Whizz Education

Proof Pack

2021

Contents

Executive Summary

Whizz Education's individualised learning programmes have reached more than 9,000 schools and over 1,500,000+ students worldwide. Our theory of change is rooted in **holistic programme design** that seeks to integrate learning technologies in the context of each environment.

A core challenge in classrooms everywhere is the multi-year knowledge gap among students which, according to data from the Maths-Whizz virtual tutoring platform, reaches **4 years by upper primary** in developed contexts (and is slightly less in low-resource environments due to relatively low overall attainment levels).

The COVID-19 pandemic has amplified this challenge, with **around half of students experiencing knowledge declines**, with an average decline of eight months.

Maths-Whizz is a virtual tutor designed to simulate the most effective behaviours of a human tutor. A rich and varied evidence base is emerging in support of its efficacy:

- Students' maths knowledge (measured in terms of Whizz's global Maths Age metric) is predicted by usage of Maths-Whizz. Students who receive an hour a week of virtual tutoring via Maths-Whizz increase their Maths Age by an average of **18 months in the first year.**
- Multiple studies from different international contexts show that usage and progress on Maths-Whizz **correlates with and is predictive of local measures of attainment**.
- In marginalised communities in Kenya, where Maths-Whizz was implemented as part of a partnership-driven model that entailed Whizz Education's programme design elements, **learning rates more than doubled over a 4-year period**, with gains directly and indirectly attributed to targeted course corrections throughout the lifecycle of implementation.

As schools and governments seek to build back better following the disruptions wrought by the pandemic, the proven pedigree of virtual tutoring, when **implemented holistically** in the **spirit of partnership** and with a **long-term mindset**, offers education stakeholders an assured path to recovery that addresses the needs of all students.

1. About Whizz Education

Whizz Education is a global education partner accountable for learning outcomes, founded on the belief that every child deserves a learning experience that caters to their individual needs and pace of learning. We recognise that localised solutions, designed in partnership with education stakeholders, are essential to overcoming barriers and delivering learning outcomes.

We work with schools, governments, donor agencies and other local and international stakeholders to understand and address the challenges that exist in achieving inclusive and quality education for all.

Our team of experienced education, technology and programme management experts have designed and implemented innovative solutions that leverage intelligent teaching and learning platforms and integrate technology to deliver measurable learning outcomes in a range of settings.

For almost two decades, Whizz Education has been a trusted partner for implementing educational impact projects worldwide. We are currently working in Democratic Republic of Congo (DRC), Kenya, Mexico, Thailand, New Zealand, United Kingdom, United States of America and United Arab Emirates. Our projects have reached more than 9,000 schools and over 1,500,000+ students worldwide.

Figure 1: Whizz Education's global reach

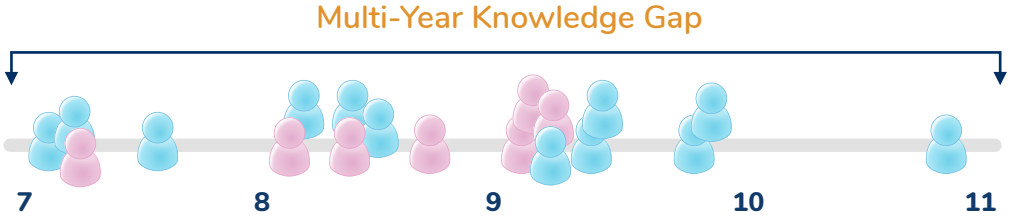
2. The challenge in every classroom

Across the world, **250 million children** are without adequate learning provision, while many students who do receive access to formal education fail to achieve their potential due to a range of threats including chronic teacher shortages, low-quality teacher training, large class sizes and schooling disruptions induced by the global pandemic and other emergencies.

The world's governments and education stakeholders are under enormous pressure to take action in light of stagnant progress towards SDG 4 (inclusive and quality education for all)[1].

2.1 The Multi-Year Knowledge Gap

In maths classrooms globally, a **multi-year knowledge gap** exists between students, making it profoundly difficult for teachers to address the diverse needs of all learners consistently.



Using the Maths Age metric (defined in section 3.1), Whizz has been able to quantify this challenge. In more developed contexts, this gap reaches **four years by upper primary**, and increases through the grade levels as knowledge deficits are left unaddressed.

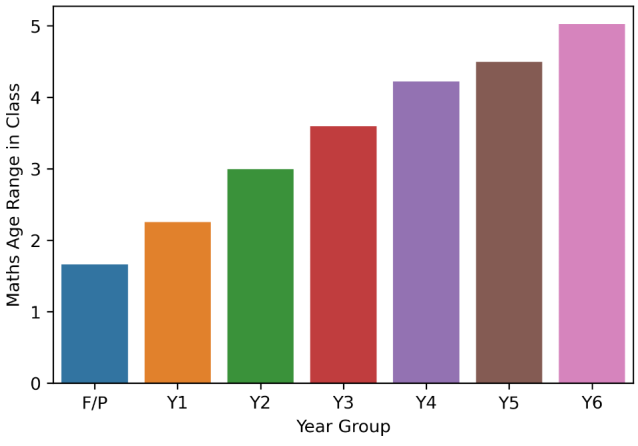


Figure 2: The knowledge gap, defined as the range in Maths Age, per year group in a sample of 764 UK classes of size 10-40 students.

In marginalised communities in Kenya, class size also exerts an influence on the knowledge gap. The median class size is 45 and it is not uncommon for classes to have over 100 students. However, while larger classes tend to exhibit a larger multi-year knowledge gap, the overall gap is less pronounced in these contexts. This is largely due to the fact that overall attainment levels in these communities are much lower, resulting in less variance among students.

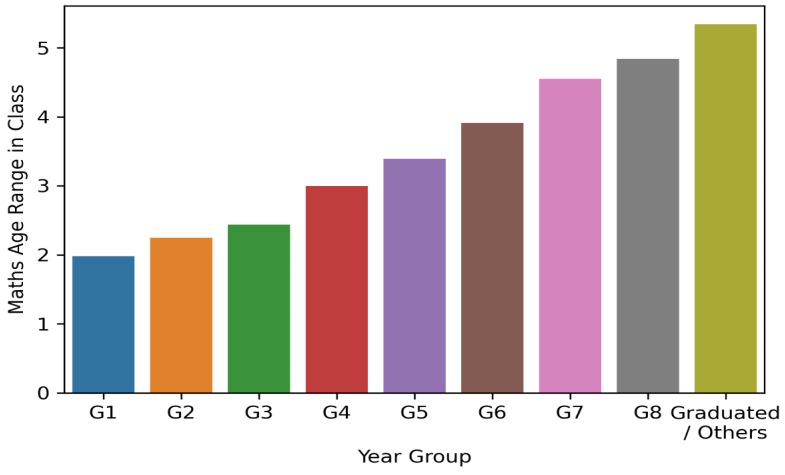


Figure 3: The knowledge gap per year group in a sample of 2,235 classes from marginalised communities in Kenya

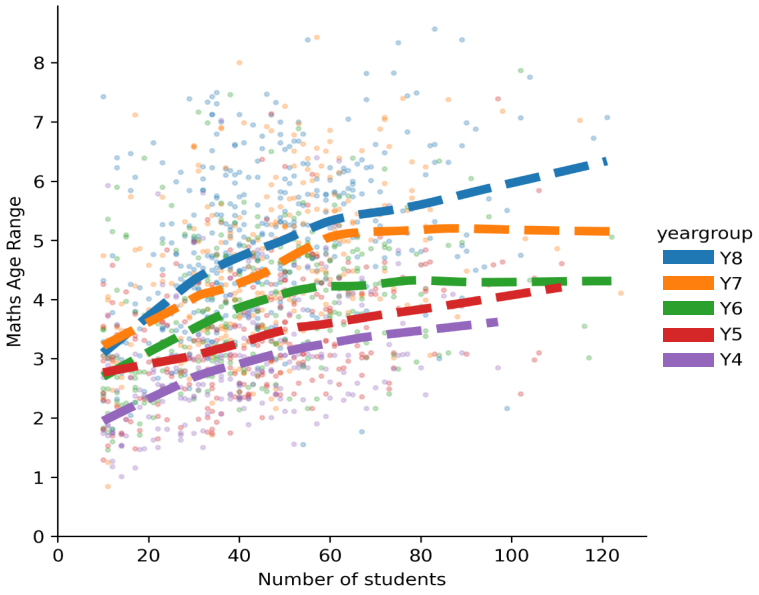


Figure 4: A local regression model for each grade level, showing how class size correlates with the knowledge gap

2.2 Learning Loss

During periods of school disruption or stagnancy, the attainment gap widens as historically marginalised students fall further behind. Whizz's 2018 analysis of summer learning found that knowledge declines (measured in terms of reduction in Maths Age) are a widespread phenomenon among students who are inactive with learning during the summer, with losses amounting to around **two and a half months** on average[2].

The COVID-19 pandemic exacerbated learning loss. Our research in the UK and US found that **46% of students exhibited learning loss** during the first wave of the pandemic, with a staggering **knowledge decline of eight months** on average.

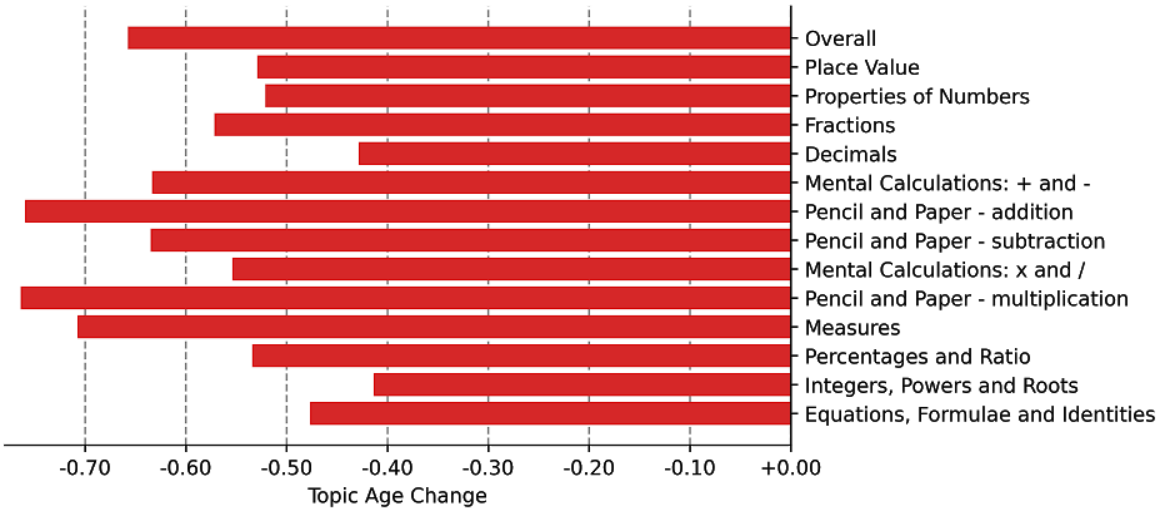


Figure 5: Learning loss in UK/US during the first wave of COVID-19, broken down by topic

The corresponding results in Kenya, the basis of Project iMlango, were even more startling[3]: we found that **53% of students experienced some learning loss** in the first wave of COVID-19, with an **average loss of 13 months**.

Not all students are affected equally. Students in lower grade levels are more likely to experience learning loss (presumably because they have a weaker foundation to rest on), while students in 'hardship' areas of Kenya were more likely to experience learning loss compared to their more affluent counterparts.

It is in this context of widening attainment gaps that the need for individualised tutoring presents itself. Among education interventions, one-to-one tutoring enjoys one of the largest effect sizes[4]. There is also evidence that these benefits can be replicated by 'virtual' tutoring platforms that automate the most effective tutoring behaviours such as providing immediate and scaffolded feedback to students, and adapting content to their pace of learning[5,6]. In particular:

- Students receiving virtual tutoring consistently outperform their peers in controlled studies (92% of studies examining virtual tutoring found that these services significantly improve academic attainment);
- The body of research is robust - three quarters of research studies are large enough to be considered of substantive importance by the US Department of Education and Institute of Education Sciences;
- The average effect size is to advance students a full quartile (e.g. from the 50th% to the 75%) in terms of performance;
- These outcomes are reliable, having been replicated across 9 countries on 4 different continents;
- On average, they yield equivalent or greater improvements in student learning than human tutoring, due to not being dependent on the availability or expertise of a human tutor.

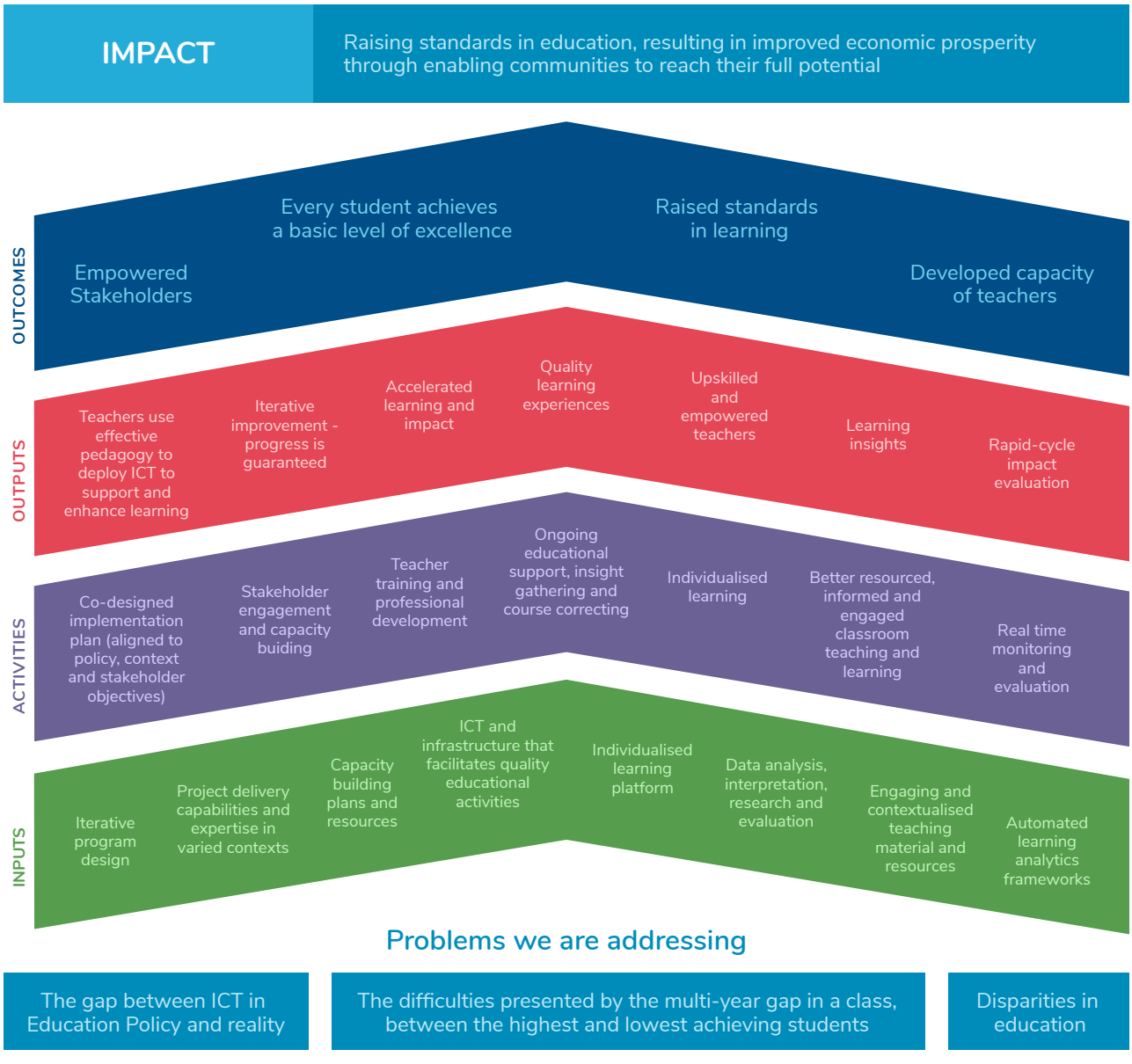
3. Our approach: Individualised learning through holistic programme design

Whizz's approach to improving educational outcomes recognises the need to design innovative teaching and learning solutions that tailor each project to the needs of the local context.

3.1 Theory of Change

The Whizz Education theory of change is anchored to measurable outcomes across the education ecosystem.

Whizz Education Theory Of Change



Whizz's approach to improving educational outcomes recognises the need to design innovative teaching and learning solutions that tailor each project to the needs of the local context.

Figure 6: The elements of Whizz's holistic approach to educational programme design and implementation

Some of these elements are elaborated in the sections below.

3.2 The Maths-Whizz Tutor and Maths Age

Maths-Whizz is an online, virtual tutor that is designed to **simulate some of the most effective behaviours of a human tutor**. It currently covers Foundation through to Year 8 (ages 5-13).

The tutor begins by assessing students across a range of maths topics. Using this assessment profile, the tutor automatically prepares a learning plan aimed at addressing the student's specific knowledge gaps. Students are guided through hundreds of lessons, which typically comprise an instructional element, an animated, interactive exercise and a short assessment. Maths-Whizz adopts a **mastery approach**: students only move forward in a topic when they have demonstrated understanding of each lesson.

The tutor uses continuous assessment to detect when a student is struggling. It provides scaffolded prompts and, where necessary, directs students to more foundational content to address their knowledge gaps. Thus Maths-Whizz **adapts at every moment** to each child's needs and pace of learning.

As students interact with Maths-Whizz, it feeds back key learning data to parents and teachers. They can access, in real time, insights into how their children are progressing, and where they need more support.

Throughout the learning journey, the tutor calculates the student's knowledge level in terms of a ***Maths Age*** - this is done for each topic, and the student's overall Maths Age is calculated as the mean of all individual 'Topic Ages'.

Maths Age is a criterion-referenced metric based on Whizz's international maths curriculum. It is analogous to reading age: a student with a Maths Age of 9 has the knowledge expected of a nine-year-old and so on. It has been shown to have robust predictive validity relative to a range of external assessment benchmarks (see section 4).

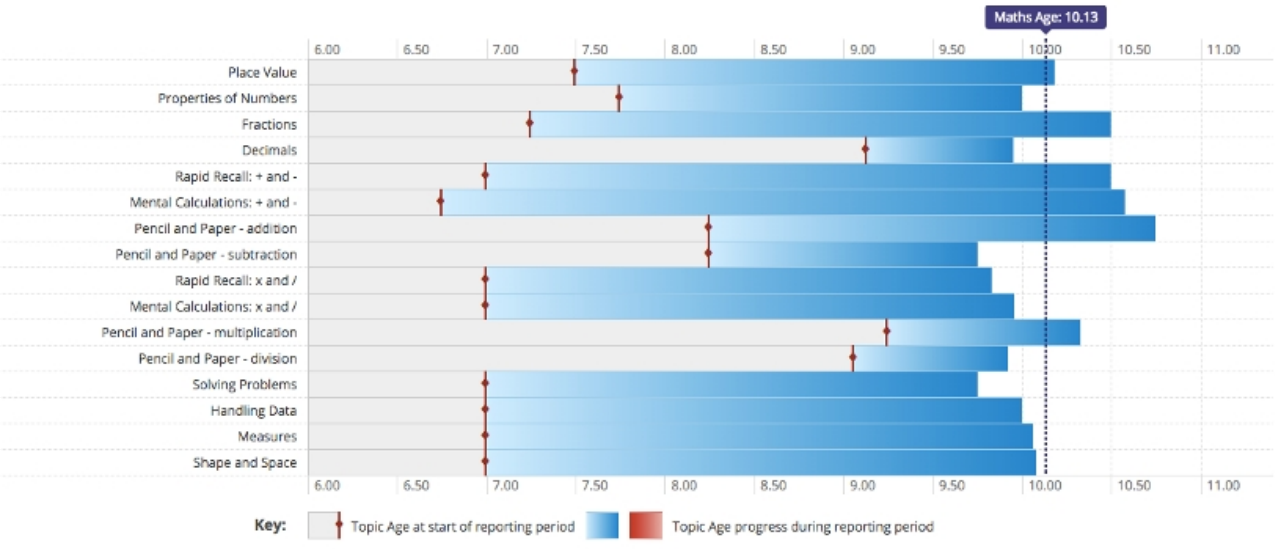


Figure 7: A student learning profile on Maths-Whizz, where the bars measure the student's Maths Age in each topic. The grey bars show a jagged learning profile that was uncovered by the student's initial diagnostic assessment. The blue bars show the student's improvement in each topic through their use of Maths-Whizz. With a sustained diet of individualised tutoring, the student now exhibits a more balanced profile, with less variation between topics.

Why Maths Age?

Maths Age affords several key benefits to students, parents, educators and policymakers:

- Gives visibility to each student's individual strengths and weaknesses, enabling **more differentiated approaches** to curriculum and instruction;
- Allows for real-time, **low-stakes comparisons** between students, classes, schools, districts and even entire countries;
- Reflects the dynamic nature of maths ability, emphasising the **potential for growth** rather than fixed labels of achievement;
- Provides an **internal reference point** with which to measure learning gains acquired through the Maths-Whizz virtual tutoring platform.

3.3 Blended learning

From a teacher's perspective, Maths-Whizz is like having a virtual teaching assistant for every student, supporting their individual learning needs and reporting key insights back to them in real-time.

When thought of this way, virtual tutoring has enormous potential to transform schools' approach to instruction and assessment. For instance, teachers can utilise the range of automatically generated insights to implement true mastery-based approaches that allow for more differentiation in the classroom.

The aim of implementation is to ensure students and teachers can seize upon the best of online and offline learning, and to ensure the two reinforce one another as part of a blended approach to learning. The need for such hybrid approaches has been underscored by the global pandemic, and the flexibility it has demanded of education delivery models.

When implemented school-wide, virtual tutoring can help instil a culture of data-informed practice among teachers and school leaders.

With parents also able to access live reports for their students, virtual tutoring also fosters a triangle of success between students, parents and teachers.

3.4 Continuous course correction

Our **course corrective approach** to implementation rests on two foundations:

1. Real-time data collection on the Maths-Whizz virtual tutoring platform that enables monitoring of progress towards clients' educational goals.
2. The local context of each implementation, acquired through close engagement with clients, is required to give meaning to trends observed in the data.

Figure 8: Whizz's course correction model

When data is combined with the story on the ground, we arrive at **actionable insights** that highlight where we are falling short on a client's objectives, and what concrete steps can be taken to keep them on course.

3.5 Whizz Impact Evaluation Framework

Impact Evaluation addresses a core part of Whizz's mission - namely, it ensures we are ***accountable to learning outcomes***. Whizz's Impact Evaluation Framework is based on **five key dimensions** of quantitative evaluation (our focus here is on outcomes that can be measured). Every impact evaluation that Whizz (or our partners) undertakes is based on some combination of these five dimensions.

1. **Source**: where the evaluation data is taken from (within the initiative or externally)
2. **Cohorts**: who is being compared (intervention group or control group)
3. **Sample**: who among the cohorts is evaluated (representative subset or whole group)
4. **Schedule**: how often the data is collected (baseline-midline-endline, or continuous)
5. **Evaluator**: who undertakes the study (initiative provider, external partner or both)

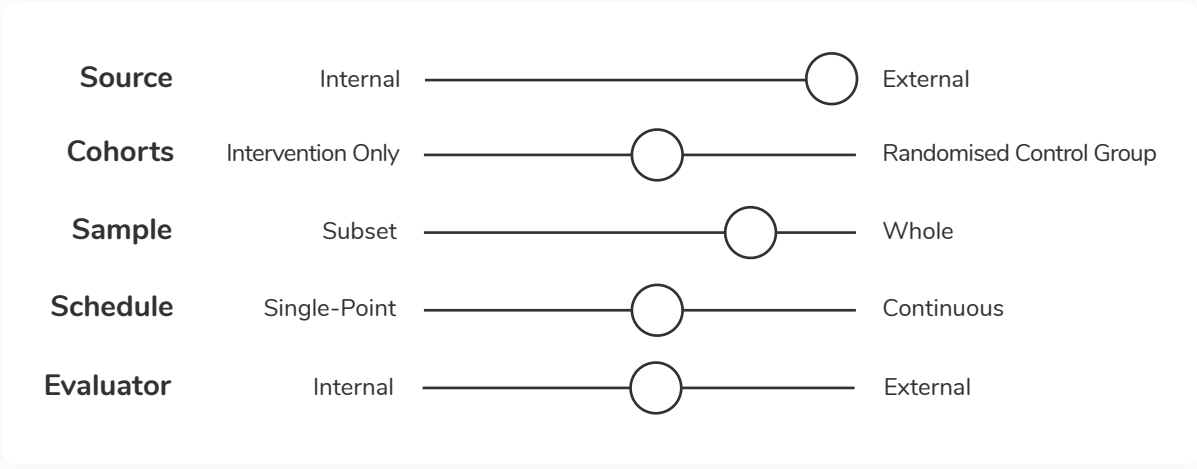


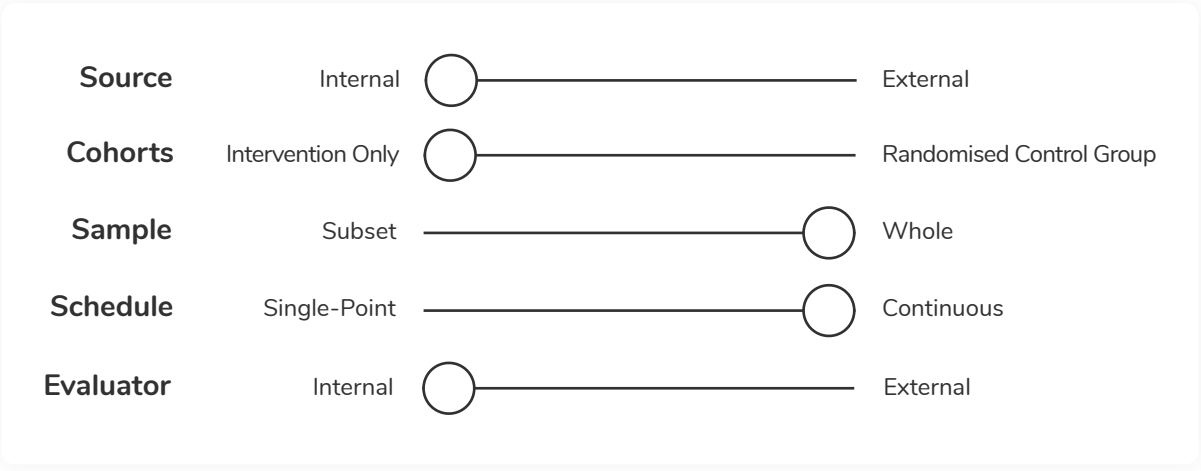
Figure 9: The five dimensions of impact evaluation, visualised as dials. Each dimension can be thought of as a continuum, with right-hand dials generally associated with more rigorous approaches.

It helps to visualise these choices as dials. As a general rule of thumb, choices situated to the right are associated with more rigorous evaluation (that said, the choices ultimately reflect the stated objectives and circumstances of each implementation).

4. Measures of impact

This section gathers a range of evidence that points to the efficacy of Whizz Education's work.

4.1 18-Month Learning Gains With One Hour Of Virtual Tutoring In First Year Of Use



We first explore the extent to which Maths Age grows with Usage in students' first year on Maths-Whizz. Usage includes all time spent learning on the virtual Maths-Whizz tutor, including consolidation and reinforcement areas like Replay. It can be interpreted as students' time on task on Maths-Whizz.

Our analysis is based on **47,119 students across all countries** who completed their initial assessment no earlier than January 1st 2016 and had access to Maths-Whizz for an average of at least fifteen minutes per week during their first year. Students who had a reassessment in this period were left out of the analysis to ensure that all reported improvements in Maths Age arose from progressing through the Maths- Whizz curriculum.

Figure 10 demonstrates the **strong positive correlation between Usage and Maths Age Improvement** – the more time students spend on Maths-Whizz each week, the more they progress through the curriculum. Students investing an average weekly Usage of **45-60 minutes achieved an average improvement of 1.36 years in their first year** on Maths-Whizz. Students who spent **an hour a week on Maths-Whizz achieved an average Maths Age improvement upwards of 1.5 years (18 months) in their first year**.

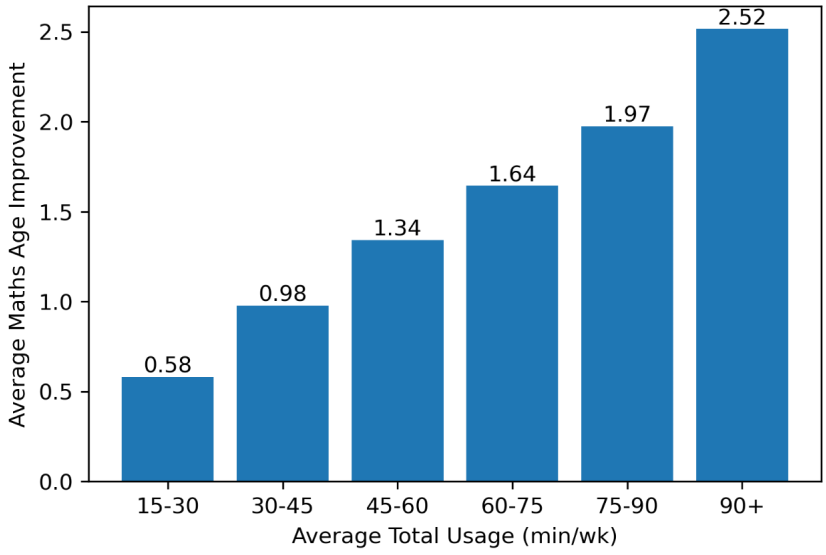


Figure 10: Usage vs First-year Maths Age improvement on Maths-Whizz

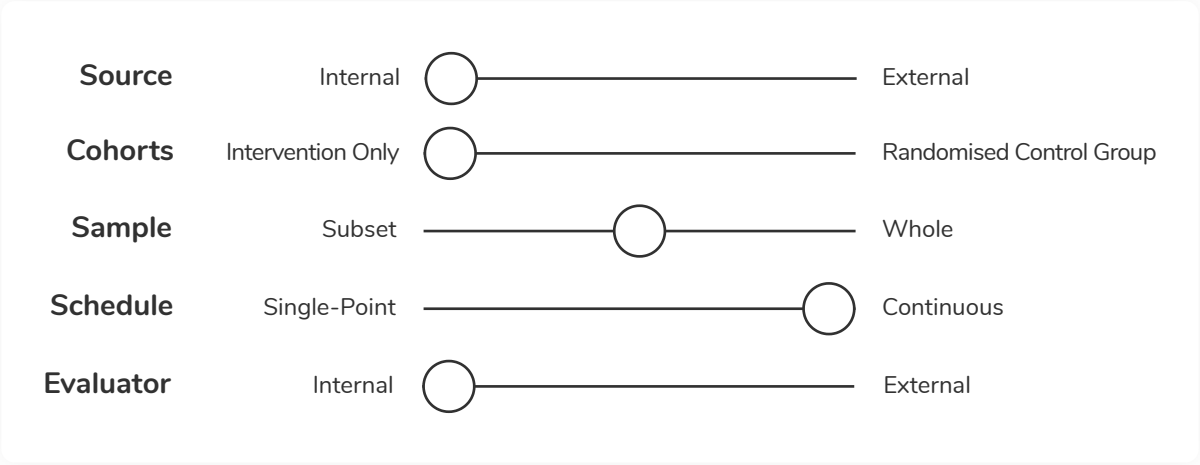
Smaller Learning Sessions Lead To Better Outcomes

A 2019 study carried out by the University of Oxford using data from the Maths-Whizz tutoring platform found that **educational outcomes are enhanced when students break up their learning into smaller sessions**[7].

By dividing an hour of learning into three sessions of twenty minutes apiece, rather than a single session of an hour, students can expect to increase their Progressions (number of learning objectives completed) by **up to a third**. Compounded over a whole year, this corresponds to a further Maths Age improvement of around **six weeks**.

This finding gives credence to the 'little and often' mantra that Whizz has espoused for several years, and that aligns with external evidence[8].

4.2 Doubling Of Learning Rates In Sub-Saharan Africa



The provision of virtual tutoring, by itself, results in a modest uplift of student learning outcomes. Learning gains are significantly enhanced, however, when this technology is implemented as part of **robust and holistic programme design** that engages multiple partners and stakeholder groups.

This was strongly demonstrated by findings from Project iMlango[9], a pioneering partnership with the Kenyan Ministry of Education, Science and Technology (MOEST) and the UK Foreign, Commonwealth and Development Office (then known as the Department for International Development). Whizz Education was part of a consortium that supported children in **205 schools** in Kenya who do not regularly attend school due to environmental, economic and societal issues by improving education outcomes in maths, literacy and life skills. Whizz led on the maths component of the project, delivering virtual tutoring to over **80,000 students** along with capacity building support and teacher training.

A benchmarking analysis at the baseline of the project established that students in those communities were advancing their learning by just 0.58 years each academic year.

Students who were able to access Maths-Whizz virtual tutoring for at least 30 minutes per week* **progressed at a rate of 0.68**; a modest gain but well short of the accelerated learning enjoyed by their peers in more developed contexts.

* The average Usage of students in this bracket was consistently around the 45-minute mark in each period of reporting, so the added learning gains cannot be attributed to additional time-on-task.

Deploying continuous course corrections as part of a partnership-led implementation approach, this figure gradually improved throughout the life cycle of the project, eventually more than doubling, leading to learning rates in line with students in Whizz's international territories.

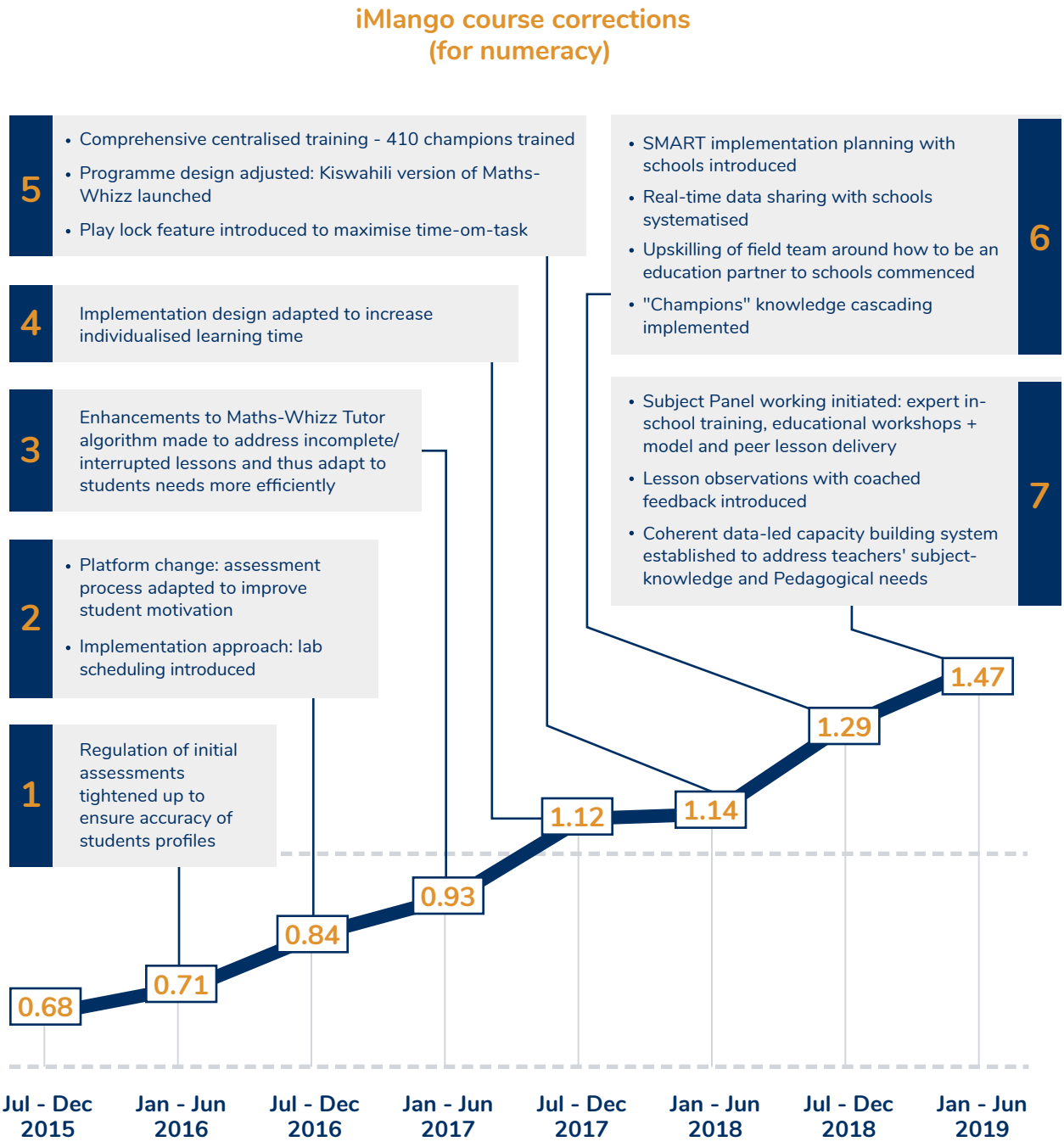
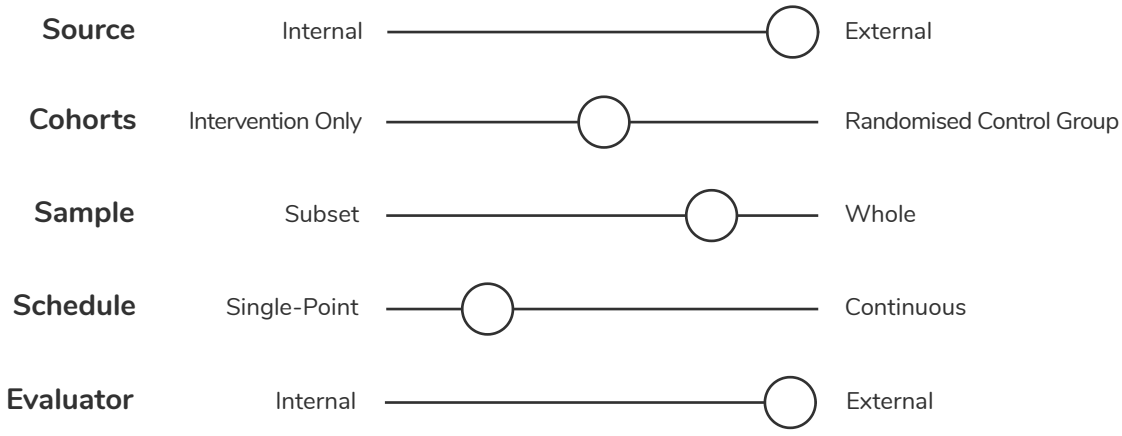


Figure 11: The evolution of learning progress rates in Kenya, indexed by course corrections that took place during the lifecycle of implementation

The (more than) doubling of learning progress rates can be attributed to several specific enhancements to product and implementation design, including:

- The introduction of **bilingual support** in Maths-Whizz to aid comprehension for students with low English literacy levels. Students experienced a **4pp increase in lesson pass rates** once they made use of the bilingual option, while **lesson time was reduced by 30 seconds**.
- **More responsive tutoring algorithms** following high incompletion rates on Maths-Whizz lessons, which led to a **10% reduction in lesson completion times**.
- **Timetabling and tight regulation of Maths-Whizz supervision** - teachers and school leaders were supported with explicit guidance on how to maximise learning within a supervised lab setting.

4.3 Independent Evaluation Of Whizz Education With Respect To National Assessments

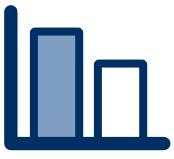


What follows is a brief summary of the main results from three separate external studies on the impact of Whizz's programmes on students' learning.

Evaluación De Impacto De Math-Whizz; El Caso De Aguascalientes (Mavrikis Et Al., 2017, UCL Institute Of Education)

Full study available on request.

In 2017 researchers from the UCL Institute of Education conducted a study in the Mexican state of Aguascalientes to investigate whether Maths-Whizz increased students' maths learning and motivation. They found that:



Students using Maths-Whizz saw a 6-percentage point larger average improvement in PLANEA (adapted) test scores compared to a control group.

Students using Maths-Whizz for at least five minutes per week saw a 9-percentage point increase in test scores after just 1 month.

60% of teachers identified MathsWhizz' approach or its impact on student motivation as key strengths (of 170 that responded to the relevant question).

The analysis examined data from 28,000 students in year 4 from the state of Aguascalientes, Mexico. Students had access to Maths-Whizz for 18 months prior to the evaluation period of September to October 2016. A comparison control group did not have access to Maths-Whizz for any of the period. It was found that students that had access to Maths-Whizz saw a greater increase in mean assessment scores than those in the control group. Furthermore, students with at least 5 minutes of weekly Maths-Whizz usage during the evaluation period saw significant and larger gains than both the control and low-usage Maths-Whizz students.

419 teachers completed an online survey about their use of Maths-Whizz, a number of interviews and classroom observations also took place. All pointed to "an overwhelming support for Maths-Whizz, and appreciation of the overall implementation". The study also included interviews with parents of participating students. All interviewees referred to changes in their children's behaviour and learning outcomes.

> Teacher Surveys Showed Overwhelming Support For Maths-Whizz, And Appreciation Of Its Overall Implementation.

Intelligent Tutoring Systems In K-12 Education: An Evaluative Study Of Maths-Whizz And Maths Age (Schlepps, 2015, UCL Institute Of Education)

Full study available on request.

In 2015, researchers at the UCL Institute of Education reviewed two datasets, from the United States and New Zealand respectively, to independently evaluate the impact of Maths-Whizz on external exams. They found that:

- Students at an elementary school in Washington state who were on Maths-Whizz enjoyed significantly larger gains on the STAR assessment when compared to control students at a nearby school.
- Usage on Maths-Whizz significantly correlated with gains in the e-assTTle national assessment of New Zealand.

> Baseline assessment data showed the 4th grade students at Enterprise to be well behind their peers at the control school. After just three months of tutoring with Maths-Whizz the Enterprise students had closed this achievement gap

The analysis of the STAR results looked at data for students from Enterprise Elementary School (Seattle) and a nearby control school with comparable demographics. Students in grades four and five at Enterprise Elementary had access to Maths-Whizz whilst those at the control school did not. Baseline assessment data showed the 4th-grade students at Enterprise to be well behind their peers at the control school. After just three months of tutoring with Maths-Whizz, the Enterprise students had closed this achievement gap. The 5th-grade students at Enterprise started ahead of the comparative control students and, within the same time period, significantly extended their advantage.

Whizz has since replicated the findings for the STAR assessment in 2016. Students at Rainier View Elementary School achieved learning gains even higher than those found in Enterprise.

The Impact Of An Online Tutoring Program On Mathematics Achievement (Clark And Whetstone, 2014)

The Journal of Educational Research, DOI: 10.1080/00220671.2013.833075.

In 2014, researchers Amy Clark and Patti Whetstone investigated the impact of Maths-Whizz on students in Kentucky.

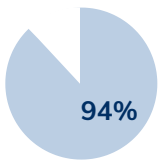
They found that:

- There was a statistically significant relationship between Maths Age and state test scores.
- 94% of teachers said that they were either satisfied or very satisfied with their students' progress on Maths-Whizz

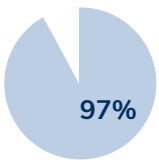
The analysis of test scores looked at the attainment and progress over the course of one year for 106 students at an elementary school in Kentucky. Students in grades three to five had access to Maths-Whizz. Controlling for grade, students' Maths Age was found to be a significant predictor of end-of-year assessment score. Low-ability students achieved the greatest improvement over the year.

35 teachers from 15 elementary schools that used Maths-Whizz completed a survey on the use of Maths-Whizz to support mathematics instruction. Teachers overwhelmingly reported positive student reaction to the programme, almost all were very satisfied or satisfied with student enjoyment (97%) and student enthusiasm for the program (94%). Teachers reported using Maths-Whizz for reinforcing concepts, introducing new material and providing remediation. Almost all were very satisfied or satisfied with the mathematical content (97%), curriculum (97%) and its alignment (97%).

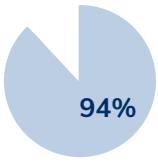
Teachers Using Maths-Whizz Were Satisfied With...



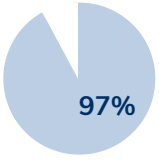
Student progress



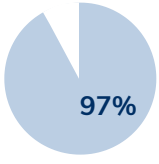
Student progress



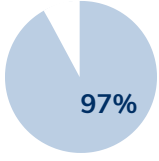
Student enthusiasm for the programme



Mathematical content



Curriculum



Alignment

4.4 What Our Customers Say

> Whilst many of our children regularly access the programme from home, the usefulness of being able to utilise Maths-Whizz in the current pandemic has been very well-received by our staff, pupils, and parents. The ability to check progress whilst also allowing children to still see a purpose for maths has been hugely motivational. In such unprecedented times, such online tools and options are great to support the balance of remote learning.

Rachel Davis MBE
Headteacher
Little Sutton Primary, United Kingdom

> In terms of results, obviously last year was a bit different with the restrictions and lockdowns. We saw our progression rates slow in a range of subjects due to the pandemic except maths, which remained steady, and this is due to the children's access to Maths-Whizz. It's been such a vital tool to be able to scaffold to their ability. It means they have been able to engage with maths learning at home, while their parents carry on with their lives.
> While students have been able to attend school, 87% of our children making accelerated progress when completing their recommended amount of Maths Whizz. This means the children had advanced further than their chronological age compared with the number of weeks exposed to the virtual tutor.

Josh Still
Maths Subject Leader and Lead Teacher
Valley Invicta Primary School at Leybourne Chase, United Kingdom

> We've found since implementing Maths-Whizz, that our pupils have become better mathematicians because it enables them to practice what we teach in lessons. It's tailored to the needs of each child and pitches work at the right level. It's also visual and appealing, providing structure balanced according to need.

Chris Edwards
Headteacher
Reedham Primary School, United Kingdom

“I am very pleased that our province has been selected for this project. We have been monitoring your activities in our schools. There is a lot of enthusiasm among students and teachers. Unfortunately the challenges of our city are real. We have no electricity and our internet connection is not stable.

Mr Mungeta Herve
Proved of Mbandaka, Democratic Republic of Congo

“We were worried about our Scientific classes. The students leaving Y8 didn't want it anymore. Thanks to Maths-Whizz the students regained confidence in themselves. Most of them tell us that they are no longer afraid of mathematics. As a positive consequence of Maths-Whizz here at the Institut Fraternite, this year the number of students enrolled in the Scientific options has almost doubled compared to last year. Our observation is that we have gone from 33 students last year to 54 this year.

Brother Arthur Nselolo
Director
Institut Fraternite, Kikwit, Democratic Republic of Congo

“Our school has gained popularity since the arrival of these computers. Our enrollment has almost doubled this year. And Maths-Whizz has given these computers a purpose. We didn't know what to do with them.”

Assumani Blanchard
Headteacher
Institut du Kasai, Tshikapa, Democratic Republic of Congo

“Topic Focus helps me to be in control of what my learners are doing while using Maths-Whizz tutor in the lab. Because of this, I am able to pinpoint specific topics I want the students to improve on and assign that to them. It makes my work easier because I have 70 students in the class.

Kambi ya Waya Primary School
Kambi ya Waya Primary School, Kenya

“Maths-Whizz has been very effective for us at Cambridge International School to support maths learning, and more so in distance learning. I especially recommend using the links to the relevant curriculum activities for online lessons. Maths-Whizz has also been very useful in planning effective interventions. Teachers can easily identify the learning gaps in a student’s learning through the clear Maths-Whizz progress reports and set the targets using the focus topic for practice. Students enjoy these interactive activities.
Parents, too, have noticed growing confidence in their child and their interest in maths. I appreciate all the great efforts by the Maths-Whizz team in making it one of the best maths online tutor services to support maths learning from Year 1 to 8 and would happily recommend it to all schools, especially those following the UK National Curriculum.”

Nargis Nadir
Primary Maths Curriculum Leader
GEMS CAMBRIDGE INTERNATIONAL SCHOOL, DUBAI

“This offline Teachers’ Resource will be of great help to myself and my colleagues. The majority of my students have special needs and learn best when lessons are interactive and catchy such as Maths-Whizz. The fact that it can be accessed offline is a plus because I can use them even in the furthest classes that have limited access to a WIFI connection.

Mr Gome
Maths teacher
Sahajanand Special School, Kenya

> “Without a doubt, Maths-Whizz has accelerated our students’ learning, making it feel more like play than a chore. In addition to that, the teacher can assign the exercise related to the topic being taught, which helps the student excel in that topic. Also, it gives a simple but thorough assessment of each child.

Jaseena Appamkandam
Head of Kindergarten
The Central School, Dubai

5. Discussion and recommendations

The varied evidence base presented here grants us confidence in the efficacy of virtual tutoring.

The latest correlational analysis of how time-on-task (Usage) compares with learning gains (Maths Age improvement) is consistent with historical findings and suggests that one hour a week of individualised tutoring remains sufficient to drive an eighteen-month average first year learning improvement.

This edition of the Proof Pack sheds light on the enabling factors for efficacy. For the first time, we have a statistical foundation for the claim that breaking a given amount of Usage into multiple smaller learning yields additional learning gains.

The example of Project iMlango demonstrates the impact that robust and comprehensive programme design can have on student learning outcomes. When continuous course correction is embedded into the deployment of virtual tutoring, modest uplifts from individualised learning can, over the course of months and years, make way for transformational impact on student learning. At the core of this approach is a collaborative approach to implementation among multiple stakeholder groups, each bringing their expertise to bear on the learning and teaching of mathematics.

It must be acknowledged that while the efficacy of virtual tutoring is now well established, ensuring its effectiveness at scale remains an open question for future research and development.

Three separate impact studies show a positive correlation between Maths-Whizz Usage and/or Maths Age with external measures of student attainment. There are, of course, several confounding variables that influence both Maths Age and external performance data, such as the quality of teaching, a child's home environment and exposure to other learning materials. For that reason, we advise caution against inferring strong causal links between Maths-Whizz and student attainment. Nor do we attribute improved learning outcomes exclusively to the Maths-Whizz virtual tutor, given the rich variety of ways in which the platform can be implemented.

That said, the studies are situated in different educational contexts, thus overcoming the threat of external validity and pointing to the reliability of Maths Age as a measure of students' maths attainment. These findings suggest strong alignment between the learning students enjoy through Maths-Whizz and the requirements of various curricula and assessment frameworks.

The evidence presented in this Proof Pack inform the following recommendations for partners:

- Integrate virtual tutoring within the unique context of your environment

Like any technology, virtual tutoring is most effective when implemented in service of your educational goals. Your adoption of virtual tutoring should reinforce your existing curriculum, assessment and instruction strategies. A thorough plan should be designed from the outset that specifies the fine details of implementation, from scheduling to real-time monitoring of student learning data.

- Work in partnership with multiple stakeholders

If it takes a village to raise a child, then it takes an entire education ecosystem - students and teachers, programme managers and education success partners, policymakers and donors - to help them fulfill their learning potential. EdTech is multi-faceted and it draws on skills and perspectives from a range of fields. Do not feel you have to tackle your thorniest problems alone; ally with partners who share in your goals and can support your strategies.

- Adopt a long-term mindset

Transformational change requires a years-long commitment and outset. An ethic of continuous improvement ensures that lessons can be learned and acted upon throughout the lifecycle of implementation. Individual course corrections, informed by real-time measurement and contextual understanding of your environment, combine to achieve tremendous impact in the long run.

- Schedule quality learning time every week

One hour of Maths-Whizz virtual tutoring remains sufficient to drive an eighteen-month average improvement in the first year of implementation. This does rely on focused, quality learning time, which can be aided by

  - Scheduling an hour a week of virtual tutoring for every student
  - Committing to a learning plan during holiday periods to prevent learning loss
  - Breaking learning into 15-20 minute sessions at a time

As with any individualised approach, these recommendations should be applied within the context of your environment and the specific needs of your students. While we discourage excessive usage of Maths-Whizz, some students may benefit from up to two hours of virtual tutoring each week, while high attaining students or younger students may only require 30-60 minutes to make good progress.

Whizz's Education Success Partners are on hand to guide clients through these core aspects of implementation.

Whizz Education is committed to raising standards in mathematics, and to furthering our investigation of the impact of our programmes. Several impact studies are ongoing all over the world and this Proof Pack will be updated periodically to reflect up-to-date evidence and insight.

We welcome the opportunity to discuss ways to work towards achieving transformational change in learning outcomes for children around the world. Contact us at whizzeducation.com or email **global@whizzeducation.com**

References

1. https://sdgs.un.org/goals/goal4
2. Whizz Education, Summer Learning Loss, April 2021
   Retrieved from https://www.whizzeducation.com/wp-content/uploads/Summer-learning-loss-SCREEN.pdf
3. Whizz Education, 'Measuring the Impact of COVID-19 on Learning in Rural Kenya', April 2021
   Retrieved from https://www.whizzeducation.com/wp-content/uploads/Kenya-Covid-Impact-SCREEN.pdf
4. Bloom B.S., 'The 2 Sigma Problem: The Search for Methods of Group Instruction as Effective as One-to-One Tutoring', Educational Researcher, 13(6), 1984, pp. 4-16.
5. VanLehn K., 'The Relative Effectiveness of Human Tutoring, Intelligent Tutoring Systems, and Other Tutoring Systems, Educational Psychologist, 46(4), 2011, pp. 197-221.
   http://www.public.asu.edu/~kvanlehn/Stringent/PDF/EffectivenessOfTutoring_Vanlehn.pdf
6. Kulik J.A. & Fletcher J.D., 'Effectiveness of Intelligent Tutoring Systems: A Meta-Analytic Review', Review of Educational Research, 86(1), 2016, pp. 42-78.
7. Bond O., 'Understanding the effect of usage behaviour on learning rates', EPSRC Centre for Doctoral Training in Industrially Focused Mathematical Modelling, 2019.
   Retrieved from https://www.whizzeducation.com/wp-content/uploads/Usage-schedules-lay.pdf
8. Reisner E.R et al., 'A review of programs involving college students as tutors or mentors in Grades K-12.' U.S. Department of Education, 1990.
   Retrieved from https://eric.ed.gov/?id=ED318832
   See also Education Endowment Foundation, One to one tuition: https://educationendowmentfoundation.org.uk/education-evidence/teaching-learning-toolkit/one-to-one-tuition.
9. www.imlango.com

Contacts Us

Our Offices

United Kingdom

Whizz Education Ltd
Macmillan House
Platform 1, Paddington Station
London, W2 1FT
United Kingdom

Tel: +44 (0) 203 328 6564
Email: support@whizz.com

USA

Whizz Education, Inc.
PO Box 3060,
Roanoke, VA. 24015,
United States

support@whizz.com

KENYA

Whizz Education
Karen Office Park,
Hemingways Building
PO Box 2101-00502
Nairobi, Kenya

+254 734 774 972
kenya@whizzeducation.com

UAE

Whizz Education
ED-18 Block 9
Dubai Knowledge Park
PO Box 98427
Dubai, UAE

Tel: +971 4 454 8340
Email: support@whizz.com

Our Agents

Thailand

Nanmee Books
11 Soi Sukhumvit 31 (Sawasdee)
Sukhumvit Road, Klongtoey Nua
Wattana, Bangkok, 10110
Thailand

Tel:+66 (0) 2662 3000
Email: mathswhizz@nanmeebooks.com

New Zealand

iLearn Interactive
PO Box 200
Mangawhai, 0540
New Zealand

Tel: +64 9 431 4466
Email: info@ilearn.co.nz

www.whizzeducation.com