

<b>Institution:</b> University of Nottingham		
<b>Unit of Assessment:</b> 4 – Psychology, Psychiatry and Neuroscience		
<b>Title of case study:</b> Unlocking Talent Through Tablet Technology: Raising Attainment in Numeracy and Literacy Skills in Marginalised Children Worldwide		
<b>Period when the underpinning research was undertaken:</b> 2013 - 2019		
<b>Details of staff conducting the underpinning research from the submitting unit:</b>		
<b>Name(s):</b>  Nicola Pitchford	<b>Role(s) (e.g. job title):</b>  Professor of Developmental Psychology	<b>Period(s) employed by submitting HEI:</b>  2002-present
<b>Period when the claimed impact occurred:</b> 2013 – ongoing		
<b>Is this case study continued from a case study submitted in 2014?</b> N		
<p><b>1. Summary of the impact</b>          The University of Nottingham has been instrumental in scaling a new technology intervention – onecourse – that has raised attainment in numeracy and literacy among disadvantaged children globally. As a founding member of the <a href="#">Unlocking Talent alliance</a>, Professor Pitchford has accrued a robust scientific evidence base demonstrating the effectiveness of onecourse and informing implementation in 238 primary schools in Malawi and the UK. This has convinced a range of donors to invest in expanding the programme (GBP20,000,000 since 2013). Working with multiple partners, the programme has, to date, reached 167,171 children in Malawi, Ethiopia, Kenya, South Africa, Uganda and the UK, and additional research is being conducted in India, Cambodia, Brazil, Myanmar, Syria, Mozambique and Canada. Collectively, this work has received global recognition from the President of Malawi within his 2019 State of Nation address; the 2018 <a href="#">Comic Relief Tech4Good</a> for Africa Award; and the 2019 <a href="#">Global Learning XPRIZE</a>.</p>		
<p><b>2. Underpinning research</b>          Acquiring basic numeracy and literacy skills is a fundamental human right. Yet, despite global efforts to increase access to primary education, where numeracy and literacy are typically acquired, 617,000,000 children and adolescents worldwide do not possess these basic foundational skills (<a href="#">UNESCO, 2017</a>). Failure to acquire basic numeracy and literacy skills results in social and financial dependency on others and limits the extent to which individuals can actively participate in society. At a population scale, a lack of these foundational skills negatively impacts on health and wellbeing and on a country's potential for economic growth. Traditional methods of learning have failed to solve this global crisis, so innovative, alternative, approaches are required.</p> <p>To address this global crisis, a new alliance – Unlocking Talent – was formed in 2013, with three founding partners: onebillion - a UK not-for-profit, the University of Nottingham (UoN), and Voluntary Service Overseas (VSO) - the world's leading development charity. The alliance has capitalised on the advantages of digital technology to deliver a new and innovative app-based learning environment – onecourse – developed by onebillion, evaluated by UoN, administered by VSO, and implemented globally at scale by the alliance. Professor Pitchford (UoN) led an interdisciplinary research programme including a collaboration with Dr Antonie Chigeda at the School of Education, University of Malawi. Together they have applied rigorous quantitative and qualitative research methodologies, grounded in psychological theory, in a staged and systematic research programme. This has progressively built the strength of research evidence from small-scale pilot (1 school), to proof of concept (2+ schools), to medium-scale efficacy studies (50+ schools). The research aimed to assess the effectiveness of onecourse in raising early learning outcomes, to understand why onecourse is successful, and to determine who benefits most [1-5].</p> <p>Research has shown that onecourse is highly effective in supporting the development of basic foundational skills in disadvantaged children in Malawi, a low-income country in Sub-Saharan Africa [1, 3, 5, 6], and in the UK, a high-income country in the West [2, 4, 7, 8]. Using randomised control trials, significant learning gains equivalent to an extra 3-12 months of standard educational instruction were found for children in Malawi aged 6-9 years who</p>		

used onecourse daily for 8-14 weeks [1, 5]. Similarly, children in the UK aged 4-5 years who used onecourse daily for 12 weeks made significant learning gains equivalent to an extra 3 months of standard educational instruction [4]. This finding was corroborated by a large efficacy trial of onecourse with UK children aged 5-6 years in need of extra support with learning maths, evaluated by the University of Oxford, as part of a project funded by the Education Endowment Foundation [7]. The intervention is particularly suitable for children in need of extra support with learning maths, especially those with poor memory skills, as it reduces the cognitive load of learning in conventional classroom settings [2]. The research has also shown that onecourse supports the acquisition of basic numeracy skills in pupils with Special Educational Needs and Disabilities [3]. When using onecourse, pupils in Malawi with a range of disabilities acquired basic numeracy skills, albeit over a longer period of time than their mainstream peers. Importantly, the intervention enables girls and boys to learn at a similar rate [1, 5], which, when implemented at the start of primary education, prevents gender biases that typically emerge over the first year of schooling [5]. This demonstrates that historically entrenched gender disparities in early learning outcomes arise from socio-cultural factors and can be prevented through effective app-based learning environments.

These findings highlight the potential for onecourse to be effective at a global scale. Publishing research findings as gold open access has allowed governments and NGOs worldwide to access and benefit from the research.

### 3. References to the research

1. Pitchford, N.J. (2015). Development of early mathematical skills with a tablet intervention: a randomized control trial in Malawi. *Frontiers in Psychology*, 6: 485. DOI:10.3389/fpsyg.2015.00485
2. 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. DOI:10.1016/j.compedu.2017.01.011
3. Pitchford, N.J., Kamchedzera, E., Hubber, P.J., & Chigeda, A. (2018). Interactive Apps Promote Learning of Basic Mathematics in Children With Special Educational Needs and Disabilities. *Frontiers in Psychology*, 9: 262. DOI:10.3389/fpsyg.2018.00262
4. 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*, 111: 284-298. DOI: 10.1037/edu0000286
5. 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. DOI:10.1111/desc.12864

### Underpinning grants:

6. Unlocking Talent Through Technology: Improving Learning Outcomes of Primary School Children in Malawi. Sponsors: Royal Norwegian Embassy. Dates: 2015-17. Project lead VSO, total grant GBP2,500,000; Amount to UoN: GBP386,882. PI: Nicola Pitchford
7. Raising Attainment in Early Years Maths with Child-Centred Apps. Sponsors: Education Endowment Foundation. Dates: 2017-18. Amount: GBP251,125. PI: Nicola Pitchford
8. Maximising Reach and Utility of iPad Interventions to Support Learning of Basic Mathematical Skills in Disadvantaged Primary School Children. Sponsors: ESRC - Collaborative PhD Studentship. Dates: 2014-18. ES/J500100/1, Amount: GBP75,147. PI: Nicola Pitchford

### 4. Details of the impact

Delivering onecourse through multiple partnerships in Malawi, Ethiopia, Kenya, South Africa, Uganda and the UK, has enhanced the learning of basic foundational skills for 167,171 disadvantaged children, culminating in the [Comic Relief Tech4Good](#) for Africa Award in 2018, the [Global Learning XPRIZE](#) in 2019, and major investment of GBP20,000,000 to expand the programme globally.

### Impact within Malawi

The Unlocking Talent alliance, which implements onecourse – a high-quality, curriculum-based, interactive content, delivered to learners through hand-held tablets connected to a set

of headphones – has received the highest recognition from the President of Malawi, His Excellency, Peter Mutharika, in his State of the Nation address of the 48<sup>th</sup> session of parliament (21<sup>st</sup> June 2019): *“There is no education without basic education. That is why my Government always places emphasis on basic education to equip our children with basic knowledge and skills for them to be productive citizens in future. In this respect, since 2014, we have implemented a number of projects. These include the National Reading Programme, the Malawi Education Sector Investment Programme and the Unlocking Talent Project. These programmes were aimed at increasing access to education, deepening basic knowledge and developing skills in our learners”* [a – pg4].

Since 2013, following the results of the original pilot randomised control trial within one school [1], the Unlocking Talent alliance has partnered with the Ministry of Education, Science and Technology in Malawi to scale the implementation of onecourse. As of September 2020, onecourse has been implemented in 112 schools within 15 districts [c], totalling 150,000 learners [b], making significant progress towards achieving the aim of reaching all 5300 primary schools in Malawi [b]. The programme has significantly raised numeracy and literacy attainment for early grade learners across Malawi [1, 5] and has enabled teachers to facilitate learning in extremely challenging contexts with very high pupil-teacher ratios. For example, one teacher said *“The innovation has lessened our work because the kids are able to grasp those concepts from the tablets. The students understanding has improved. Most are doing well in counting and simple mathematics. In Chichewa, they are learning a lot to combine sounds to form words and read words and sentences”* [d]. Teachers have also noted additional benefits as lessons with onecourse have increased attendance at school. For example, Grace Chigwechokha, 41, has 84 children in her class at Chiuzimbi Primary School in Malawi, ranging in age from 6-14 years. She reports *“I can see my learners are able to read and write, and the absenteeism has also been reduced – they don’t want to miss the classes. Even those with troublesome behaviour have changed”* [e]. Benefits have also extended to teachers in Malawi by increasing their capacity to utilize digital technology to support pedagogical practice. To date, 6000 pre-service and 2540 in-service teachers have been trained in digital education technology competency standards, and 4 Primary Education Advisors and 300 Teacher Training College lecturers have completed training in teaching and learning methodologies with digital education technologies [c].

Scaling the programme across Malawi has been funded by a consortium of donors, including the Royal Norwegian Embassy, the Scottish Government, the Foreign, Commonwealth and Development Office (FCDO, formerly Department for International Development), UNICEF, Comic Relief, and a German state-owned development bank (KfW), to the sum of GBP20,000,000 [g]. The UoN research has been instrumental in enabling donors to make informed decisions about investing in the programme. For example, in 2017, the Norwegian Ambassador to Malawi stated *“The research has provided information and evidence related to the project that has given us confidence to report to our HQ and other partners, not only about the UT’s [Unlocking Talent’s] progress, but also output, and it helped us shape the dialogue around implementation methods and scaling of the project”* [f]. The UoN research has also been important in VSO’s evidenced based education programming: *“[Professor Pitchford] through the University, brings rigour to the learning and evaluation processes, providing credibility and confidence in our understanding, through structured evidence of the realities of our interventions,”* Head of Business Development for Southern Africa and Sierra Leone [k]. Scaling of the programme has also increased capacity within VSO through the creation of 30 new positions alongside the recruitment of 50 education specialist volunteers at VSO [g].

In 2018, the Unlocking Talent alliance won the [Comic Relief Tech4Good](#) Africa award for improving numeracy and literacy skills of primary school children in Malawi [i]. This award recognises organisations and individuals who use digital technology to improve the lives of others and make the world a better place.

**Impact within the UK**

Since 2013, onecourse has been used in 126 schools [2, 4, 7, 8, g] and has narrowed the attainment gap for over 1000 disadvantaged early years and year 1 pupils [2, 4, g, j, k]: children that used onecourse were shown to have significantly improved mathematical skills when compared to children that followed standard educational practice. To ensure the implementation of onecourse in UK primary schools was of high fidelity, in collaboration with an early-years specialist teacher and Apple Distinguished Educator, Professor Pitchford developed bespoke online training materials as part of the national efficacy trial, funded by the Education Endowment Foundation (EEF). Independent research by the University of Oxford showed the training was of high quality and increased capacity of the teachers and teaching assistants that took part in the trial. Commenting on the success of the project, the Apple Distinguished Educator reported: *“with funding from the Education Endowment Foundation, our school is recognised nationally for our excellence and expertise in using educational technology. This is beneficial to our School Improvement Plan as we are in a position to develop skills of teachers across the country. The results we have seen from working with Professor Pitchford has extended within our own practice”* [k].

The onebillion project was recognised by the EEF as a ‘promising project’ and was included in their ongoing ‘EEFective Kent project’ (launched in 2019), which aimed to bring evidence-based programmes to Kent (UK) to support the attainment of all pupils. Professor Pitchford attended a series of roadshows across Kent in 2020, raising the profile and awareness of the onecourse intervention. The programme was made available to all publicly funded schools in Kent in September 2020, scaling the programme further in the UK [i]. Based on the research evidence [4, j], the onebillion project was featured in the EEF ‘Improving mathematics in the early-years in key stage 1’ guidance report published in January 2020 that highlighted the crucial role teaching assistants, trained by Professor Pitchford, played in its successful deployment [o – pg33, box 17].

**2020 Coronavirus pandemic: Recommendations for remote learning in the UK**

In response to the 2020 coronavirus pandemic the EEF published a rapid evidence assessment on remote learning in April 2020; a review schools could use as an evidence base on methods ‘to support remote learning during school closures caused by the 2020 coronavirus pandemic’ [p – pg 3]. The EEF funded onebillion project [j] implemented in UK schools by Professor Pitchford was highlighted in the report as one of the methods that could be used in remote learning for Key Stage 1 to develop early mathematical skills [p – pg 15]. Professor Pitchford was also contacted by the UK Open Innovation Team in the Cabinet Office in April 2020, to feed into a review for the Department for Education on the potential use of technology to mitigate the effects of school closures on disadvantaged children during the 2020 coronavirus pandemic. Professor Pitchford’s input to the review was commended by the team as being ‘valued and having a positive influence on policy discussions’ [q], as the review led directly to the Department for Education ‘[securing] funding for laptops for many children who [did] not already have access to a computer’ [announced by the Education Secretary](#) on 19<sup>th</sup> April 2020 [q]. This positive policy outcome received widespread media attention, reported by [BBC News](#), [the Metro](#), [the Guardian](#) and [the Independent](#) online media outlets on 19<sup>th</sup> April 2020 [q].

**Global expansion of Unlocking Talent**

Following success in Malawi and the UK, [showcased recently by FCDO](#), the Unlocking Talent alliance has implemented onecourse in Ethiopia, Kenya, Uganda, and South Africa. Research is also being conducted in India, Myanmar, Cambodia, Tanzania, Mozambique, Syria, Brazil and Canada [b, c]. Partners assisting the expansion include the African Maths Initiative, iSchool Africa, Haileybury Youth Trust, Cisco, Airtel, and ABA International School [c]. To ensure best practice and high fidelity of implementation as the programme scales in new countries and contexts, Professor Pitchford co-created a suite of open access toolkits, published in June 2020, with VSO and Imagine Worldwide – a US-based NGO providing all children with the opportunity for success [m]. The toolkits have mobilised the research findings and learnings from the Unlocking Talent alliance to ensure consistent



implementation, monitoring, and evaluation of the programme as it scales globally and to enable policymakers to evidence investment decisions.

In 2019, onebillion were announced as joint grand prize winners of the Global Learning XPRIZE – a USD15,000,000 competition sponsored by Elon Musk to solve humanity's grand challenges [n]. Launched in 2014, the Global Learning XPRIZE challenged innovators around the globe to develop scalable solutions that enable children to teach themselves basic reading, writing and arithmetic within 15 months. After being selected as one of five finalists, onebillion received USD1,000,000 and went on to have their onecourse software field tested in Tanzania. The competition reached nearly 3000 children across 170 villages in Tanzania [m]. After reviewing the field test data, an independent panel of judges found results between the top two performers were indiscernible and determined two grand prize winners would split the prize purse, receiving USD5,000,000 each. The CEO of onebillion, stated, "*Professor Pitchford's research [...] has been instrumental in the uptake and overall success of the scale at which onecourse has been implemented through the Unlocking Talent alliance. [...] The [UoN] research was no doubt an important factor contributing to the success of onecourse in the Global Learning XPRIZE competition*" [h].

The cost of innumeracy and illiteracy to the global economy is estimated at GBP120,000,000,000 (World Literacy Foundation, 2015). 171,000,000 people could be lifted out of poverty by acquiring basic numeracy and literacy skills at primary school (UNESCO Global Monitoring Report 2013/14). Our work is the start of this.

#### 5. Sources to corroborate the impact

- a) Malawi News Agency Online – [State of the Nation Address](#), President Peter Mutharika, 1<sup>st</sup> meeting in the 48<sup>th</sup> session of Parliament, 'Education and Skills Development' pg4 (21<sup>st</sup> June 2019) [PDF] accessed 14<sup>th</sup> October 2019
- b) onebillion website, [Impact – Partners and Projects](#), [PDF] accessed 20<sup>th</sup> September 2019
- c) VSO website, [Unlocking Talent in Malawi](#), [PDF] accessed 2<sup>nd</sup> December 2019
- d) Forbes website, [The Future of Learning Unfolding in Malawi](#) (1<sup>st</sup> July 2019), [PDF] accessed 14<sup>th</sup> October 2019
- e) VSO website, Blog entry ['I love teaching – but it is so difficult'](#) (4<sup>th</sup> October 2017), [PDF] accessed 14<sup>th</sup> October 2019
- f) Letter from the Royal Norwegian Embassy Ambassador to Malawi (12<sup>th</sup> October 2017) [PDF]
- g) Letter from the Head of Business Development for Southern Africa and Sierra Leone at VSO (17<sup>th</sup> November 2020) [PDF]
- h) Letter from the CEO of onebillion (27<sup>th</sup> November 2020) [PDF]
- i) 2018 Comic Relief [Tech4Good Africa award](#) website, [PDF] accessed 2<sup>nd</sup> December 2019
- j) [Education Endowment Foundation website](#) showing funding of an efficacy trial of the onebillion maths apps in England, with associated evaluation report from the University of Oxford (autumn 2019), [PDF] accessed 2<sup>nd</sup> December 2019
- k) The Psychologist article [Partnerships for Impact](#), volume 33 (October 2020) [PDF]
- l) 'EEFective Kent Project' prospectus (2019), [PDF]
- m) Imagine Worldwide Toolkits, including [website](#) (June 2020) [PDF]
- n) [Global Learning XPrize website](#), '\$15M Global Learning XPRIZE Culminates With Two Grand Prize Winners' (15<sup>th</sup> May 2019) [PDF] accessed 27<sup>th</sup> November 2019
- o) Education Endowment Foundation guidance report, *'Improving Mathematics in the Early Years and Key Stage 1'* (January 2020) [PDF]
- p) Education Endowment Foundation, *'Remote Learning, Rapid Evidence Assessment'* (April 2020) [PDF]
- q) Letter from Open Innovation Team, Cabinet Office; Gov.uk press release *'New major package to support online learning'* announcing funding for laptops; Media reports by [BBC News](#), [the Metro](#), [the Guardian](#) and [the Independent](#) (April 2020) [PDF]