evaluating an EdTech intervention in Pakistan (Khalayleh et al., 2021), with a tabular example of which milestones and M&E metrics are expected at different stages of an intervention. The example illustrates the importance of systematic data collection and reporting to ensure not only ongoing evaluation, but also course correction strategies.

It is helpful to think of monitoring and evaluation tools in education using the principles known as the 4Rs: relevance, reliability, regularity, and responsiveness*.

The 4Rs were suggested for quality assessments in schools by Pooja Nagpal, 2023 and are adopted here for a M&E procedure.: https://www.centralsquarefoundation.org/blogs/first-principles-for-foundational-literacy-and-numeracy-assessments

Relevance ensures that data are collected as part of M&E practices and measure relevant outcomes, including essential skills and knowledge areas, as well as creative and socio-emotional competencies that underpin further learning and growth.

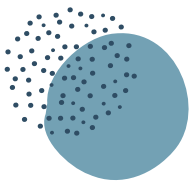
Reliability ensures that reported data are trustworthy and have undergone rigorous scrutiny. Reliable metrics maintain the integrity of the data and enable researchers to draw sound conclusions from impact reports.

Regularity involves conducting data requests at routine intervals to track learning trajectories, and to evaluate learners' and teachers' progress. Regular M&E metrics provide valuable insights into students' progress and facilitate early identification of learning gaps.

Responsiveness entails creating an agile, dynamic monitoring system that continuously improves based on feedback. This principle emphasises the importance of proactive adaptation and improvement to benefit learners, ensuring that the monitoring system not only provides real-time information and feedback, but is also responsive to learners' and teachers' evolving needs.

3. VALIDATION STAGE

In efficacy studies, an impactful implementation of EdTech is one where the use of the EdTech leads to measurable, positive, and meaningful impacts on users. To validate this assumption, qualified researchers need to create an intervention plan, determine participants' eligibility criteria, create an experimental protocol, and set up a data collection process or engine. While these elements are shared across interventions, their individual character varies depending on the exact purpose and context of each intervention design.



For example, a typical intervention plan specifies the eligibility criteria of the targeted participants based on the theory of change established in Stage 1, along with the typical usage patterns supplied by the EdTech company's internal insights. Within-subject or between-subject experimental designs have different internal and external validity, and the choice should be decided based on the specific design of the EdTech tool to be tested, available resources (e.g., time, personnel), and the company's expectations regarding the envisaged impact of a validation study.

The methodological approach to an intervention varies from case to case and requires a close match with the factors established in the implementation and scaling phases. For example, the design of an intervention needs to consider the barriers and enabling factors for implementation or scaling identified in Stage 2.

Researchers engaged in designing interventions typically prioritise suggested approaches based on their feasibility and acceptability within a specific context, considering the envisioned impact measurements. This process involves synthesising insights from relevant literature on intervention factors supported by strong evidence for the intended context and outcome measures. Often, a balance must be struck between the intended impact and what can feasibly be measured.

Given the variable validity and quality of outcome measurement instruments in education (Albarqouni et al., 2018), adjustments to outcome measures may be necessary to align with a given context. Statisticians can provide guidance on selecting the most appropriate approach, considering desired effect sizes and measurement methods. Ultimately, these deliberations on trade-offs and compromises contribute to shaping the intervention design.

For instance, in a country grappling with severe teacher shortages, the intervention might necessitate implementation by EdTech-trained facilitators instead of traditional educators. While this adjustment potentially diminishes ecological validity by veering from the scenario where interventions are executed by teachers, it ensures consistent testing of students' outcomes by proficient, certified professionals. Consequently, statisticians can establish correlations between the measured input (EdTech utilization) and the resulting output (impact on outcomes), facilitating a more robust analysis of the intervention's efficacy.

DESIRED CAPABILITIES IN THE EDTECH INDUSTRY FOR SCALING AND EVALUATING EDTECH

Research should be an integral part of any EdTech solution, as it is central to informed decision-making related to the product lifecycle.

Ongoing research not only provides a real-time understanding of learners' needs and demands of the educational context, but it also enables the EdTech creators to be agile, adaptive, and responsive.

To conduct continuous research, robust systems must be in place. This involves collecting data and implementing structured processes to analyse and obtain actionable insights from the data. The results of these efforts should contribute to a dynamic feedback loop, guiding iterative improvements in product strategies.

For an EdTech company to grow, research should remain at the forefront, as it facilitates ongoing effectiveness and efficacy throughout all three stages. To achieve the sustainable success of an EdTech solution, various teams within the EdTech company must be involved to connect to different aspects of such research and its integration into the EdTech growth cycle. For each stage, the best practice recommendation is to involve qualified researchers who are independent of the company's research or product teams, to continuously support and augment the company's research capabilities.

Different teams within an EdTech organisation play crucial roles at different stages, supporting collaboration with researchers focusing on impact and ensuring efficacy of the EdTech product. One example of an EdTech organisation that has adopted effectiveness and efficacy as one of its core pillars of product and business development is Age of Learning, Inc (www.ageoflearning.com). We use this example given our familiarity with the internal processes and the need to illustrate the often abstract suggestions concerning desired research practices in EdTech.

To ensure the efficacy of an EdTech solution, considerations for what will lead to learning must start at the initial ideation and development phase of the product or service (Figure 2). At this stage, the Age of Learning team of educators, curriculum specialists, and child development researchers collaborate to investigate the existing literature on pedagogical approaches for helping learners acquire specific skills and the effectiveness of those approaches.

Using efficacy as the north star, the team seeks to understand the most effective approaches to producing learning outcomes. Lessons learned at this stage of product development at Age of Learning informs the next phase, the designing and building phase, in which product designers work closely with LXD and UXD researchers, using existing evidence of what has been effective in helping learners acquire the target skills.

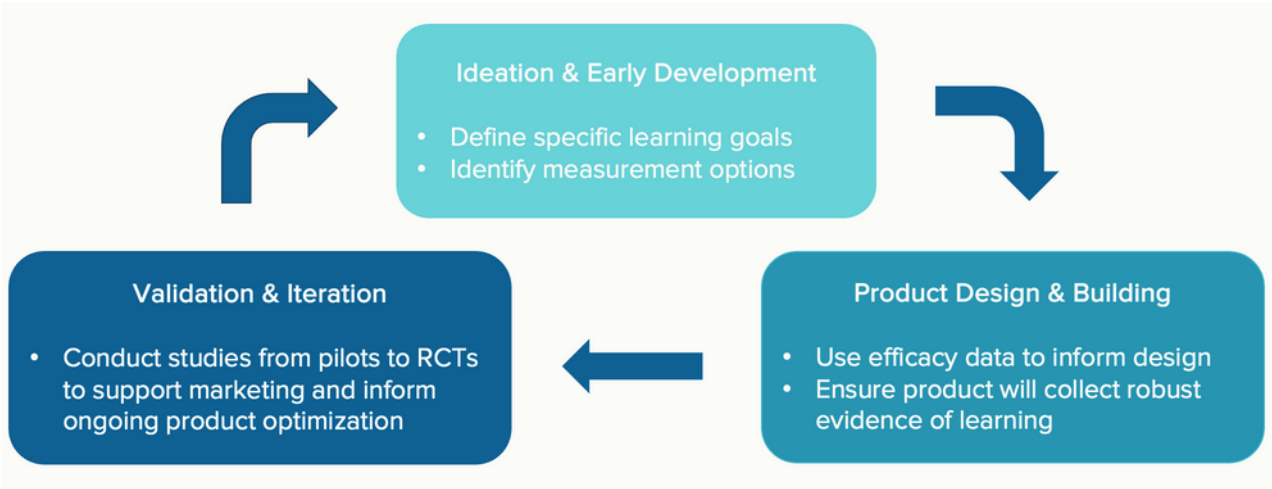


Figure 2: Illustration of the product development process at Age of Learning.

Product designers hypothesise specific learning features or experiences that they believe will support learners in their journey to gain specific skills. These hypothesised products are then tested with target users as a team of LXD and UXD researchers at Age of Learning pose questions to better understand how users are experiencing the EdTech solution and why they use it. The insights gathered through these testing sessions are validated with multiple users, and they enable the curriculum designers and product developers to make decisions that will maximise the chances that Age of Learning programs will produce the intended learning outcomes. During the building phase, EdTech developers should consider the evidence that needs to be collected to demonstrate the effectiveness of the product or solution.

At Age of Learning, for example, Evidence Centred Design approach was adopted to embed assessments in contexts of educational games, with emphasis on aligning target knowledge, skills, or abilities, with desired evidence and in-game assessment tasks designed to elicit such data.

Once the EdTech solution is released for mass use, it transitions into the validation and iteration phase: validation in the market and iteration based on real-world user experience. The customer success and sales teams can be leveraged to identify users who can partner with the EdTech solution provider for implementation and research on effective implementation strategies. Some EdTech companies have established agreements with research partners, who support the company in formative research, product refinement, or design of an evaluation study. Some also work with educational professionals and practitioners, such as former teachers, who provide valuable insights and practical perspectives on design and usability of products. At Age of Learning, the customer success managers and sales managers work closely with the research teams to establish the relationships needed for successful implementation and efficacy research. This involves putting in place data sharing and data privacy agreements, obtaining research approvals and informed consent, and determining the responsibilities of each party to ensure the fidelity of program implementation. The research teams then create the study design, collect data, conduct analyses, and share the findings with relevant stakeholders.

During this validation and iteration stage, collaboration between teams with different insights into implementation is essential. For example, the customer success managers can provide valuable information about the context of implementation, such as level of educator buy-in, specific challenges affecting a school or a district, or degree of interest from families or caregivers. The customer success team at Age of Learning regularly provides such information to the research and data teams to facilitate and support the interpretation of the analytics data that are being generated as students and educators use specific EdTech solutions. The information about implementation context also enhances and supplements interpretation of external assessment data that may be linked to EdTech usage data as research teams conduct analyses to illustrate the relationship between the two.

Researchers experienced in impact measures are indispensable in evaluating the EdTech's potential impact on learning outcomes and advising on scalability. Results interpreted in the context of information about implementation are valuable for supporting marketing teams as they seek to expand implementation across various contexts. They are also valuable for shaping product development of an existing EdTech solution or the creation of new features or product lines. At Age of Learning, the efficacy research team works closely with the communications and marketing teams to ensure that claims made about the efficacy of its EdTech solutions are not only accurate and supported by research evidence, but also easily comprehensible by a broad audience. The efficacy research team also supports the product and curriculum teams by sharing lessons about the aspects of the EdTech implementation that were successful, aspects that could have been more successful, as well as information about the degree of EdTech efficacy for different subgroups, under specific circumstances and settings. These lessons support product and curriculum designers' prioritisation of their work, for example, by indicating the urgent need for additional content that can support learners who come in with very little knowledge, or the need to adjust specific aspects of the EdTech experience to facilitate implementation.

The capabilities of the EdTech company's internal staff will ideally be complemented by that of external researchers. Even in EdTech organisations that have the internal capacity to conduct the range of research needed to maximise the product's effectiveness and efficacy, it is important for these organisations to work with independent, third-party researchers, who can provide an objective perspective. Age of Learning has partnered with researchers at WestEd, SRI International, LearnPlatform by Instructure, among others, to understand the effectiveness of its programs. Partnerships with such third-party researchers is especially valuable when seeking to evaluate the effectiveness or efficacy of an EdTech solution, as they bring greater credibility to the research than that conducted by the company's internal staff.

Conclusion

In an EdTech company's solid evidence portfolio, there is room for participatory research approaches that involve multiple educational stakeholders, including students, as well as rigorous efficacy studies. While learning, social, and community impacts are often associated with social enterprises and impact-linked funds, these metrics are underutilised in EdTech financing. Through focused attention towards strengthening research expertise at various stages in growing impactful EdTech organisations, the field can nurture a more nuanced understanding of evidence-based technologies and foster cross-pollination of research expertise both internal and external to the company. Ultimately, this will increase the chances that educators have tools at their disposal to help accelerate student learning, address individual learner needs, and close the gap in learning opportunities.

Achieving this aspiration is not easy. While some companies opt for maximising resources for a randomised controlled trial, this narrow approach may yield less than optimal outcomes if implemented at the wrong stage of a company's development, potentially hindering growth due to resource intensity. The necessity for continuous external research collaborations with EdTech companies and independent research partners cannot be overstated. Transparent documentation, specifically requiring evidence of efficacy and effectiveness, is crucial. We urge EdTech funders and investors to prioritise funding for capacity building in EdTech research on efficacy and effectiveness, making it a standard practice embedded in all EdTech organisations focused on enhancing learning outcomes.

References

Albarqouni, L., Hoffmann, T., & Glasziou, P. (2018). Evidence-based practice educational intervention studies: a systematic review of what is taught and how it is measured. BMC Medical Education, 18(1), 1-8.

Hirsh-Pasek, K., Zosh, J. M., Golinkoff, R. M., Gray, J. H., Robb, M. B., & Kaufman, J. (2015). Putting education in "educational" apps: Lessons from the science of learning. Psychological Science in the Public Interest, 16(1), 3-34.

Khalayleh, A., Baloch, I., Dele-Ajayi, O., and Kaye, T. (2021). A Monitoring and Evaluation Framework for Blended Learning: Pakistan Ministry of Federal Education and Professional Training. [Working Paper]. 10.5281/zenodo.4633326. Available at https://docs.edtechhub.org/lib/XBPZPS3P.

Kucirkova, N., Campbell, J., Lindroos Cermakova, A. (2023). EdTech Impact Evaluation Frameworks: Summary 2023, Report for WiKIT AS, DOI:10.13140/RG.2.2.21563.59681

McKenna, J. W., Flower, A., & Ciullo, S. (2014). Measuring fidelity to improve intervention effectiveness. Intervention in School and Clinic, 50(1), 15-21.

Moeini, A. (2020). Theorising Evidence-Informed Learning Technology Enterprises: A Participatory Design-Based Research Approach (Doctoral dissertation, UCL (University College London)).

OECD (2023), "From data to insights", in PISA 2022 Results (Volume II): Learning During – and From – Disruption, OECD Publishing, Paris. DOI: https://doi.org/10.1787/44cba6b1-en

Schmidt, M., & Huang, R. (2022). Defining learning experience design: Voices from the field of learning design & technology. TechTrends, 66(2), 141-158.

Singal, A. G., Higgins, P. D., & Waljee, A. K. (2014). A primer on effectiveness and efficacy trials. *Clinical and Translational Gastroenterology*, *5*(1), e45.