



# *onecourse* evidence synthesis

Generation and synthesis of evidence for the efficacy of onecourse technology to enhance foundational learning by diverse groups of children in different contexts worldwide

Nicola J Pitchford & Karen A Levesque

DECEMBER 2024

  
THE FUTURE OF LEARNING

## INTRODUCTION

In this paper, we present a synthesis of the generation of an evidence base that tests the efficacy of an innovative educational technology (EdTech) designed to enhance foundational learning by diverse groups of marginalised children, in different locations, worldwide. Establishing a robust and replicable evidence base can take years and requires the continual and cumulative efforts of multiple actors to embed scientific research into education policy and practice at scale. Not only do we need to know what works, but for whom, in which circumstances, and how, to better understand the mechanisms underpinning an intervention's effects. Yet research evidence alone is insufficient to bring about transformational change. Policy makers are needed who draw on research evidence and have the inspiration, insight, and grit to instigate transformative change.

We demonstrate how policy makers in Malawi have used scientific evidence accrued over the past 11 years to transform foundational education by implementing an innovative EdTech – onecourse – in all 6000+ state primary schools nationwide. The evidence is grounded in proof-of-concept research, which led to a series of robust longer term efficacy studies. Additional studies focused on the use of the EdTech by children with special educational needs and disabilities (SEND) and children not making progress in reading. Investigations into how the EdTech is effective have also been undertaken to shed light on the pedagogical features embedded within the software that support learning. As the program scales, implementation research is now being conducted to ensure the EdTech delivers its potential to transform foundational education for all.

## CONTEXT

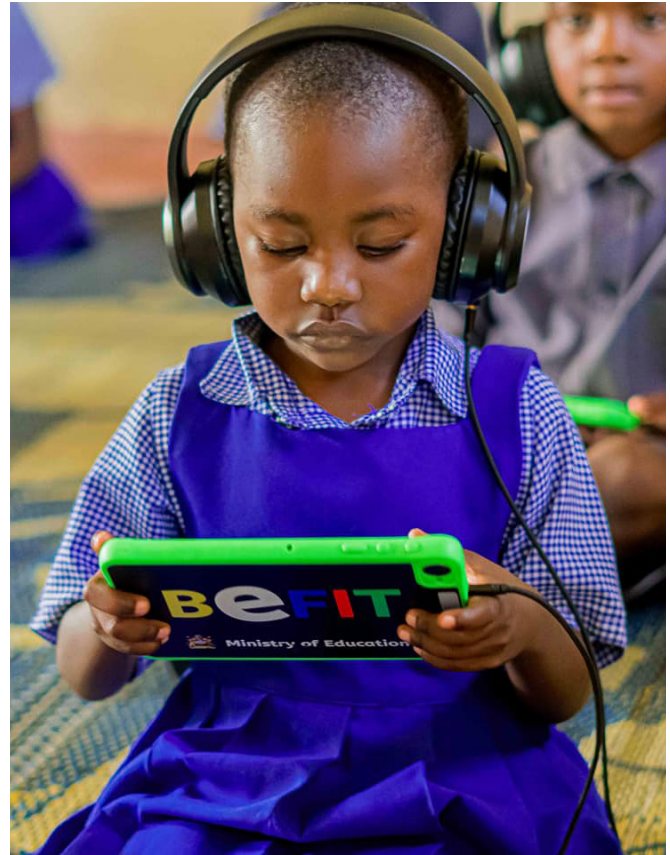
Malawi – one of the poorest countries in the world – is using research evidence to transform primary education and raise the human capital of future generations by improving foundational education for all learners in grades 1-4.

Like many countries in Sub-Saharan Africa, Malawi faces significant challenges to primary education including overcrowded classrooms, limited learning materials, and a shortage of trained teachers. As a result, only 19% of children aged 7 to 14 years have foundational reading skills and 13% have foundational numeracy skills. This leads to social and financial dependency, limits the extent to which individuals can actively participate in society, and raises vulnerability to pernicious social issues such as forced marriage, female genital mutilation, and child labour (International Center for Research on Women, 2016). Consequently, learning poverty negatively impacts population health and well-being and potential for economic growth.

Malawi successfully introduced free primary education in 1994, which has significantly improved access to primary education. However, the country still faces a high learning



poverty rate of 87% and there is a pressing need for innovative and transformative approaches to providing foundational education to meet the national goals in Malawi's official vision plan "Malawi 2063." To accomplish this, the Government of Malawi is using scientific evidence to enable meaningful and effective learning to happen at scale.



#### RESEARCH EVIDENCE

The evidence base has been generated in parallel by researchers from the University of Nottingham in the UK and the NGO Imagine Worldwide in the US and Africa. Since 2013, we have been testing the efficacy of an interactive EdTech – onecourse – developed by UK-based non-profit – onebillion – to improve foundational education by different groups of learners in Malawi. The EdTech delivers personalised, adaptive software that enables each child to learn reading, writing and numeracy at the right level. Children work on tablets through a carefully structured course made up of thousands of engaging activities, games, and stories. Over the past 11 years, we have built a complementary and robust evidence base focusing on different aspects of the software and program, in different locations, with a diverse range of learners.



## PROOF-OF-CONCEPT RESEARCH

The first study was reported by Pitchford (2015) who conducted a pupil-level randomised control trial (RCT) at a state primary school in Lilongwe, the capital of Malawi, in 2013, to test if onecourse could raise young children's numeracy skills. The study showed that after 8 weeks of using the EdTech for 30 minutes a day, learners in grades 1-3 made significant improvements in basic numeracy compared to standard classroom practice and teachers could implement the EdTech with ease. Additional benefits were also shown, as learners' attentional skills increased after using the EdTech, enabling them to focus more on class (Pitchford & Outhwaite, 2019).

This research provided proof-of-concept that well-designed EdTech could be deployed in a low-income context to improve foundational numeracy skills. The research ignited interest from international donors to invest in expanding the program to 7 districts across Malawi. With funding from the Royal Norwegian Embassy, the Voluntary Service Overseas (VSO) implemented the EdTech into Malawi primary schools. Pitchford et al., (2019) showed the EdTech program significantly raised foundational numeracy and literacy skills of early grade learners. The EdTech also reduced the attainment gap that typically emerges during the first 2 years of standard schooling to the disadvantage of girls. Results showed similar learning gains for girls and boys with the EdTech, thus equalising foundational education across gender. Further research by Pitchford et al., (2018) showed that Malawian children with SEND could learn with the EdTech, albeit at a slower pace than mainstream peers.

The research conducted in Malawi was corroborated by Outhwaite et al., (2017) in the UK. Despite the UK being a high-income country in the Global North, results from a pupil-level RCT involving 12 schools demonstrated the same EdTech significantly raised basic numeracy skills of children in the early years of UK primary schools compared to standard classroom instruction (Outhwaite et al., 2018). Further research in the UK, conducted by Gulliford et al., (2021) showed the EdTech could also support numeracy acquisition by developmentally young children, including children with Down Syndrome. Additionally, Outhwaite et al., (2020) showed the EdTech significantly bolstered the basic numeracy skills of bilingual children in Brazil compared to regular maths teaching, when delivered in either the language of instruction – English, or their home language – Brazilian-Portuguese.

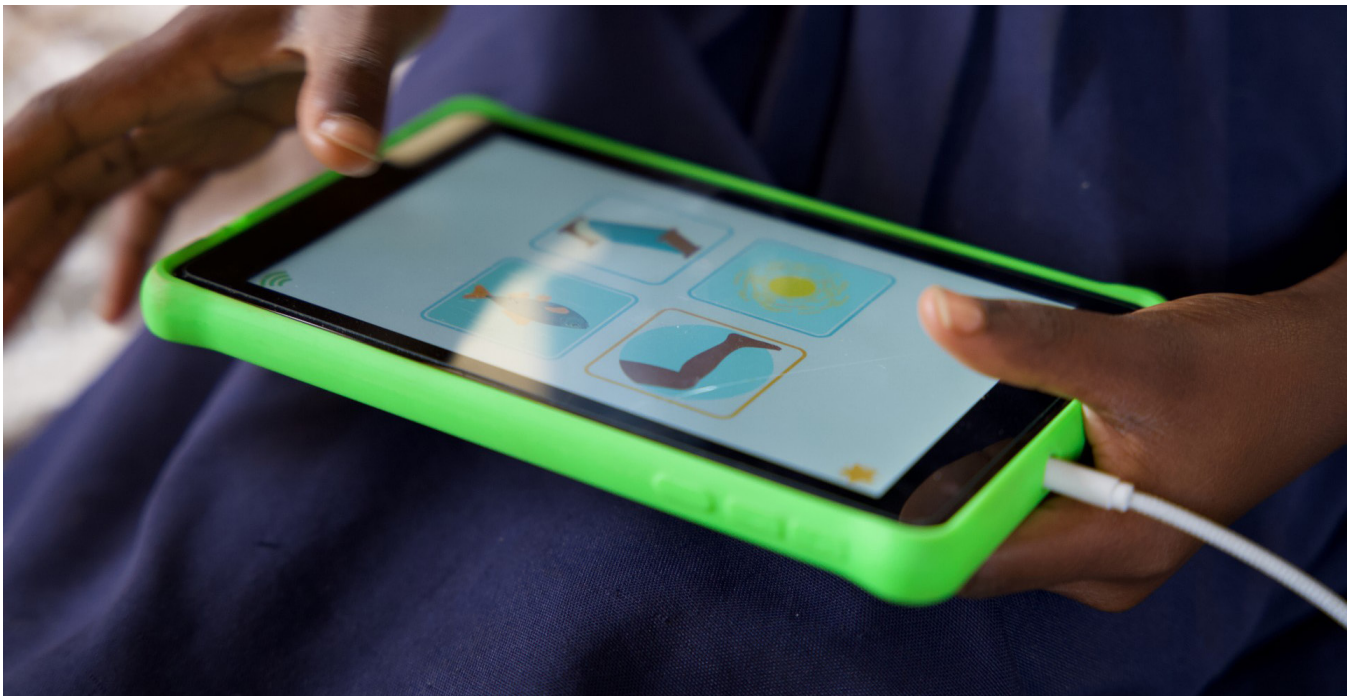
## EFFICACY RESEARCH

Thus, evidence was mounting that this EdTech could provide an effective and inclusive learning environment for children in different educational settings, including some of the most marginalised children in the world.



Results from the Global Learning XPRIZE added to the evidence base, as one billion were announced joint winners of this coveted prize in 2019. After a 15-month field trial with out-of-school children living in remote villages in Tanzania, children who were given access to the onecourse software showed greater learning gains in foundational literacy and numeracy than three of the other software solutions trialled.

Based on the early proof-of-concept evidence, Imagine Worldwide undertook a series of efficacy studies in Malawi and other countries to investigate how this EdTech could raise foundational skills over longer periods of time in government schools and in different languages and contexts, including refugee camps. Multiple rigorous studies showed robust learning gains in literacy and numeracy over 8 weeks to 13 months of tablet use and demonstrated increasing impacts associated with greater time on task and with each successive version of one billion's software (Levesque et al., 2020; 2021; 2022; 2024). Further, stakeholders reported that children's excitement about school, attendance, and confidence as learners also improved. The studies also showed that girls benefited at least as much as boys from the tablet program.



Importantly, this EdTech program was also shown to mitigate against learning loss during school closures. During Imagine's 2-year RCT in Malawi, program delivery was interrupted for seven months by COVID-related closures. Yet, results showed that children who had participated in the EdTech program prior to schools closing returned to school with higher achievement levels than their peers who had received standard instruction only (Bardack et al., 2023a).



To date, at least nine RCTs – the gold standard in effectiveness research – have been conducted by multiple researchers using onebillion’s software in different countries, languages, and settings. These RCTs have consistently shown positive and significant learning gains in literacy and numeracy.

However, while average efficacy impacts were consistently positive and significant, the studies also found that a substantial proportion of learners remained non-readers despite using onebillion’s software for extended periods of time. About 40% of learners in both RTI’s Global Learning XPrize RCT and Imagine’s 2-year RCT remained non-readers after using the tablet program for 15 months and 13 months, respectively. This contrasted with about 60% of children in the 2-year RCT who received standard instruction only remaining non-readers. Being a “non-reader” means not being able to read a single word of connected text, that is, text presented as sentences in a paragraph. To understand factors influencing non-progress in reading, Bardack et al., (2023b) conducted an initial exploratory study that showed that children’s visual working memory skills uniquely predicted high versus low progress in reading over and above some other known predictors of early literacy development, such as home literacy and learning environment and age. Bardack et al., (2024) are now extending this research to examine a broader range of factors, including short-term memory, working memory, inhibitory control, and cognitive flexibility, among others. One goal of this research is to inform software improvements.

#### PEDAGOGICAL RESEARCH

Recently, research has focussed on how onebillion’s software is effective for different groups of learners. Huntington et al., (2023a) showed that onecourse is rich in pedagogical features that are known to support learning. They compared onecourse to the other four software solutions trialled in the Global Learning XPRIZE and showed that 13 out of 15 key pedagogical features examined were significantly more prominent in onecourse than the other finalists’ software. Furthermore, to ensure this EdTech is accessible and



engaging to all learners, Layachi & Pitchford (2024) conducted a participatory formative evaluation of the onecourse software for use by children with SEND. Expert reviewers identified strengths of the EdTech and areas of weakness where improvements are needed to support children with vision impairment, hearing, and functional difficulties through recommended hardware and software updates, and by considering how the technology could be used to boost children’s motivation, and the role of the teacher in supporting children with SEND to use the technology effectively.

## IMPLEMENTATION RESEARCH

As the program scales, it is critical to determine how implementation impacts learning with the EdTech. Implementation research involves determining the implementation practices with which learning is optimised with the technology. Gulliford et al., (2021) argued it is vital that EdTech implementation is carefully blended with the existing educational environment to ensure teachers have flexibility and control when implementing the technology as a pedagogical tool. Preliminary findings indicate that implementation matters.

For example, Outhwaite et al., (2019) showed that having an established routine accounted for 41% of the variance in learning gains achieved with this EdTech by 4-5-year-olds in the UK. Established routine referred to implementing the intervention at a consistent time each day, having a dedicated member of staff whose responsibility it was to implement the intervention, having well organized equipment, having a dedicated space within the classroom and a seating plan where children used the software. In another observational study, four different and unique implementation modalities designed to promote access to the EdTech for grade 1 learners were piloted in Sierra Leone. These included Split Class – which allowed the teacher to work with half the class while the other half worked with the tablets in the classroom; Tablet Sharing – which required the teacher to pair children to work on the tablet together in the classroom; Remedial – in which targeted children that were struggling to learn in class, or the wider school environment, were given access to the tablets; and Projector – which enabled the teacher to share the software content with the whole class through a projector. Results showed the greatest learning gains were achieved with the Tablet Sharing modality (Lurvink & Pitchford, 2023), indicating that collaborative learning can add value to the tablet technology. Further research by Huntington et al., (2023b) with out-of-school children living in remote regions of Tanzania highlighted the importance and extent of community engagement in supporting different aspects of the implementation of this EdTech intervention.

As the tablet program rolls out over 6 years to all primary schools in Malawi, Imagine is conducting implementation research to help ensure that program quality is sustained at scale and that the impacts demonstrated by prior efficacy research are realized. The research seeks to understand the barriers to and enablers of quality implementation at scale





and to provide real-time feedback to implementation teams to address any issues that are uncovered (Peters et al., 2013; USAID, 2020). Early implementation research in Malawi identified some particular concerns raised in rural areas and in the southern region of the country, including concerns about the content of the tablet that were addressed with additional community engagement (Lopez et al., 2024). Implementation research findings are being used on an ongoing basis to inform training materials, community sensitizations, and implementation practices.

#### **EMBEDDING EVIDENCE INTO POLICY AND PRACTICE**

Grounded in this substantial body of rigorous research, the Government of Malawi, in collaboration with Imagine Worldwide and onebillion, are now embedding this EdTech in all state primary schools nationwide, through the ground-breaking Building Education Foundations through Innovation and Technology (BEFIT) program. Supported by a consortium of partners, including philanthropic funders and implementation service providers, the national expansion will serve 3.8 million children per year in grades 1-4 across all 6,000 state primary schools in Malawi.

The policy decision emerged from a multi-year process that ultimately led to full government adoption of the research-based program. Following the proof-of-concept study, VSO initially expanded the program with support from the Ministry of Education to about 150 schools. A National Steering Committee was established to monitor the program and review additional emerging research. As government interest in expanding the program grew, nongovernmental partners (including onebillion, VSO, Imagine) developed successive scaling concept papers, the latter of which was accepted by the Ministry.





A co-creation workshop was held with government officials and the partners, following which in 2022 the Ministry formally decided to scale the program as a full government program to be called BEFIT. The program launched in the first new 500 schools in school year 2023-24.

Imagine's research on Year 1 of BEFIT – involving an assessment of learning gains, an endline stakeholder survey, as well as ongoing implementation research — indicated the program had a strong start. It was implemented largely as intended, attained expected learning gains, and elicited positive responses from key stakeholders (Levesque et al., 2024b). And results were consistent across multiple data sources. The research also found that the program can be improved further with greater time-on-task, refinement of implementation practices, and continuous improvement of the software.

## CONCLUSION

Basic literacy and numeracy are the keys to unlocking a child's potential — improving their health, wealth, and social outcomes (Evans & Hares, 2021). Our research has shown that child-directed EdTech can deliver high-quality education for millions of marginalised children worldwide. The evidence is strong, diverse, and replicable: now governments need to follow the lead of Malawi to abolish learning poverty and make foundational education a reality for all children, everywhere.



## REFERENCES

- Bardack, S., Levesque, K., Bahlibi, A., Chigeda, A., & Winiko, S. (2023a). Impacts of a Tablet-Based Curriculum Intervention on Literacy and Numeracy Trajectories in Malawi. Presentation. Society for Research in Child Development 2023 Biennial Meeting. Available on request.
- Bardack, S., Levesque, K., & Lopez, C. (2024). Literacy as a catalyst for change: Developing an assessment battery to identify key reading precursors for EdTech in developing contexts. Presentation. Comparative and International Education Society 2024 Annual Conference. Available on request.
- Bardack, S., Lopez, C., Levesque, K., Chigeda, A., & Winiko, S. (2023b). An exploratory analysis of divergent patterns in reading progression during a tablet-based literacy program. *Frontiers in Educational Psychology*, 8:983349. doi: 10.3398/feduc.2023.983349.
- Evans, D.K. & Hares, S. (2021). Should Governments and Donors Prioritize Investments in Foundational Literacy and Numeracy? CGD Working Paper 579. Washington, DC: Center for Global Development. <https://www.cgdev.org/publication/should-governments-and-donors-prioritize-investments-foundational-literacy-and-numeracy>.
- Gulliford, A., Walton, J., Allison, K., & Pitchford, N.J. (2021). A qualitative investigation of implementation of app-based maths instruction for young learners. *Educational and Child Psychology*, 38, 90-108. <https://doi.org/10.53841/bpsecp.2021.38.3.90>.
- Huntington, B., Goulding, J., & Pitchford, N.J. (2023a). Pedagogical features of interactive apps for effective learning of foundational skills. *British Journal of Educational Technology*, 00, 1–19. <https://doi.org/10.1111/bjet.13317>.
- Huntington, B., Goulding, J., & Pitchford, N.J. (2023b). Expert perspectives on how educational technology may support autonomous learning for remote out-of-school children in low-income contexts. *International Journal of Education Research Open*. <https://www.sciencedirect.com/science/article/pii/S2666374023000389>.
- International Center for Research on Women (ICRW). (2016). A second look at the role education plays in women's empowerment. <https://www.icrw.org/wp-content/uploads/2016/10/A-Second-Look-at-the-Role-Education-Plays-in-Womens-Empowerment.pdf>
- Layachi, A., & Pitchford, N.J. (2024). Formative evaluation of an interactive personalised learning technology to inform equitable access and inclusive education for children with Special Educational Needs and Disabilities. *Technology, Knowledge and Learning*. <https://doi.org/10.1007/s10758-024-09739-0>.
- Levesque, K., Bardack, S., & Bahlibi, A. (2024a). EdTech as Supplemental Learning in Two Tanzania RCTs. Presentation. Comparative and International Education Society 2024 Annual Conference. Available on request.
- Levesque, K., Bardack, S., & Chigeda, A. (2020). Tablet-based Learning for Foundational Literacy and Math: An 8-month RCT in Malawi. *Imagine Worldwide Technical Report*. <https://www.imagineworldwide.org/resource/tablet-based-learning-for-foundational-literacy-and-math-an-8-month-rct-in-malawi/>.



- Levesque, K., Bardack, S., & Chigeda, A. (2021). Technology-enabled Learning in a Second Language: A Proof-of-Concept RCT with Refugee Children in Malawi. Presentation. Comparative and International Education Society 2021 Annual Conference. Available on request.
- Levesque, K., Bardack, S., Chigeda, A., Bahlibi, A., & Winiko, S. (2022). 2-year RCT of EdTech in Malawi. *Imagine Worldwide Research Brief*, No. 1. <https://www.imagineworldwide.org/resource/two-year-rct-of-edtech-in-malawi/>.
- Levesque, K., Bardack, S., Lopez, C., Bahlibi, A., & Winiko, S. (2024b). Building Education Foundations through Innovation and Technology (BEFIT) Year 1 Research Technical Report. <https://www.imagineworldwide.org/resource/befit-year-1-research-technical-report-executive-summary/>.
- Lopez, C., Levesque, K., & Winiko, S. (2024). Gathering community perspectives through implementation research: Understanding variation, fears, and expectations to aid a nation-wide edtech scale-up in Malawi. Presentation. Comparative and International Education Society 2024 Annual Conference. Available on request.
- Lurvink, A-F., & Pitchford, N.J. (2023). Introduction of an EdTech intervention to support learning of foundational skills in Sierra Leone: policy, teacher, and community perspectives. *Frontiers in Educational Psychology*, 8:1069857. <https://www.frontiersin.org/articles/10.3389/feduc.2023.1069857/full>.
- MEASURE Evaluation Implementation Research Technical Working Group. (2012). Fundamentals of Implementation Research. U.S. Agency for International Development MS-12-55. <https://www.measureevaluation.org/resources/publications/ms-12-55.html>
- Outhwaite, L.A., Faulder, M., Gulliford, A., & Pitchford, N.J. (2018). Raising early achievement in math with interactive apps: A randomized control trial. *Journal of Educational Psychology*. <http://dx.doi.org/10.1037/edu0000286>.
- Outhwaite, L.A., Gulliford, A., & Pitchford, N.J. (2017). Closing the Gap: Efficacy of a tablet intervention to support the development of early mathematical skills in UK primary school children. *Computers and Education*, 108, 43-58.
- Outhwaite, L.A., Gulliford, A., & Pitchford, N.J. (2019). A new methodological approach for evaluating the impact of educational intervention implementation on learning outcomes. *International Journal of Research and Method in Education*. DOI: 10.1080/1743727X.2019.1657081.
- Outhwaite, L.A., Gulliford, A., & Pitchford, N.J. (2020). Language counts when learning mathematics with interactive apps. *British Journal of Educational Technology*. doi:10.1111/bjet.12912.
- Peters, D., Adam, T., Alonge, O., Agyepong, I.A., & Tran, N. (2013). Implementation research: what it is and how to do it. *The British Medical Journal*. *BMJ* 2013;347:f6753. doi: <https://doi.org/10.1136/bmj.f6753>.
- Pitchford, N.J. (2015). Development of early mathematical skills with a tablet intervention: a randomized control trial in Malawi. *Frontiers in Psychology*, 6:485.



Pitchford, N.J., Chigeda, A. & Hubber, P.J. (2019). Interactive apps prevent gender discrepancies in early grade mathematics in a low-income country in Sub-Saharan Africa. *Developmental Science*, 22:e12864. <https://doi.org/10.1111/desc.12864>.

Pitchford, N.J., Kamchedzera, E., Hubber, P.J., & Chigeda, A. (2018). Interactive apps promote learning in children with Special Educational Needs. *Frontiers in Psychology*, 9:262.

Pitchford, N.J. & Outhwaite, L.A. (2019). Secondary benefits to attentional processing through intervention with an interactive maths app. *Frontiers in Psychology*. DOI: doi: 10.3389/fpsyg.2019.02633.

U.S. Agency for International Development. (2020). Implementation Research Overview: Working Document. <https://www.edu-links.org/sites/default/files/media/file/Implementation%20Research%20Overview.pdf>.

#### AUTHOR DETAILS

*Nicola Pitchford (PhD)* conducted this research whilst a Professor of Developmental Psychology at the University of Nottingham, UK. She is now Head of Quality Assurance at the International Centre for EdTech Impact where she continues to evaluate the impact of EdTech for different groups of learners worldwide.

Email: [nicola.pitchford@foreduimpact.org](mailto:nicola.pitchford@foreduimpact.org)

*Karen Levesque (PhD)* is Head of Research for Imagine Worldwide, USA. She is an education researcher and leader who applies strong research skills to real problems of practice and is passionate about improving education outcomes for children in Africa and across the globe.

Email: [karen.levesque@imagineworldwide.org](mailto:karen.levesque@imagineworldwide.org)

#### PHOTO CREDITS

Cover image (*Imagine Worldwide*), Page 3 left image (*Rising Academy Network*), Page 3 right image (*Ulalo*), Page 5 image (*onebillion*), Page 6 images (*EducAid*), Page 8 image (*Imagine Worldwide*)

