



Whizz Education

Proof Pack, July 2020

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Executive Summary

Whizz Education is a partner accountable to learning outcomes. Since 2004, we have partnered with parents, schools and ministries of education around the world to deliver individualised learning programmes. The Maths-Whizz virtual tutoring platform has reached over 1.5 million students across the globe and is proven to accelerate learning.

Maths-Whizz Accelerates Students' Progress in Mathematics

- Our research shows that students who use Maths-Whizz for 60 minutes a week typically enjoy accelerated learning gains, increasing their Maths Age (Whizz's international measure of maths knowledge) by an average of 18 months in their first year of use. More precisely:
 - o There is a positive and statistically significant correlation between students' time on task on Maths-Whizz ('Usage') and their improvement in Maths Age.
 - o Students who used Maths-Whizz for 45-60 minutes increased their Maths Age by an average of 1.42 years in their first year of use.
 - o 73% of students with 45-60 minutes of usage a week saw accelerated knowledge gains.
- Studies carried out by independent evaluators have shown a relationship between learning gains on Maths-Whizz and increased performance in external assessments. This trend has been observed worldwide:
 - o In Mexico, Mavrikis (2017) found that students on Maths-Whizz had a greater average improvement in PLANEA (adapted) score following a one-month intervention. Furthermore, teachers and parents expressed strong positive views on the impact of Maths-Whizz.
 - o Schleppe (2015) has shown that students on Maths-Whizz made significantly larger gains in the STAR assessment than comparable peers in the US. There was also a significant relationship between Maths-Whizz Usage and e-assTTle assessment score in New Zealand.
 - o Clark and Whetstone (2014) demonstrated a statistically significant relationship between Maths Age and state test scores in Washington, US. They also found that 94% of teachers were satisfied with student progress and engagement on Maths-Whizz.



73% of students with 45-60 minutes of usage a week saw accelerated knowledge gains.



Evidence of Impact

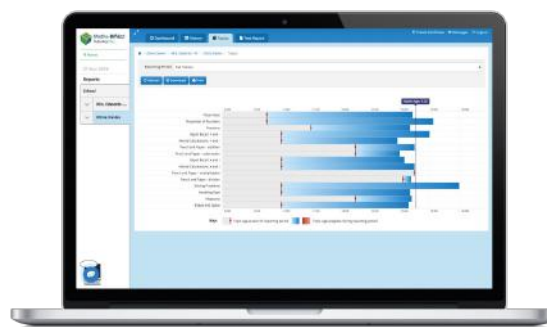
In this report we explore whether the pedagogical foundations of Maths-Whizz translate into positive impact on student learning outcomes. Progress in Maths-Whizz is measured through Maths Age.

What is Maths Age?

When a student first starts with Maths-Whizz, a diagnostic assessment (in the form of an adaptive test that takes, on average, 45 minutes to complete) identifies the extent of their core mathematical knowledge. Based on their performance, a “Maths Age” is calculated; first for individual topics and then an overall average (arithmetic mean). The calculation takes into account the expectations of the underlying Maths-Whizz curriculum, as set out by leading educationalists.

Maths Age has a natural interpretation: a Maths Age of 8.5, for example, means the student is performing at the overall level we would expect of an eight-and-a-half year old. Higher attaining students may find their Maths Age is ahead of their actual age, whereas struggling students may find their Maths Age is lower than their actual age. Typically, a student’s knowledge may vary across the different topics, e.g. an 8 year old may find that she has a Maths Age of 8.5 in Shape and Space, but only 7.25 in Fractions.

Having established the starting profile of each individual student, Maths-Whizz delivers lessons suitable to that profile through the automated Tutor, which adapts to each student’s unique needs. Thus the assessment process is continuous and Maths-Whizz remains flexible at all times to adjust the course of lessons, just like a human tutor would do, depending on how the child is progressing. The student’s performance in each lesson is tracked continuously in each topic, and Maths Age is updated in real-time to reflect their progress.



Why Maths Age?

Maths Age brings three key benefits to students, parents, and teachers:

- Gives visibility to each student’s individual strengths and weaknesses, enabling a differentiated approach that meets them where they are;
- Allows for real-time, low-stakes comparisons between students, classes, schools and even districts;
- Reflects the dynamic nature of maths ability, liberating students of fixed labels that all too often limit their growth.

We will focus on two key questions around impact evaluation:

1. How does Maths Age correlate with usage on Maths-Whizz?
2. How do Maths-Whizz usage and Maths Age compare with external measures of student attainment?

Our evidence to date suggests that Maths Age grows predictably with usage, informing our recommended usage of 60 minutes/week to achieve accelerated learning. Moreover, three separate impact studies will be presented in which Usage and Maths Age are shown to correlate with local, independent measures of student attainment.

How does Maths Age grow with Usage?

In this section we 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 31,903 students across all territories who completed their initial assessment no earlier than January 1st 2015 and 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 1 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 achieving an average weekly Usage of 45-60 minutes can expect an average improvement of 1.42 years in their first year on Maths-Whizz.

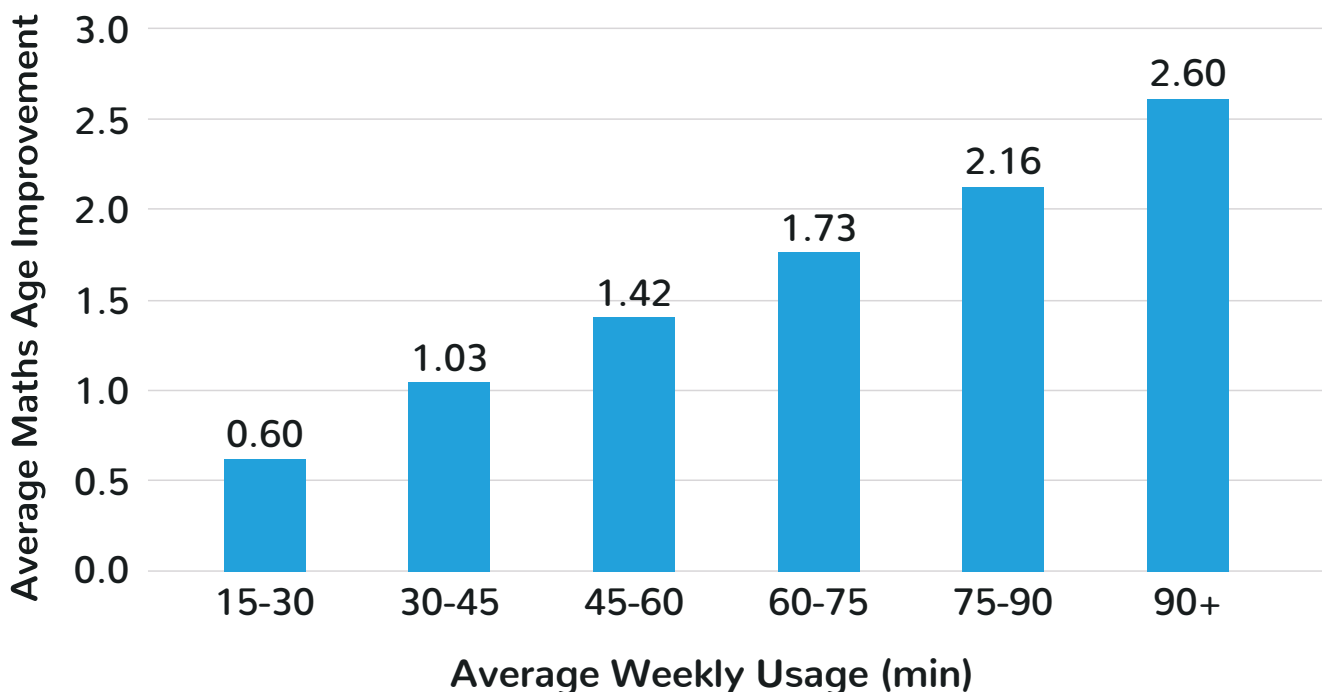


Figure 1: Average Maths Age improvement in the first 12 months of Maths-Whizz

Students are said to have accelerated their learning if they achieve a Maths Age improvement greater than the period of time they have been using Maths-Whizz. Over a 12-month period, therefore, accelerated learning corresponds to a Maths Age Improvement of more than 1.00. Figure 2 reveals that the percentage of students achieving accelerated learning increases through the Usage bands.

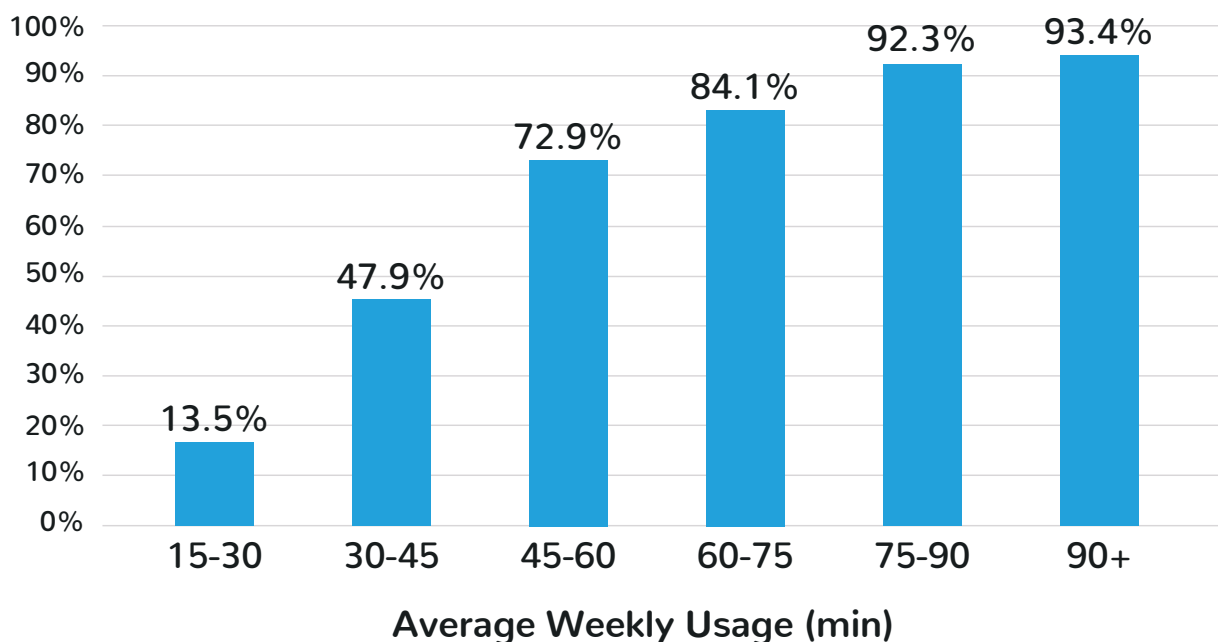


Figure 2: Percentage of students with accelerated progress

Discussion

Whizz Education has always been committed to demonstrating the impact of our work on students' learning outcomes. In 2009 we published our first large-scale analysis, which showed that students who use the Maths-Whizz tutor for 60 minutes per week in their first year accelerate their learning, achieving 18 months of progress. This finding has been replicated several times, with each study confirming the same patterns of growth.

This latest study incorporates students from all territories, including those in aid funded projects that represent some of our most challenging environments. As one might expect, there is some variation in the rates of progress observed for a given amount of usage. We do not present the details here as they have been covered extensively in separate analyses. In any case, the positive correlation between Maths Age Improvement and Usage is common throughout the world. As we make ongoing enhancements to the Maths-Whizz product and service, we expect to see increased rates of progress across all territories.

We are always exploring new ways to make learning more efficient for students while supporting them to master and retain core curriculum content. As such, the data presented in this analysis is an overall reflection of the service at the present time and this analysis is the subject of ongoing research.

How do Usage and Maths Age compare with external measures of student attainment?

What follows is a brief summary of the main results from three separate studies on the impact of Maths-Whizz 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 Maths-Whizz' 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 1.5 years 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 score 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.

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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.

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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 second data set contained the e-assTTle assessment scores for a set of New Zealand students that had access to Maths-Whizz. Controlling for initial achievement, a statistically significant correlation was found between time spent learning on Maths-Whizz (i.e. Usage) and e-assTTle scores.

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.

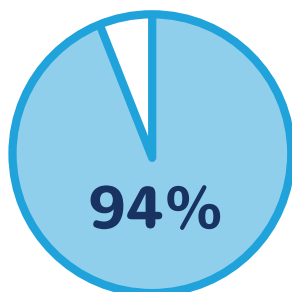
They found that:

- 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.

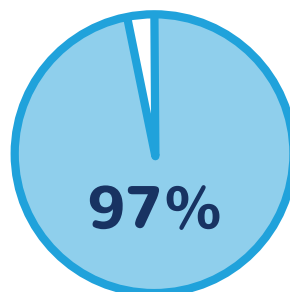
The analysis of test scores looked at the attainment and progress over the course of one year for 106 students at an elementary school in Kentucky. Students in grades three to five had access to Maths-Whizz. Controlling for grade, students' Maths Age was found to be a significant predictor of end-of-year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

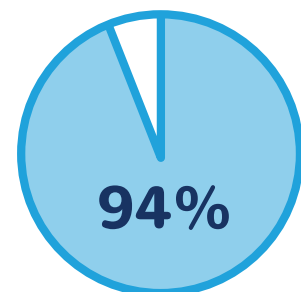
Teachers using Maths-Whizz were satisfied with...



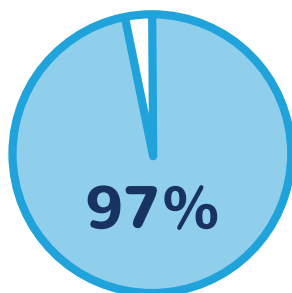
Student progress



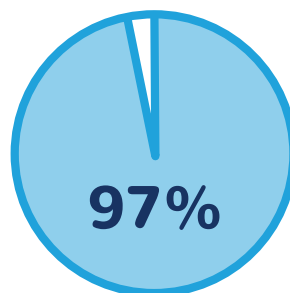
Student enjoyment



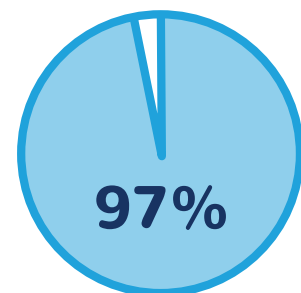
Student enthusiasm for the programme



Mathematical content



Curriculum



Alignment

Discussion

Three separate impact studies show a positive correlation between Maths-Whizz Usage and/or Maths Age with external measures of student attainment. 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 progress metric.

Of course, there are 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 do not infer causal links between Maths-Whizz and student attainment. Nor do we attribute improved learning outcomes exclusively to the Tutor, given the rich variety of ways in which the Maths-Whizz Suite (including Teachers' Resource) can be adopted.

That said, these studies give us confidence that the pedagogical basis for Maths-Whizz translates into positive and meaningful impact on student learning. The consistency with which Maths Age correlates to different measures of student attainment indicate a strong alignment between the learning students enjoy through Maths-Whizz and the requirements of various curricula and assessment frameworks.

Whizz Education is committed to raising standards in mathematics, and to furthering investigation of the impact of Maths-Whizz. Several impact studies are ongoing all over the world.

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These studies give us confidence that the pedagogical basis for Maths-Whizz translates into positive and meaningful impact on student learning.

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Conclusions and Recommendations

Based on the relationship between Usage and Maths-Age, Whizz Education maintains the usage recommendations presented in previous Proof Packs.

In particular:



- **Underachieving students**, or students who need more time to absorb maths concepts, are recommended to use the Maths-Whizz Tutor for 90 minutes a week. Based on the most recent data, the vast majority of students at that level of Usage accelerate their learning in maths.



- **The majority of students** should aim for 60 minutes per week, with which they can expect to increase their Maths Age by 18 months in the first year.



- **High attaining students** will typically have a Maths Age beyond their actual age. They can be challenged to progress through the curriculum at the expected rate with just 30-45 minutes per week on Maths-Whizz.

The relationship between Usage and Maths Age has been presented as an overall summary but will typically vary by context, and will evolve with further enhancements to the Maths-Whizz Tutor. As such, these recommendations should be interpreted as a loose guide; the specific approach should be considered with the Whizz Education Success Manager in consultation with parents, teachers and school leaders.

Our impact studies all point towards a positive correlation between Usage, Maths Age and scores on local assessments. That these results hold up across multiple educational contexts give us further confidence in the recommendations above.

Maths-Whizz is such an excellent tool for building a child's confidence and motivation that most students will derive significant benefit from regular usage for even shorter periods than are recommended.

Note that some of this Usage should be devoted to Topic Challenge, where students can consolidate their knowledge. The optimal split between Tutor and Topic Challenge is an area of further research for Whizz.

Appendix

Usage in first year (mins/wk)	# Students
15-30	20,538
30-45	7,180
45-60	2,492
60-75	900
75-90	386
90+	407

Table 1 – Number of students grouped by their average weekly usage during their first 12 months on Maths-Whizz.

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