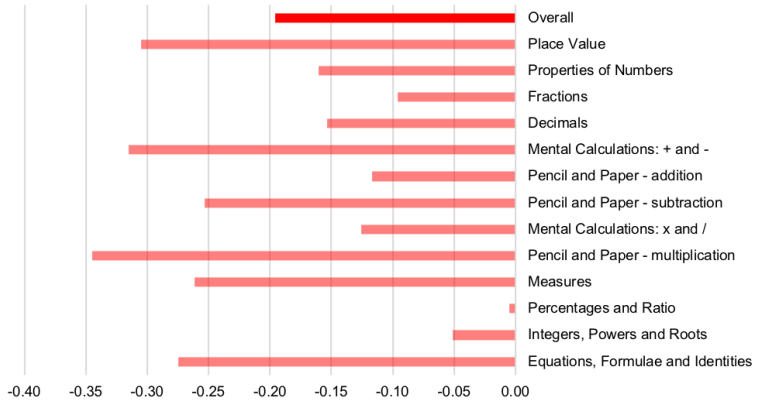
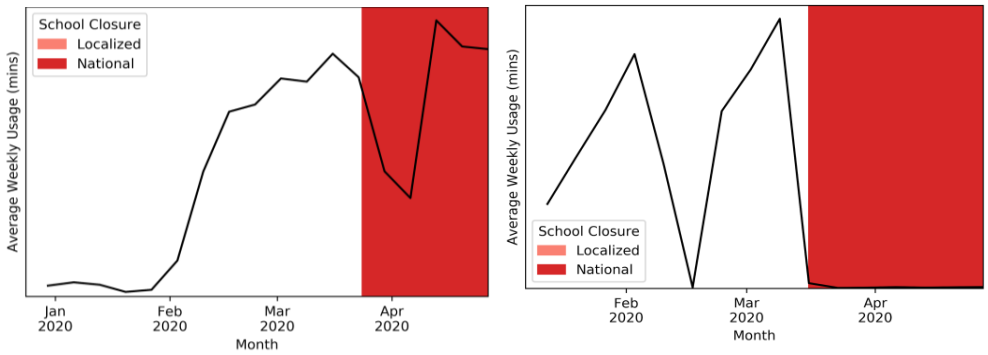
Whizz findings on learning loss

Summary

- Even prior to COVID-19, students worldwide typically experience 'learning loss' over the summer break, amounting to **2.5 months of lost learning in mathematics over a 6-week summer break**. This compares to a 2-month gain for those students able to access virtual tutoring for one hour a week over the same period. Summer learning loss by maths topic:



- Early indications are that COVID-19 has preempted these learning losses. Whizz data exposes the stark digital divide between marginalised and non-marginalised communities. **Access to online content is a key differentiator of learning during school closures.** New Zealand vs rural Kenya week-on-week access trends Jan 2020 - May 2020:



- We therefore anticipate an amplification of learning loss attributable both to COVID-19 and the summer break. **Accelerated recovery** is more paramount than ever.

I. Quantifying summer learning loss pre-COVID

Summer learning loss is an established phenomenon in education. External research points to a 2.6 month drop in students' maths knowledge when they are inactive over the summer period.[1] In this study we use Maths-Whizz data to find our own estimate of the extent of learning loss over the summer, and break down the loss by topic.

How the estimate was derived

To estimate summer learning loss, we selected students on Maths-Whizz in the UK who met the following criteria:

- Assessed at the start of the academic year (Sep '14, '15, '16 or '17)
- Not reassessed until September or October the following year
- The initial assessments did not take more than two months to complete (after starting the assessment)
- Average weekly usage was at least 30 minutes between Sep-Jun in the first year - ensuring the student's Maths age at the end of the academic year is a reliable measure of their true maths knowledge at that point
- Total usage from 20 July - 31 August in the first year did not exceed 30 minutes - so we can assume they did not acquire new knowledge on Maths-Whizz
- Following reassessment, their Maths Age did not increase by more than one month - so we can assume they did not acquire new maths knowledge outside of Maths-Whizz
- Only topics that appear in the diagnostic assessment are considered, which ensures that all comparisons of students' Topic Ages are based on knowledge they have demonstrated in Maths-Whizz

A total of 681 students met this criteria and are included in the results below.

Results

Overall: students experience an average drop of 0.20 in Topic Age (Figure 1), corresponding to 2.4 months of lost learning, which is close to the external estimate of 2.6 months.

[1] Cooper H., Nye B., Charlton K., Lindsay J., Greathouse S. (1996). The effects of summer vacation on achievement test scores: A narrative and meta-analytic review. *Review of Educational Research, 66*(3), 227–268. http://journals.sagepub.com/doi/10.3102/00346543066003227

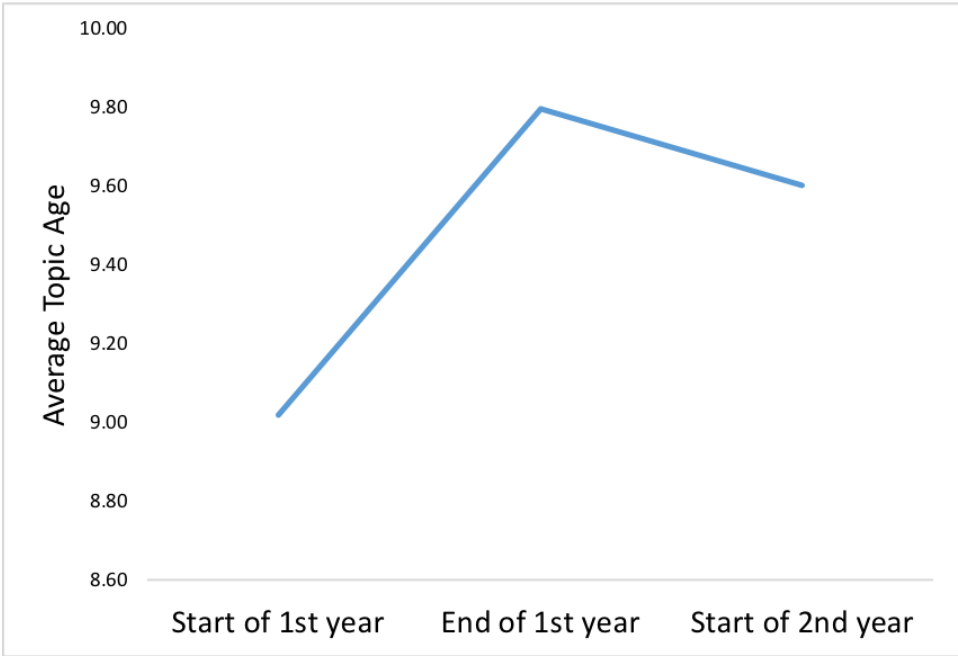


Figure 1: Overall summer learning loss

A drop is experienced in every assessed topic (Figure 2). The greatest loss is seen in *Pencil and Paper - multiplication* (0.34 years) and the smallest loss is observed in *Percentages and Ratio* (0.01 years). One contributing factor is the maximum and minimum possible Topic Ages - since Percentages and Ratio starts at a later point in the curriculum, there may be less scope for learning loss for those that have covered the topic. This is a question for further research.

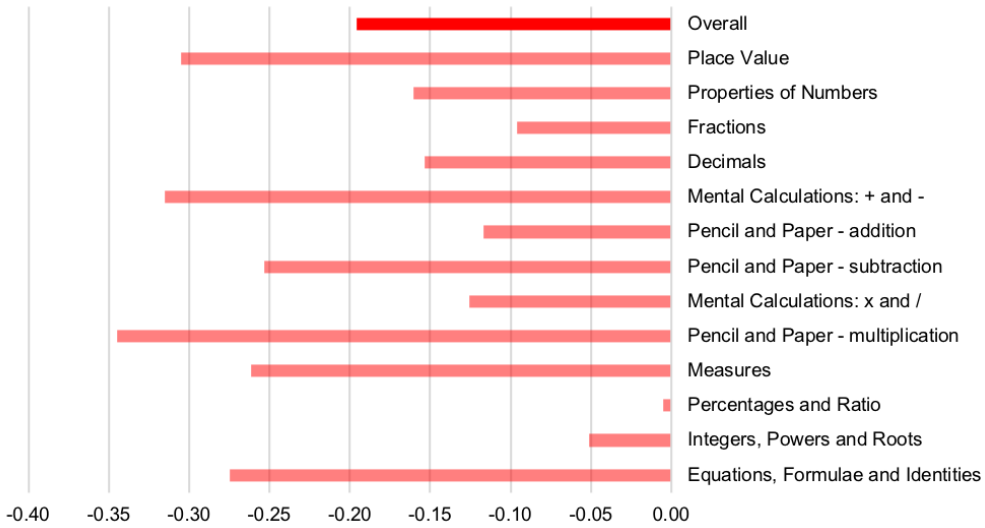


Figure 2: Learning loss by topic

The difference a virtual tutor can make

Figure 3 shows the learning potential of virtual tutoring over the summer. With 45-60 minutes per week of Maths-Whizz tutoring a week over a six-week summer period, students can expect to acquire 9 weeks of knowledge (based on an expected Progress Rate of 1.5, which has been verified by separate Whizz studies). This amounts to 0.17 years of acquired knowledge, compared to 0.20 years of lost learning for those students not active on Maths-Whizz (and not accessing other maths resources).

Thus Maths-Whizz amounts to 0.37 years of learning gains over the summer, or 4.44 months:

Figure 3: Learning progress with and without Maths-Whizz

The study relied on a sample of UK students who met the strict criteria for inclusion. We have no reason to suspect the trends would differ markedly in other regions, though this is a topic for future research.

II. Visualising the digital divide during COVID-19

Covid-19 is still in its infancy, but already it is amplifying the threat of learning loss as students worldwide struggle for access to basic education.

At Whizz we are able to track students' access and quality of learning in mathematics through our Maths-Whizz virtual tutoring platform. As students interact with the tutor, it generates analytics in real-time, as an automatic by-product of their learning. Our longitudinal Usage data (where Usage is defined as time-on-task in Maths-Whizz) brings into focus the two intervening forces of holiday learning loss and what we might term 'Covid learning loss'.

Here, for example, is a time-series plot showing the average weekly Usage on Maths-Whizz among students in the UK. Dates for localised and national school closures are taken from UNESCO. Usage numbers have been omitted as the focus of analysis is on directional trends.

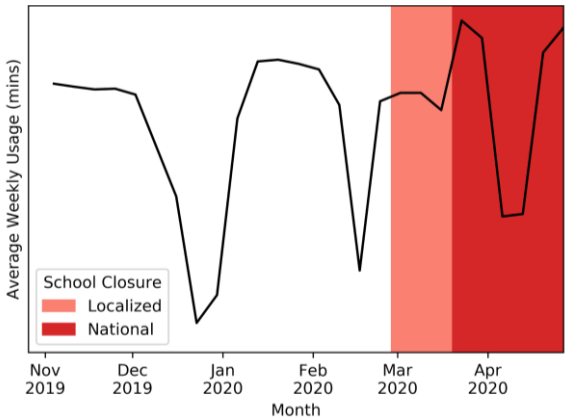


Figure 4: Average Usage among school users of Maths-Whizz in the UK, week-on-week

Prior to Covid-19, there were two unmistakeable troughs corresponding to the Christmas holiday and February half-term respectively, as students directed their attention away from their studies. Since the advent of school closures, a fluctuating pattern has persisted, mediated in large part by a third dip over the Easter break in April. More encouraging is the revival of student activity on Maths-Whizz in recent weeks, with Usage surpassing even its pre-Covid levels.

As schools look to online delivery models for instruction, Maths-Whizz is poised for greater uptake as its design is optimised for this medium (in contrast, say, to ill-fated attempts to deliver synchronous lessons via Zoom to thirty primary students at once).

While adoption levels vary between different territories, the same story has emerged elsewhere: a steady uptake in virtual tutoring, mediated by precipitous drops during holiday periods. Covid-19

poses very real dangers to students' learning, but these dangers are already a natural consequence of the schooling calendar. The persistent threat to students' learning resides in the conventional view of holiday periods as a wholesale 'break' from education.

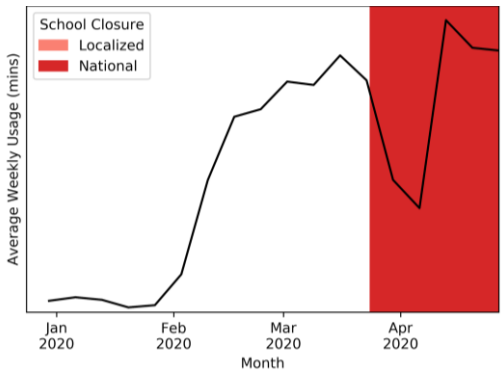


Figure 5: New Zealand: Usage trends before and after the start of the academic year (early February) are consistent with other territories. The April drop is explained by the Easter break.

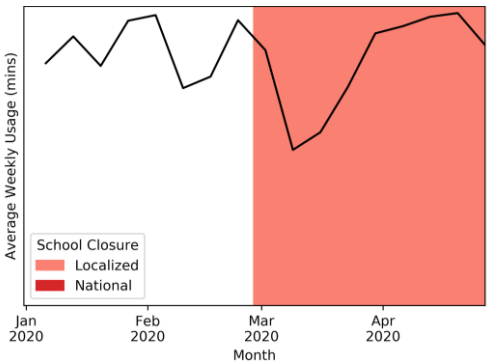


Figure 6: United States: The noticeable drop in March corresponds to spring break, which also coincided with the advent of school closures. Usage has picked up as many schools have taken advantage of our support through Covid-19.

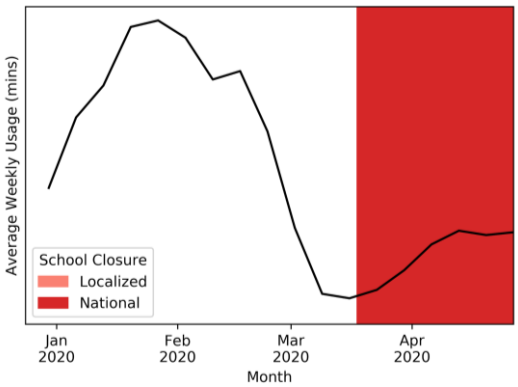


Figure 7: Thailand: The pre-closure decline is in line with the summer vacation. Usage is rising as Maths-Whizz is made available in remote summer camps.

Bridging the digital divide

Learning losses are not distributed evenly among students. Students from more affluent backgrounds are more likely to enrol in summer camps, and they have more ready access to learning resources. Social distancing has placed newfound importance on the internet as a delivery vehicle for education. Digital technologies have baked into them the potential to avert learning loss by affording students access to quality learning content tailored to their needs and preferences. The upturn in Usage on Maths-Whizz bears testimony to the flexibility that comes with online learning, accessible on any internet-enabled device.

These same technologies, however, risk widening the digital divide, with many families unable to afford or access online learning content. As a 2018 PISA analysis explains, school readiness for digital learning unfolds in three phases. The first is the most essential layer of access. In resource-constrained contexts such as rural Kenya and the Democratic Republic of Congo, Usage on Maths-Whizz has been decimated as students' only access to online learning has, to date, been available through purpose-built ICT labs in schools. When schools close, so do the avenues to these students' education.

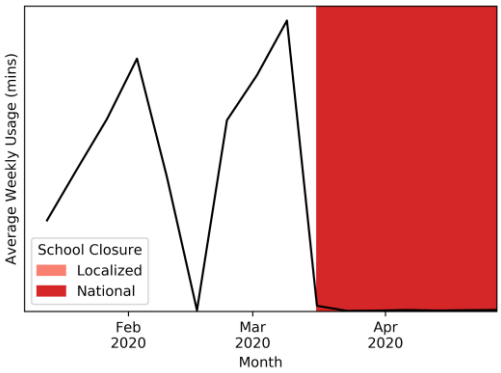


Figure 8: Rural Kenya: School closures - first due to holidays and then Covid-19 - decimate online learning as students rely on ICT labs for access

The barrier of access is felt even in more developed contexts. In the UK and US, for example, we see huge variations in Usage levels, within and between schools. These contexts reveal their own instances of the digital divide. Many of our partner schools in low-income areas, where families lack access to the internet, are observing a significant downturn in Usage. This is why the first phase of response efforts has centered, in many parts, on infrastructure - enabling internet access for the most marginalised groups (those on free school meals, for instance).

Whizz's own commitment to ensuring learning never stops begins with an effort to expand access to virtual tutoring. In many contexts, this has translated into providing additional licenses to schools. In others, like Kenya and DRC, we are working with partners to overcome infrastructural bottlenecks by making Maths-Whizz accessible on affordable smartphones. In Thailand, Maths-Whizz is being offered as a remote learning solution for summer camps. Each context requires its own adapted implementation.

Even as we confront challenges of access, our approach is rooted in the other two phases of school readiness mentioned in the PISA report: addressing the *digital use gap*, which relates to purposeful, guided use of online content and the *school digital gap*, which relates to 'the capacities and capabilities of each school to provide individualized, or suitably levelled and sequenced, digital learning for students; to promote and monitor engagement with these materials; and to provide feedback that helps maximize learning outcomes.'

Across all territories, we have created remote professional development offerings for teachers. A webinar series, led by our central team of education experts, has been launched for both parents and teachers. In Kenya teachers are able to access, through their smartphones, courses on classroom instruction, which will be supported by remote workshops with local experts. A suite of 'flat' maths content including worksheets and worded problems have been disseminated via teacher WhatsApp groups, to coincide with the Kenya Institute of Curriculum Development (KICD) home learning schedule. Teachers have then cascaded these materials down to parents through their own local

networks. In the UK, we have already made many of our award-winning Teachers' Resources available on BBC Bitesize, and we are in informal discussions with KICD to include some of this content with their televised home learning curriculum. In the DRC, we are also pursuing the goal of granting teachers access to the Maths-Whizz tutor (again, via affordable smartphones) to enhance their content knowledge.

Learning must never stop in a post-Covid world

These examples are a snapshot of how Whizz is responding to the urgent needs of Covid-19. They fit into a wider effort among educators to ensure all students, and especially the most vulnerable, are supported even during this period of disruption. When the dust hopefully settles on Covid-19, the world will have undergone a seismic shift. The things we take for granted – our health, our livelihoods, our social interactions – will face microscopic examination. So too will our mechanisms of schooling. If we address short term needs with an eye on future needs, we can prepare schools for disruptions to come by making online delivery of quality education a staple component of business-as-usual schooling.