



Math-Whizz® Proof Pack

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Math-Whizz[®]
Brought to you by Whizz Education

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Executive Summary

Math-Whizz is [Whizz Education](#)'s award-winning online suite of math services and resources. The suite helps parents, schools, districts and educational stakeholders around the world to raise standards and enjoyment in math and to address students' individual learning needs. Math-Whizz won the Innovation Award at the 2011 Education Resources Awards organized by the British Educational Suppliers Association (BESA). The Math-Whizz suite won the award for Best International Digital Resource at BETT in 2016.

Maths-Whizz consists of three related components. The [online virtual Tutor](#) guides each student through a comprehensive maths curriculum, starting with an initial assessment and then delivering lessons according to their individual needs. Progress is reported to teachers and parents through [real-time Reporting](#) that gives visibility to each student's strengths and weaknesses across different topics. Reports are based on Whizz's *Maths Age* metric, which has been established as a reliable measure of student progress and can also be used to compare performance between classes and even schools and districts. Finally, the collection of lessons and instructional resources contained in [Teachers' Resource](#) enables lesson planning, richer classroom dynamics and deeper learning.

Math-Whizz is most effective when these three components are used in close concert. Whizz Education's Customer Success team is dedicated to supporting teachers to adopt Math-Whizz in ways that serve the unique context of their learning environment.

Over the last ten years, Math-Whizz Teachers' Resource, Math-Whizz Tutoring Plus and the Math-Whizz Suite as a whole have been implemented successfully in over 6,000 schools worldwide. At least 1,000,000 students have benefited in multiple countries, more than a third of these students having been tutored by Math-Whizz. In the UK, Math-Whizz has been highly effective in both State and independent private schools. In the USA, schools/school districts in a number of states are using Math-Whizz services, including Alaska, California, Hawaii, Kentucky, Michigan, New York, Oregon and Washington State. Several schools in the UAE and New Zealand are into their fourth or fifth year of using Math-Whizz, while we have also had significant adoptions of Math-Whizz in their local language by schools in Kazakhstan, Russia and Thailand. Whizz Education is a proud partner of iMlango, a DFID backed program, supplying Math-Whizz in English to over 100,000 students, including many marginalized girls and boys in approximately 200 rural communities in Kenya. A further implementation of Math-Whizz in Spanish across 125 schools in the state of Aguascalientes in Mexico has been expanded to address the individual learning needs of 50,000 students.

This pack is divided into four parts. Firstly, we outline the *Pedagogical Foundations* that underpin the Maths-Whizz offering. The second part is dedicated to *Evidence of Impact* on student learning outcomes across multiple educational contexts. The central metric of interest is *Math Age*, which is first correlated against student usage, and then compared with independent measures of student attainment in four separate educational contexts.

The third part gathers a summary of best practices in adopting Math-Whizz, informed by these findings. We conclude in the final part with some thoughts from the people that matter the most – our students, teachers and parents – on their experiences with Math-Whizz.

1. Pedagogical foundations of Math-Whizz

The Math-Whizz Tutor has been designed to simulate the behavior of a human tutor. It is governed by the following educational principles to ensure a high quality, personalized learning experience for every child.

Adaptive tutor delivers a personalized curriculum journey for all students

The Math-Whizz Tutor is based on automated lesson delivery that adapts to each child's individual needs and pace of learning. Lessons are chosen at the appropriate level of difficulty, based on the child's past performance, to give them learning experiences within their **Zone of Proximal Development** (Vygotsky, 1978). Math-Whizz champions **mastery learning** (Bloom, 1984): the tutor will not allow students to progress to the next learning objective within a topic until they have passed both the exercise and test.

Content supports basic mastery of core skills and concepts

The Math-Whizz curriculum consists of over 1,200 learning objectives, each covered by an animated exercise and most by a related test. Students encounter Math-Whizz content in Tutor, and teachers can also create mixed worksheets and use Replay mode to provide opportunities for further practice.

All Math-Whizz content is created through months of close consultation with educationalists and supports multiple strands of mathematical learning including **procedural fluency** and **conceptual understanding** (as defined, for example, by Kilpatrick, Swafford, & Findell, 2001).

Math-Whizz Suite supports blended learning

As highlighted by our case studies from across the world, the Math-Whizz Suite adapts to the context of each classroom, enabling a range of blended learning models (Clayton Christenson Institute, 2013).

For the Tutor, Whizz recommends 45-60 minutes of use per week. Students may work towards this goal in **Lab Rotation**, or as part of the **Flipped Classroom** model, supplemented by school-driven homework policies. Instructors can then develop these ideas in the classroom using Teachers' Resource (TR), which includes access to content, as well as an interactive whiteboard for more exploratory learning tasks.

Game mechanics drive student engagement

Math-Whizz is an **immersive game-like environment** that encourages learning through reward structures. For example, students can earn credits through usage and performance, which can then be used to buy virtual goods from the Math-Whizz shop. Students can compete against one another in Challenge mode, which encourages reinforcement of core skills and concepts learned in Tutor mode.

Math Age fosters growth mind-set

The Math Age metric of overall ability reinforces a **growth mind-set** (Dweck, 2007) in students and teachers as it gives a tangible measure of progress over time and shows them that math ability is dynamic and grows with sustained effort and practice.

2. Evidence of Impact

In this section we explore whether the pedagogical foundations of Math-Whizz translate into positive impact on student learning outcomes. Math-Whizz progress reports are based on an underlying metric of attainment called *Math Age*.

2.1 What is Math Age?

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

Math Age has a natural interpretation: a Math 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 Math Age is ahead of their actual age, whereas struggling students may find their Math Age is lower than their actual age. Typically, **a student’s ability may vary across the different topics**, e.g. an 8 year old may find that she has a math age of 8.5 in Shape and Space, but only 7.25 in Fractions.

Having established the starting profile of each individual student, Math-Whizz delivers lessons suitable to that profile through the automated Tutor that adapts to each student’s unique needs. Thus **the assessment process is continuous** and Math-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 Math Age is updated in real-time to reflect their progress.

Why Math Age?

Math 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 math ability**, liberating students of fixed labels that all too often limit their growth.

We will focus on two key impact questions:

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

Our evidence to date suggests that Math Age grows with usage with some measure of predictability, informing our recommended usage of 45-60 minutes/week to achieve accelerated learning. Moreover, four separate impact studies will be presented in which usage and Math Age are shown to correlate with local, independent measures of student attainment.

2.2 How does Math Age grow with usage?

In this section we explore the extent to which Math Age grows with usage in students' first year on Math-Whizz. This analysis is based on 12,869 students who were active as of July 2016 (i.e. had a valid license), had their initial assessment no earlier than Sep 1 2014 and used Math-Whizz for at least 5 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 Math Age came about through progress in students' Math-Whizz tutoring journeys. The statistics that follow are based on the arithmetic mean of the students within each usage bracket.

The data shows that students who use Math-Whizz for between 30 and 45 minutes per week over the course of their first year improve their Math Age by **1.18 years**, slightly more than the expected amount (i.e. a whole year). Students with usage between 45 and 60 minutes per week enjoy accelerated progress, increasing their Math Age by **1.57 years** over the course of their first year. The learning gains continue to increase with higher usage levels, with students in excess of 60 minutes per week exhibiting gains upwards of **1.95 years** in their first year. Improvement appears to stabilize after the 90-minute mark.

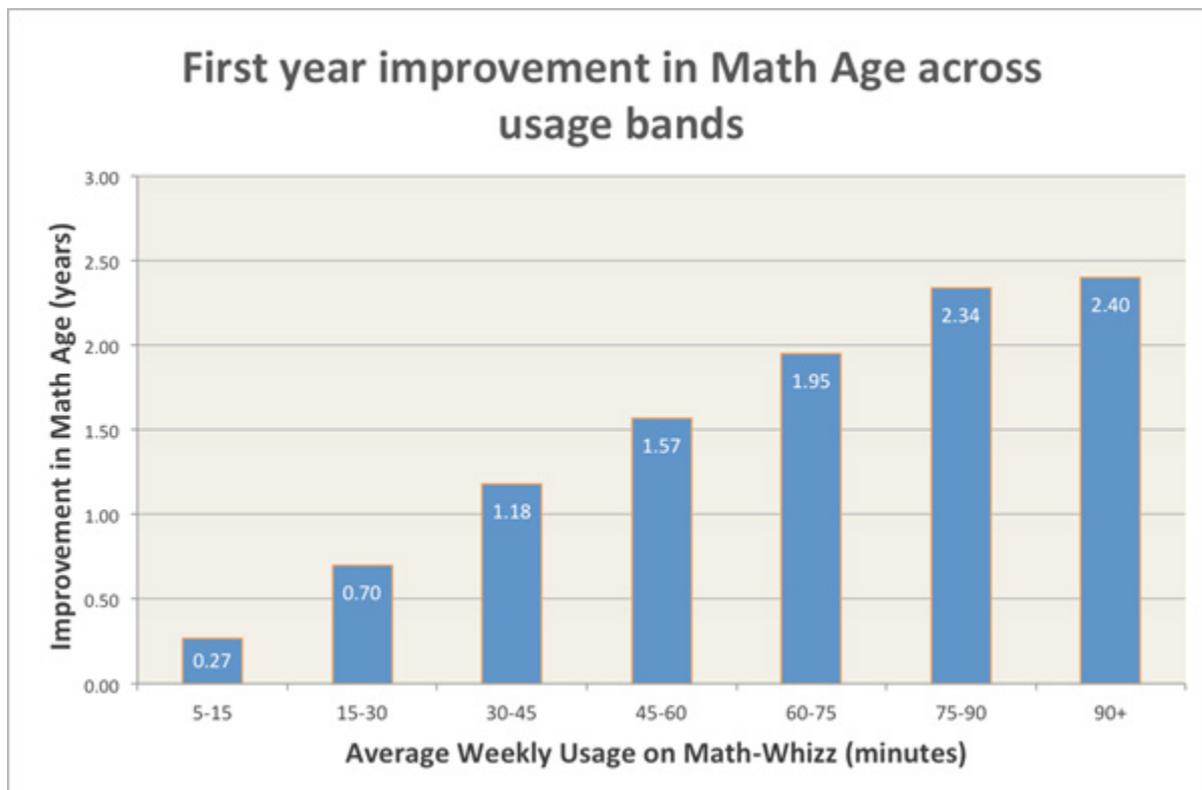


Figure 1: Math Age Improvement vs Weekly Usage in first year

Localized regression modelling allows us to estimate the expected Math Age Improvement for a given amount of usage. Our analysis shows that the expected Math Age Improvement in the first year of usage for students using Math-Whizz 30 minutes a week is **1.03 years**. The first year Improvement rises to **1.37** for students on Math-Whizz for 45 minutes per week and **1.90** for 90 minutes per week.

A key goal of Math-Whizz is to help students accelerate through the curriculum. A student is said to accelerate if their Math Age improves by an amount greater than the length of the reporting period (which is one year throughout this analysis). Of course, students who have fallen behind in the curriculum are required to accelerate to get up to speed. The following figure shows **that well over half of students who use Math-Whizz for 30-45 minutes per week can expect to accelerate** through the curriculum over the course of their first year, with **three quarters of students within the 45-60 usage bracket also accelerating**. This trend continues upward through to usage levels of 90+ minutes/week, by which point virtually all students enjoy accelerated learning.

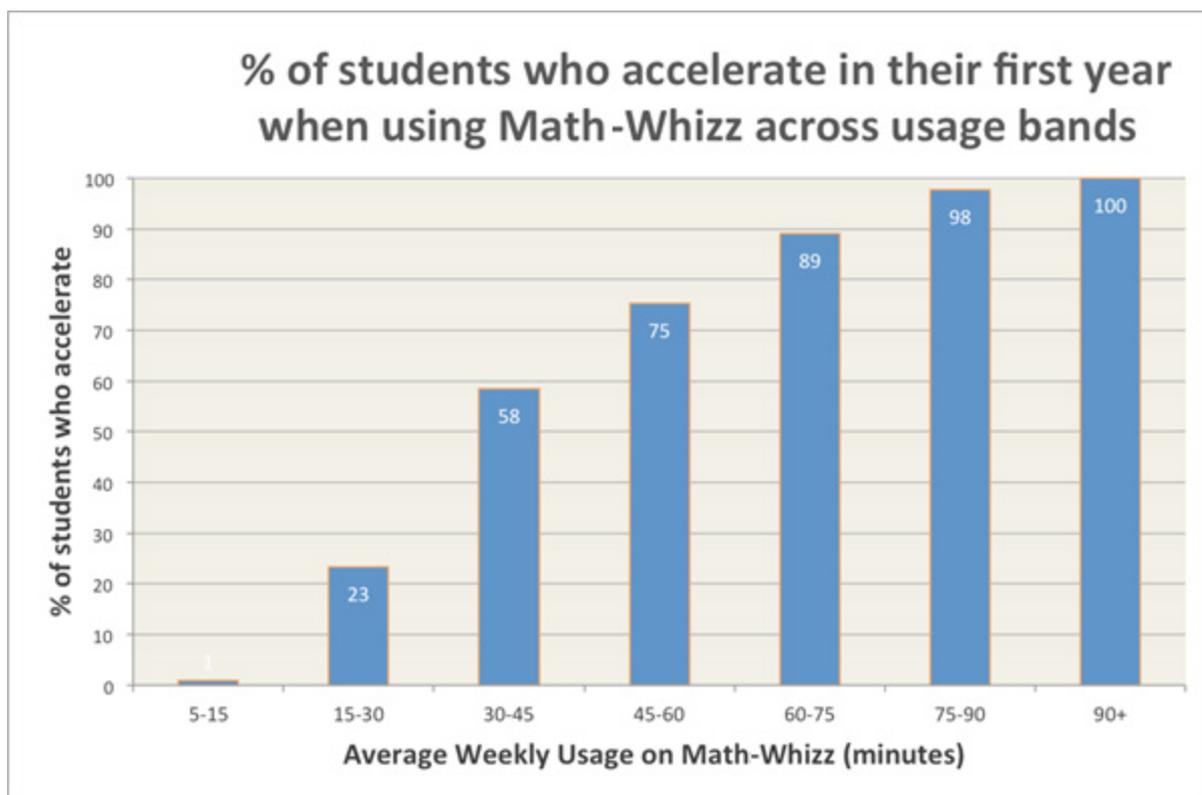


Figure 2: Accelerated learning on Math-Whizz

Discussion

Since the Math-Whizz tutor was first released in 2006, Whizz has always been committed to demonstrating its impact on students' learning outcomes. In 2009 we published our first large-scale analysis, which showed that students who use the Math-Whizz tutor for 60 minutes per week in their first year accelerate their learning by 18 months. This study has been updated several times, each one confirming the patterns of growth.

This latest study points to even higher learning gains within each usage bracket. The expected return for 60 minutes of usage per week is now 1.9 years. This increase can be attributed to on-going enhancements to the Math-Whizz tutor. A significant example is the ability for the Math-Whizz tutor to track students' progress per question and intervene at the precise moment of need, rather than waiting for the whole exercise to finish. This study supports similar research indicating that such enhancements have resulted in accelerated learning through the curriculum.

The numbers presented above will typically vary between educational contexts. The distribution of students across the different usage bands also varies by context, which influences the overall values. For example, the lower usage bands include relatively large numbers of students in Kenya, many of whom are using digital learning tools for the first time and face connectivity issues that slow down their learning. The Improvement values shown in this study represent averages across all Math-Whizz users, i.e. regional sample size

has not yet been accounted for. Future studies will segment the analysis by region, which has been deferred here only because sample sizes are small for territories new to Math-Whizz (i.e. relatively few students meet the selection criteria of analysis because twelve months have not yet passed since the initial assessment).

At Whizz 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 on-going research.

The next section is focused on the context behind some of this data. It gathers results from four studies that look at the impact of Math-Whizz in different learning environments around the world.

2.3 How do usage and Math Age compare with external measures of student attainment?

In this section we outline findings from four separate studies that investigated the relationship between usage and improvement on Math-Whizz with external measures of student progress.

What follows is a brief summary of the main results from four separate studies on the impact of Math-Whizz on students' learning. More details on these studies can be found in Appendix A (the full UCL-IOE study is also available on request).

1. In a 2015 study, researchers at the UCL Institute of Education reviewed two datasets to independently evaluate the impact of Math-Whizz on external exams. Using robust regression models, the first analysis showed that, over a three-month period, fourth and fifth grade students at **Enterprise Elementary School**, Seattle WA, who were on Math-Whizz, enjoyed significantly larger gains on the STAR assessment when compared to students at a nearby school who were not on Math-Whizz during that period. The study accounted for student demographics and environmental factors in the schools. An interesting finding was that fourth grade students at Enterprise started off well behind their peers at the control school and closed the achievement gap within the three-month study period. At the same time, the fifth grade Enterprise students started above their peers in the control school and significantly extended their advantage over the three months. Whizz has since replicated these findings in 2016 for **Rainier View Elementary School** (also in Seattle), with learning gains even higher than those found for Enterprise.

In the second part of this study, usage on Math-Whizz was shown to correlate with gains in the e-assTTle national assessment in New Zealand. The study controlled for initial achievement and showed that the correlation was statistically significant.

2. In 2014, researchers Amy Clark and Patti Whetstone investigated the impact of Math-Whizz on 106 students at an elementary school in **Kentucky**. Their findings point towards a statistically significant relationship between Math Age and state test scores. In a survey returned by 35 teachers from 15 Kentucky elementary schools as part of the same study, at least 94% said they were either satisfied or very satisfied with their students' progress on Math-Whizz, the Math-Whizz content and student enjoyment levels. Please see Appendix A, Item 3 for full details.

3. A detailed 2010 report by an Advanced Skills Teacher at **Park Hill Junior School** of its first term's use of Math-Whizz Tutoring Plus for 234 Key Stage 2 students shows a mid-strength positive correlation between Math-Whizz usage and Predicted Annual Progress. Moreover, usage and SAT level enjoy a weak positive correlation, while Math Age and SAT level enjoy a mid-strength positive correlation. The author concludes: "that Math Age should correlate so strongly with pupil math SAT levels...gives me a lot of confidence in it as a reliable measure of math attainment. That some of the original Math-Whizz assessment questions are also found in pupils day-to-day Math-Whizz tutorials, also gives me confidence that the high levels of progress being reported on Math-Whizz are real in terms of improving math skill sets". Please see Appendix A, Item 1 for full details.

4. **Toppenish School District in Washington State, USA**, saw major improvement in their math standards in 2008, evidenced by a higher proportion (increase of just under 50%) of students meeting standards in the State math exams (WASLs), following implementation of Math-Whizz for their students. The profile of the students was typically that of largely underachieving students, showing the ability of Math-Whizz to raise standards with otherwise struggling students. Please see Appendix A, Item 2 for full details.

Discussion

Four separate impact studies show a positive correlation between Math-Whizz usage and/or Math 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 Math Age as a progress metric.

Of course, there are several confounding variables that influence both Math 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 Math-Whizz and student attainment. Nor do we attribute improved learning outcomes exclusively to the Tutor, given the rich variety of ways in which the Math-Whizz suite (including Teacher Resources) can be adopted.

That said, these studies give us confidence that the pedagogical basis for Math-Whizz translates into positive and meaningful impact on student learning. The consistency with which Math Age correlates to different measures of student attainment indicate a strong

alignment between the learning students enjoy through Math-Whizz and the requirements of various curriculum and assessment frameworks.

Whizz Education is committed to raising standards in mathematics, and to furthering investigation of the impact of Math-Whizz. Several impact studies are on-going all over the world, including a randomized control trial in Kenya, in which independent baseline and endline evaluations will be conducted as part of the DFID-backed Imlango M&E (monitoring and evaluation) framework, along with several comparison studies with local assessments (please see [here](#) for further information).

3. Conclusions and Recommendations

Based on the relationship between usage and Math-Age, Whizz Education maintains the usage recommendations presented in previous Proof Packs. In particular:

- Underachieving students, or students who need more time to absorb math concepts, are recommended to use Math-Whizz Tutor for 90 minutes a week. Based on the most recent up to date data, virtually all students at that level of usage improve their math age by more than one year over a year's activity.
- The majority of students should spend 45 to 60 minutes per week where the mean improvement in Math Age 1.57 years in the space of their first year.
- High attaining students will typically have a Math Age beyond their actual age. They can be challenged and will progress through the curriculum at the expected rate with just 30-45 minutes per week on the Math-Whizz Tutor.

The relationship between usage and Math Age has been presented as an overall summary but will typically vary by context, and will evolve with enhancement to the Math-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 stakeholders, including teachers and parents.

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

Math-Whizz is such an excellent tool in 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 Replay and Topic Bank, where students can consolidate their knowledge. The optimal split between Tutor, Replay and Topic is a subject of further research for Whizz.

4. What our users have to say

In this section we hear from the people that matter the most – our students, parents and teachers – on how Math-Whizz has impacted them.

4.1 On how we raise standards in math

“Math-Whizz has invigorated our pupils and changed the way they view and learn mathematics. It has enabled children of all ages and abilities to succeed in math. The program has been exceptionally valuable for those with Special Educational Needs. By measuring improvement, all pupils have the opportunity to grow in confidence. Most importantly, we have witnessed a significant improvement in pupils’ overall math abilities. Math-Whizz has been a valuable tool for math teachers at Seven Mills.”

Anthony, Seven Mills School, London, UK

“Math-Whizz has been the solution for a big problem that we used to have in the state of Aguascalientes with the teaching process of math. I think one of the topics where our educational system has been struggling is precisely math. Math-Whizz has arrived to solve the part where our students didn’t find something that called their attention and there was an important resistance on how math was taught, and now Math-Whizz has made possible the improvement of the achievement of our students in math. Math-Whizz is not only impacting the improvement in their ability in math, but it is also helping in creating new technology abilities that they didn’t have before. I consider that we are attacking two important difficulties with just one solution and we are convinced that Math-Whizz is a very important tool and we don’t want to be without it in our Educational System. I believe that today Math-Whizz is the best pedagogical tool that we have used, not only in the state of Aguascalientes, but in the Education System of our country Mexico.”

Francisco J. Chávez Rangel, General Director of the Institute of Education in Aguascalientes (IEA), Mexico

“We’ll certainly be advocating for the quality of the product and the great customer service we’ve received. Our students and teachers like using Math-Whizz and it has made a terrific difference in our math intervention options.”

Principal, New Midway Elementary, Kentucky, US

“Math-Whizz tutoring is an outstanding personalized learning app. All of our children in Years 2, 4 and 6 log on first thing before registration creating a focussed math activity for 15 minutes at the very start of each day. They also use it during the teaching day in group work and where possible after lunch and before home. The pupils even use it during golden time. Classroom management is now a pleasure enabling class teachers to listen to pupils reading during this time. Progression has been inevitable and diagnostics superb to give detailed formative assessment.”

Tom Brannigan, E-learning Manager at Front Lawn Primary Academy, UK

“Students who used Math-Whizz showed a significant improvement in their mathematics skills. This has been demonstrated through better class participation and homework solving abilities; which in turn reflected on better grades. Further, they have mastered various English mathematical terminologies given that their mother tongue is Arabic. Also, this program has assisted tutors in delivering their lessons to students in an engaging manner, and expressed eagerness to deliver any lessons in the future through this website.”

Akhnoukh Keddiss - Head of Mathematics Department, Al Asriyya Schools, Amman, Jordan

“We have been delighted with the impact Math-Whizz has had on the children’s mathematical learning, understanding and application. We were inspected in May and the inspectors were most impressed with the scheme and amazed to see all the children so confidently accessing the program. As a school we are thrilled with the positive impact Math-Whizz has had on our continuing drive to raise mathematical standards.”

Angela Cully, Head Teacher, Mead School, Tunbridge Wells, UK

“It’s about engagement and accountability, and getting kids to build confidence and believe in their learning. This tool teaches them to manage themselves. ... Every Friday we celebrate who’s improved the most, with Gold Silver and Bronze awards. They can see how they’re improving and use it to further motivate their learning. Other tools simply don’t give the same measure of growth. Math-Whizz is huge for me. I don’t think I could give it up.”

Ted Barks, Teacher at PT England School, Auckland, NZ

“I love this website. I’m so glad! I’m so smart and better in math.”

Aliyah Yarber, age 8 (US school)

“I have got much higher marks in tests just thanks for a great online tutor!”

Ashleigh, age 10

4.2 On how we help improve levels of confidence

“Math-Whizz has proven to be a reliable source of material which excites and captivates the attention of all our children, improving levels of confidence and understanding.”

Arthur Bray, GEMS Hampshire School, UK

“Just to let you know that in October test results showed my son was below the national average in math. His teacher called me in on Friday to say that he has been re-tested and is now exactly where he should be for his age. She is amazed at his sudden increase in maths confidence. I am delighted with Math-Whizz.”

Nicola, Parent

“Thank you so much for helping us join Math-Whizz. My child’s already enjoying it! The site looks really great. It’s so colorful and personal to the child. I’m sure she’s going to thrive in her math studies from now on. My daughter’s confidence in math has blossomed in such a short time of using Math-Whizz, she’s now really enjoying the subject. Thank you again for making this possible.”

Liz, Parent

“My children are loving Math-Whizz! My 10 year old has great fun challenging other kids, seeing if he can get gold medals in all of his lessons and earning points for the fun “prizes” he can earn. He loves spending time on Math-Whizz, and I couldn’t be happier that he is learning and having fun at the same time! My 8 year old, who has struggled in math, has already gained confidence in her simple addition. She has made a lot of progress in utilizing some different strategies in her addition and I see it in her math work outside of Math-Whizz. YEA! Thanks for a terrific product!”

Susan D., Parent

Through my work as a teacher, I heard about Math-Whizz. After taking a closer look at it, I thought: I want this for my son! Within one school term, my son went from the medium math group to the high math group in year 6. Math-Whizz apparently has opened up his mind to more complex math concepts and provided him with a fun way to practice math on a daily basis.

Noha, Parent (UAE)

“One thing I have noticed is how the lessons now seem to be getting easier. Obviously they are not, but the confidence has grown so much, and the lessons appear to be ‘similar’ so the mind-set from the child is ‘I can do this’ rather than ‘I can’t’. This has been amazing to watch. I have been recording the order of lessons and math ages and also seen how the subjects follow logically. My child hated the pencil and paper subjects with a passion, but now his attitude has changed and he is enthusiastic because ‘it’s so easy!’ He also hated the rapid recalls but is now accepting the challenge to get 100%. It is really a pleasure to watch a child enjoy learning about math.”

Heather, Parent

“Despite being a secondary teacher, I dreaded doing extra math with my daughter who is in reception! She had very little stamina and became upset when she didn't understand a concept immediately. Although I knew she needed extra help, I was frightened I would put her off math if I pushed too hard. Since subscribing to Math-Whizz, both her ability and confidence have grown. She regularly does 20 minutes of online tutorials and actually enjoys doing written work!”

Diane Moore, Parent

4.3 On how we deliver personalized tutoring

“Math-Whizz is a great program that develops independence and helps us cater to the individual learning needs of our students. The data that our teachers receive is easily accessible in a detailed report and assists with further development of an effective Mathematical learning environment. Math-Whizz is easy to integrate into the classroom and makes any program more effective.”

Russell Burt, Principal, Pt England School, NZ

“Mat-reshka is the ideal tool for personalizing the learning journey of each child. The system is built on a mastery-driven tutoring model that adapts to each child’s individual pace of learning. It permits students to move to higher-level concepts only once they have demonstrated a strong understanding of foundational learning objectives, ensuring that they progress through the curriculum without gaps in their mathematical knowledge. Teachers have access to a real-time reporting tool that feeds back student usage and progress and gives them full visibility on each child’s strengths and weaknesses across the curriculum. For parents this is an opportunity to identify areas of focus for their child, and to review the material they have covered in both the classroom and at home. School authorities can similarly enjoy full visibility on progress within their school; they can compare usage and progress across classes and grade levels. This service extends to the regional level, where regional leaders can access up-to-date reports and gain insights into usage and performance across schools and even sub-regions.”

Elena Bulin-Sokolova, Director of Department of Education in Moscow

“As teachers, we all know the importance of individuality, especially when teaching math. Many children learn in different ways, visual, audio and kinaesthetic. Math-Whizz has managed to incorporate all of these forms into their colorful, fun tutorial sessions. The program’s capability of understanding each individual learner’s needs ensures that each child shows continuous progress while using the tutorial mode. Such program will never replace classroom math teaching and setting real life or cross curricular problems for children, however, as a tool to help us ensure that children reach their full potential, it is fantastic.”

Lolo Evans, Deputy Head (and Maths Advisory Teacher, Anglesey and Gwynedd), Ysgol Gymuned y Fali, UK

“As a principal, I see Math-Whizz as an incredible tool for meeting student’s academic needs because it teaches students exactly what they need. I am so impressed with how engaging and useful Math-Whizz is that I have my own sons using it at home! Both the students at my school and my own boys are greatly improving their skills and they love using Math-Whizz and doing math!”

Principal, Cedarhurst Elementary, Washington State, US

“We underwent a rigorous evaluation process of solution providers who could help us provide personalized math instruction to our students. We selected Whizz Education’s program because it continually assesses the performance of each individual student and adjusts in real-time to strengthen the student’s skills and improve his or her weaknesses. We are confident that we will see a significant improvement in the math mastery of our students.”

Darla Jones, the district’s executive director of Curriculum and Instructional Support, Connections Education, National Virtual School, US

“We have tried a number of different math programs including book-based, CD and online programs. Math-Whizz is my daughter’s favorite and the one has improved her math understanding the most. The program teaches her a concept, allows her to practice as many times as needed, and then tests her understanding of the concept. She is further motivated

by the opportunities to challenge other students worldwide, earn points to spend in the “pet store” and the engaging animations. She no longer hates math and looks forward to using the program.”

Kimberly M., Parent

“Math-Whizz provides an exciting and effective resource with a home and school version. At the heart of Math-Whizz is individual assessment and feedback so that learning is re-enforced and progressed according to the needs of the individual child. Breadth, depth, individualized fun learning – a winning combination.”

Professor Pat Preedy, Executive Principal GEMs Sherfield School, UK

“Students enjoyed using the program. They knew that it was helping them individually grow. Students that were more dedicated showed more growth. I like how the program is specific to each students’ needs.”

Teacher, Chinook Middle School, Washington State, US

“Math-Whizz has been fabulous for my 5 year old son! He is a very visual learner, so Math-Whizz fits perfectly to his learning style! I love that the program tailors to his exact needs and level and progresses from there. The handy reports that they give me allow me to see how much he has progressed, what he’s learning and how far he’s come! I can’t say enough great things about Math-Whizz!”

Gabby (Work of Childhood)

“We have used Math-Whizz with Yrs 4-6. Within these year groups we have a huge range of ability, with several of our children working within NC Level One, and some of our more able children working at NC Level Five.

We have been delighted that the children’s response has been overwhelmingly positive. It has succeeded in motivating some children who are experiencing real difficulty with Math, as well as stretching some of our more able children.

Access to the teacher data has proved extremely useful and informative, and we see huge possibilities for using Math-Whizz both in school, and at home.”

Becky Dolby- Molson, Dawn Davies, Helen Coombs, teacher, Dove Bank Primary School, UK

4.4 On how we improve Math Age

“We have seen growth in Math Age. Most teachers liked the reports and ability to monitor progress and provide feedback to students. As an administrator, I really appreciate being able to specify the date range for data (it means I can do it sporadically instead of being tied to doing it every Tuesday at 3:00).”

Teacher, Southern Heights Elementary, Washington State, US

“I have been looking at the impact of Math-Whizz in Year 6. 72% of pupils made significant progress (beyond their math years/time span) when using Math-Whizz for the correct

usage/week. [...] Most of the time, when pupils used Math-Whizz the most during the week they also made the most progress in math years.”

Mary Rogers, Class Teacher/Mathematics Manager, Old Ford Primary School, London, UK

“We have been using Math-Whizz for 4 months now. My son (8) loves it and I love it because it challenges him and pushes him. He loves saying he is averaging math as a 10 year old, because the progression chart shows where his skills are currently. He loves making the bar graph go up in age. Also, since he used his credits to purchase a turtle for his “room”, he wants to go on every day to get credits for food to feed him. We will continue using it and were very happy for the cost to benefit ratio thanks to Home-school Buyers Co-op.”

Aimee S., Parent

“We are finding Math-Whizz really useful for gathering evidence of pupil progress. Being able to print out a chronological age alongside a math age is helping us make our final assessments. This is equally true for our more able pupils as we now have really good evidence of their achievements and also the areas they are not doing quite so well in.”

Joan, Teacher

4.5 On how Math-Whizz is flexible and easy

“Math-Whizz is one of the best online tools that helps students improve their math skills in interesting ways by using interactive and multimedia programs that work on improving their abilities in both English and Math. I think that one of its best benefits is that it’s based on the internet so students can study at anytime and anywhere without having to be in the classroom to study math.”

Ms. Shada Al-Khateeb, IT supervisor, AI – Omareyah Schools, Amman Jordan

“All excellent. No problems at all. Clear icons, clear instructions, children took to it immediately. One of the best programs for math I have seen in recent years.”

Mrs Claire Robinson, Saint Thomas More R.C. Primary School, UK

“We have mixed ability classes and Math-Whizz is used a lot. All the teachers really do like it, and they find the whole system very easy to use.”

Mr. Hills, Fairlight Primary School, UK

“Math-Whizz is awesome. My 7 year old son actually ask to “play it”. This program allows him to work at his own pace and explains things in such a simplistic way that he rarely has to ask me for help. I wish there was a language arts program like this.”

Wanda, US Parent

“As a home educator, Math-Whizz has been a godsend to me, no preparation or planning lessons, just straight in and doing math each day. The lessons being tailored to the individual is wonderful as I have 2 children, one ahead of their age and one behind. They have both improved significantly and enjoy buying pets for their bedrooms.”

Lianne, Parent

“It helps you learn in an easy way.”

Becky-Jo, age 11 (UK school)

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Appendix A – Impact Studies

1. Evidence of Impact at Park Hill Junior School, UK

Report by Simon Yearley, Primary Math Advanced Skills Teacher (prepared in December, 2010)

The last few days away from the classroom have given me the opportunity to look at the impact of Math-Whizz this first term.

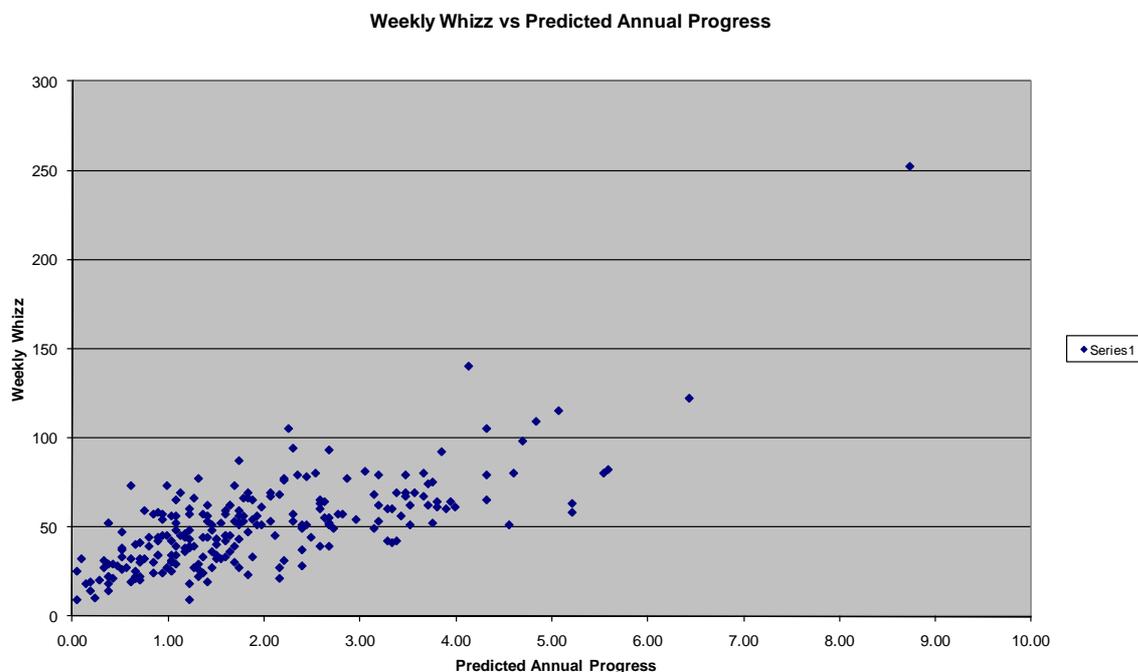
While what follows goes into some detail, hopefully you will find it of interest, especially when considered alongside your own experiences.

Math-Whizz is not cheap, but of course this cost needs to be viewed in terms of relative impact. If Math-Whizz lives up to its promise this first year - assisting all pupils to make expected or better progress in math - then it will certainly have been money well spent, perhaps even exceptional value. Of course with so many other influencing factors, the reality is likely to be far less clear!

Below are some of the questions I have sought to answer. Reference is made to 3 excel sheets (and graphs within) which can be found attached.

Q1) How does Math-Whizz usage compare with predicted Math-Whizz annual rates of progress?

Please view Excel 1, Scatter graph Years 3-6 Combined.



In all year groups, a mid-strength positive correlation exists between Average Whizz Time

and Predicted Annual Progress. Simply put, the more time a student spends on Math-Whizz, the more progress they are expected to make over the course of an academic year. It should be noted that predicted annual rates of progress are based on extrapolation of progress made to (in this case) Nov 22nd and therefore should be viewed with a degree of caution. That said, actual progress might equally be revised up as opposed to down, given familiarity with the website tutorials - time will tell!

The vast majority of students are presently predicted to make more than a year's progress, in nearly all cases where this isn't the case students have not fulfilled the expected 60 minutes of weekly Math-Whizz usage (to be returned to later).

Notably, predicted progress rates are not the same for students spending the same amount of time on Math-Whizz - there is a large degree of variation. At extremes predicted progress might vary by as much as several years despite equal time spent on Math-Whizz.

Interestingly, rates of predicted progress are higher (given similar time spent) in the elementary school than in the middle school particularly for those spending more than an hour on Math-Whizz. This does raise questions about sustainability in the years to come.

It is also striking that 46/234 (19.7%) are predicted to make upwards of 3 years progress this first year of Math-Whizz usage. Whilst on the face of it this might be a cause for celebration, clearly such rates of progress are unlikely to be sustainable, either for the student (in terms of the challenge of questions), or ultimately the website (which presently has a ceiling of 14 years of age).

Q2) How little time can students spend on Math-Whizz but still make expected (1 year) or better progress?

Please again view Excel 1, Scattergraph Y3-Y6 Combined.

There appears to be a high degree of consistency in answer to this question for each of the year groups. With no exceptions in Y3, one exception in Y4, two exceptions in Y5 and six exceptions in Y6, all students completing more than **45 minutes** of weekly Math-Whizz are predicted to make at least a year's progress. Of the six exceptions in Y6, five (as of Nov 22nd) were predicted to make 0.8 - 1 years progress. Where students have completed on average 60 minutes of weekly Math-Whizz, only 2 are presently predicted not to make expected progress.

It should be noted, however, that it can't immediately be assumed that these patterns would also be true of those students presently falling short of 45 or 60 minutes weekly Math-Whizz - it could be that these same students would still fall short of expected progress.

For students completing between 30 and 45 minutes, at a glance, expected progress falls to about 50% although here too (perhaps determined by the student's mathematical ability)

there is great variance with some students still predicted 2 years progress.

Q3) What % of students have completed the requested 60-120 minutes of Math-Whizz each week?

Using Excel 1 data sets.

Y3 students had the highest 60min+ completion rates with 24/61 (39.3%). The school wide average was lower at 69/234 (29.5%). Thus, only 3/10 students met this expectation up to Nov 22nd - this despite our commitment to complete 30 minutes during school time in ICT math.

Had this expectation been lowered to 45min+, completion rates would have stood at 134/234 (57.3%).

In 6Y, likely a result of my running the Monday lunchtime Whizz Club, 45min+ completion rates were the highest of all classes at 23/26 (88.5%). Notably even here though, 3 students fell short of their commitment.

Q4) How many students have spent 90+ minutes each week on Math-Whizz and what progress have they made?

Using Excel 1 data sets.

Another indication that the lower school have been particularly taken by Math-Whizz:

3rd Grade - 5 students averaging a predicted 3.9 years progress!

4th Grade - 5 students averaging a predicted 4.2 years progress!

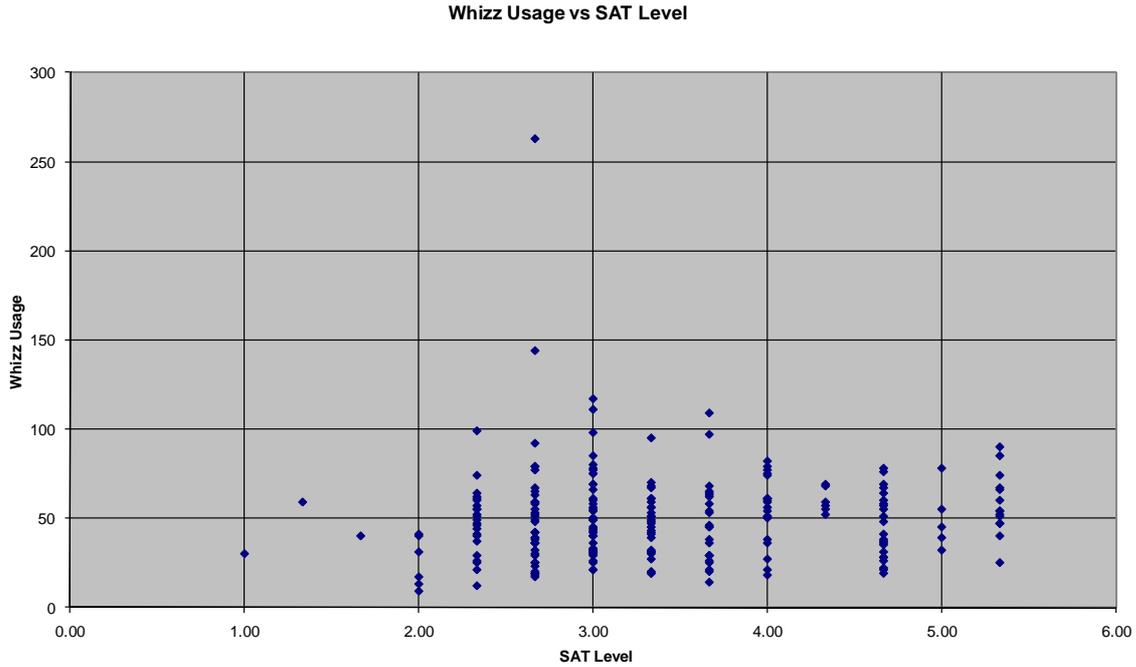
5th Grade - 4 students averaging over 70 minutes, but none over 90.

6th Grade - 1 student predicted 2.7 years progress.

As already stated, while on the face of it these large predicted gains might be a cause for celebration, there must be concerns here about sustainability. Math-Whizz does allow for 'light bulbs' to be turned off preventing students from accessing their accounts, but we see classpoints as a first step to changing 'unwanted' student behavior. That said, 90 minutes is still 30 short of the original 60-120 minute expectation!

Q5) Is Math-Whizz usage related to students' ability in math?

Please view Excel 2, Scatter graph Y3-Y6 Combined.



To make this comparison, students' SAT levels were first converted into a numerical equivalent (NSAT) whereby 1c = 1, 1b = 1.33, 1a = 1.66, 2c = 2...5b = 5.66. It was felt that this representation would make a graphed comparison with Math-Whizz usage more understandable than a standardized score alone.

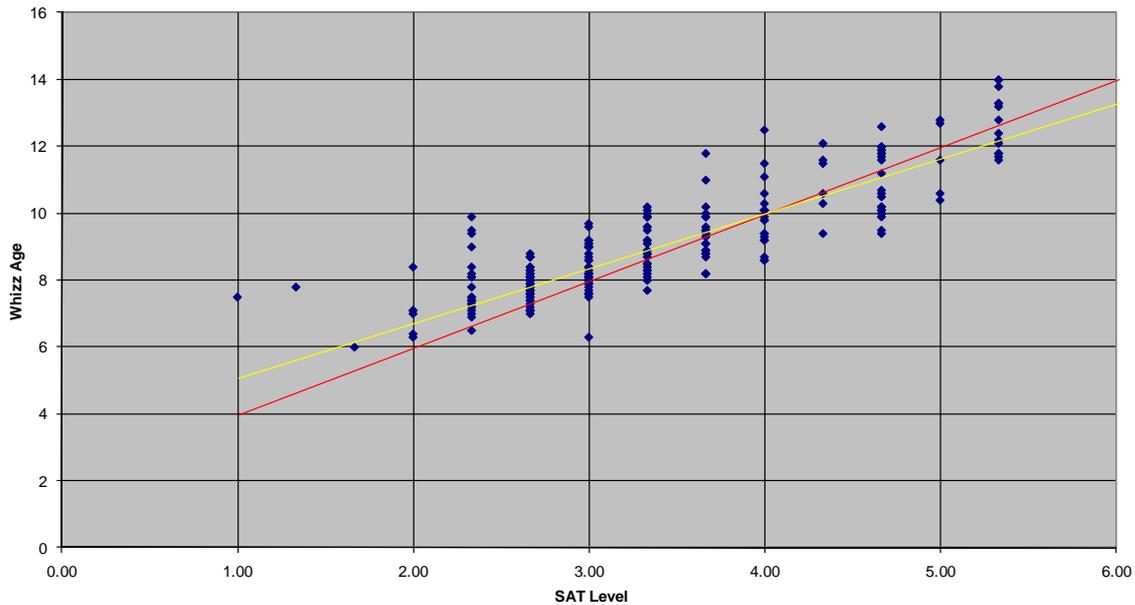
In all four year groups, although notably less so in grade 5, weak positive correlations can be seen between Math-Whizz usage and student SAT attainment in math. In simple terms, the most able students in math in each year group have typically completed 10-15 minutes more Math-Whizz each week than the least able students. Of course, the correlation doesn't give any answers as to why this might be the case.

It is thought that the intense use of TAMs support particularly in grade 5 may account for the weaker correlation in this year group: the lowest attaining students - for the first half term - were given additional 1:1 Math-Whizz time in school.

Q6) How does Math-Whizz 'math age' compare with students' SAT levels?

Please view Excel 3, Scatter graph Y3-Y6 Combined.

Y3-Y6 Whizz Age vs SAT Level



In all 4 year groups mid-strength positive correlations were found between Math-Whizz Age and students' SAT Levels (NSAT). In short, the higher students' autumn SAT level the higher students' Math-Whizz Age. The strength of the correlation indicates the commonality of the two assessments in testing the same thing. That there should be a mid-strength correlation supports the idea of Math-Whizz Age as a reliable measurement of math attainment.

Critically speaking, however, it should be noted that within each SAT sub-level there was found to be as much as +/- 2 years variation in terms of Math-Whizz Age. EAL, the computer interface, performance on the day, accuracy of SAT levelling, SAT level ceilings and form of questions might all account for these differences.

More typically the range within each SAT sub-level would appear to be closer to +/- 1 year with an even smaller standard deviation. Considering that a SAT sub-level itself encompasses approximately 8 months attainment, this again supports Math-Whizz Age as a measure that can be trusted.

Finally, while exploring lines of best fit on the Y3-Y6 scattergraphs, it became clear that there was least agreement to a linear relationship at the extremes of the data samples. Simply put, Math-Whizz Age is more conservative than might be expected when considering a students' SAT level at the extremes. For very low SATs levels, Math-Whizz Age is higher than might be expected and conversely for very high SATs levels Math-Whizz Age is lower than might be expected (relative to ARE and the 1 sub-level equals 8 months progress rule). This would fit with the idea of SAT tests being less accurate at the extremes, higher levels being more a reflection of potential than actual 'skill assessed' ability. A curious thought - perhaps Math-Whizz Age is a more accurate measure of actual math ability?!

Conclusion

That Math-Whizz Age should correlate so strongly with student math SAT levels (assessed at the same time w/b 11/10/10) gives me a lot of confidence in it as a reliable measure of math attainment. That some of the original Math-Whizz assessment questions are also found in students' day-to-day Math-Whizz tutorials, also gives us confidence that the high levels of progress being reported on Math-Whizz are real in terms of improving math skill sets (although certainly this is something we should look to confirm in the summer).

The data indicates that while only 3/10 of students have met our original target of 60-120 minutes of Math-Whizz each week, the majority are still predicted to make expected or above expected progress. Indeed, concerns about students doing too much Math-Whizz - in terms of a sustainable program of study through to 6th grade - weigh as strongly as those for students not doing enough!

The data suggests, albeit after just one quarter, that 45-60 minutes would be a preferred target for weekly Math-Whizz use. In fact, Math-Whizz themselves have settled on the following recommendation:

Underachieving Students: 90 minutes

Majority of Students: 45-60 minutes

Gifted & Talented Students: 30 minutes

With a continuing commitment to complete 30 minutes of Math-Whizz per week in lesson time, this would leave students needing to achieve just 15 more minutes (or one home sitting) to reach their weekly reward point target. With routine Monday morning teacher tracking, 'lowering the bar' in this way should mean **the vast majority of students are recorded as being successful with Math-Whizz each week.**

To tackle those students with the poorest Math-Whizz track records, our suggestion is for teachers to use their gradebook tracking sheet to nominate 5 students in each class who are given no choice to attend one of the two lunch time Whizz Clubs. Whizz Club slips could be created for students to have an early lunch and teachers would simply need to check the Whizz Club register to check that nominated students had attended.

The over-riding aiming of all of the above has been to assess and improve the use of Math-Whizz at Park Hill.

2. Evidence of Impact at Toppenish School District (WA), US

Toppenish School District, Valley View Elementary School

Overview

- 375 students - dual language school
- Ethnicity: 90% Hispanic, 7.5% Native, 2.5% White
- Special Programs: 99% Free-and-Reduced Lunch
- 20% Migrant, 65% Transitional Bilingual.

Implementation

- Math-Whizz Teacher Resource implemented in all classes.
- 100 online licenses implemented with 21st Century funding for “Breakfast Club” and 24-7 access.
- Scheduled lab time for all classes for Math-Whizz.

Results

- 4th grade made a 50% increase in scores over two years.
- 3rd grade has the largest gain from year 2 to year 3.
- The overall average percentage of students meeting standards in grades 3-5 increased from 22.83% to 32.76% respectively from year 2 to year 3.

Grade	Percentage of Students Meeting Standard on the Math WASL		
	2005-06	2006-07	2007-08
3 rd	n/a	18.3%	34.6%
4 th	20.4%	22.9%	30.4%
5 th	n/a	27.3%	33.3%
Total	n/a	22.8%	32.8%

3. Evidence of Impact at Elementary Schools in State of Kentucky, US

Extracts from Amy K. Clark & Patti Whetstone (2014): The Impact of an Online Tutoring Program on Mathematics Achievement, The Journal of Educational Research, DOI: [10.1080/00220671.2013.833075](https://doi.org/10.1080/00220671.2013.833075)

Participants

Teachers: A total of 35 teachers from the 15 participating elementary schools provided responses to the survey questions regarding the use of Math Whizz as a part of mathematics instruction. In response to a survey question regarding number of years of experience in the teaching profession, teachers reported they had experience spanning from between 2 to 5 years to more than 21 years. All teachers reported receiving training from Math Whizz on its implementation, and the majority reported taking advantage of the ongoing trainings and supports made available by Math Whizz. All of the teachers' responses were used in the qualitative analysis of the effectiveness of the Math Whizz program.

Students: State data were obtained for the end-of-course mathematics assessment for 106 children enrolled in a single elementary school that used the Math Whizz program. Of these students, 50 were enrolled in the third grade, 30 were enrolled in fourth grade, and 26 were enrolled in fifth grade during the 2009 or 2010 school year. These data were used in the quantitative analysis of online tutoring's effect on end-of-course mathematics assessments. As with the data selected from all schools, in any instances where students participated across multiple years, only the first year's data were included in the analyses.

Results

Teacher Survey:

Results from the survey of teachers indicated positive support regarding the implementation of the Math Whizz platform as a part of mathematics instruction. Teachers reported using the program for reinforcing concepts, introducing new material, providing remediation and enrichment activities, and, occasionally, rewarding students. A total of 94% of the teachers indicated they were satisfied or very satisfied with student progress as a result of the Math Whizz program. A total of 97% of teachers reported being satisfied or very satisfied with the mathematical content of the Math Whizz program. Similarly, 97% of teachers reported being satisfied or very satisfied with the curriculum of the Math Whizz program, and 97% also reported that the curriculum of the Math Whizz program aligned with the current mathematics curriculum materials. Teachers overwhelmingly reported positive student reaction to the program, as 97% reported being satisfied or very satisfied with student enjoyment and 94% being satisfied or very satisfied with student enthusiasm for the program. These findings suggest a high level of both teacher and student buy-in with regards to the implementation of the Math Whizz system across the 15 elementary schools.

Single School Analysis with End-of-Course Assessment:

Next, variables were examined for the single school that provided state math assessment

data. Correlations were similar to those reported in Table 4. In addition, significant relationships were also identified between state test and math age ($r = 0.7$), and between state test and math improvement ($r = -0.3$). The negative relationship between improvement and state test score indicates that the students who experienced the greatest improvement were the low-performing students, as measured by the state test in mathematics.

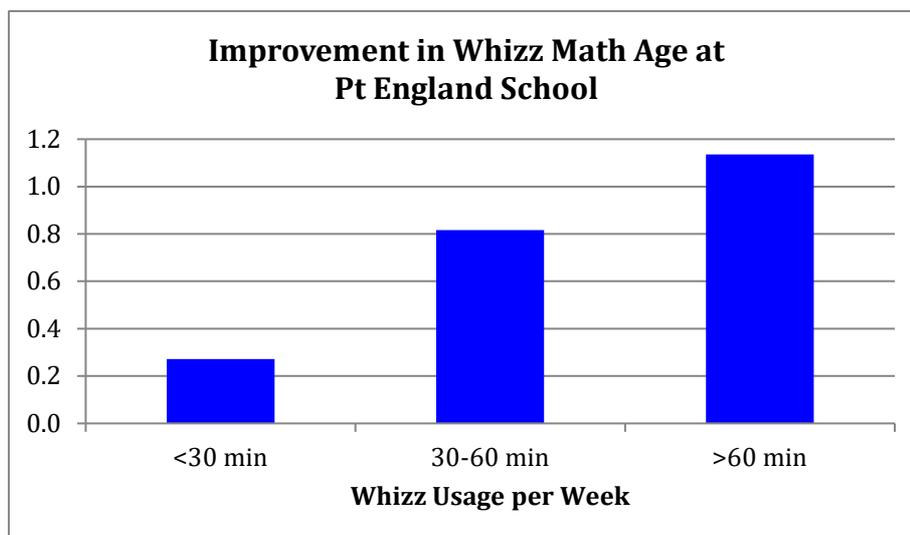
Using the mathematics state-testing data from the single school, a stepwise multiple linear regression was conducted to determine the extent that math ability and math improvement predicted math state test score. Since state test scores are reported on a single scale across the three grade levels, two dummy-coded grade level variables were included in the first step of the multiple regression to account for variance in state test score due to grade level alone. After accounting for grade level, math ability and math improvement accounted for an additional 6% of the variance in state test score. The combined variables explained 88% of the variance in state test score. Initial math ability, as measured by math age, was the stronger predictor ($\beta = 0.25$, $t = 5.62$, $p < .001$), followed by yearlong math improvement ($\beta = -0.14$, $t = -3.90$, $p < .001$). As would be expected, students who begin the year with higher math ability are more likely to score high on the end-of-course mathematics assessment. Similarly, the low-performing students who demonstrated the greatest improvement across the year were more likely to be low scorers on the end-of-course math assessment.

4. Evidence of Impact at Pt. England School, New Zealand

Math-Whizz was used at Pt. England across Years 5-8 in 2013. We have analysed the data from February – November 2013. Results clearly show that students using Math-Whizz as part of their numeracy program for 60 minutes or more per week accelerate their learning over fellow students in their overall improvement in Math-Whizz Maths Age, e-assTTle and GloSS.

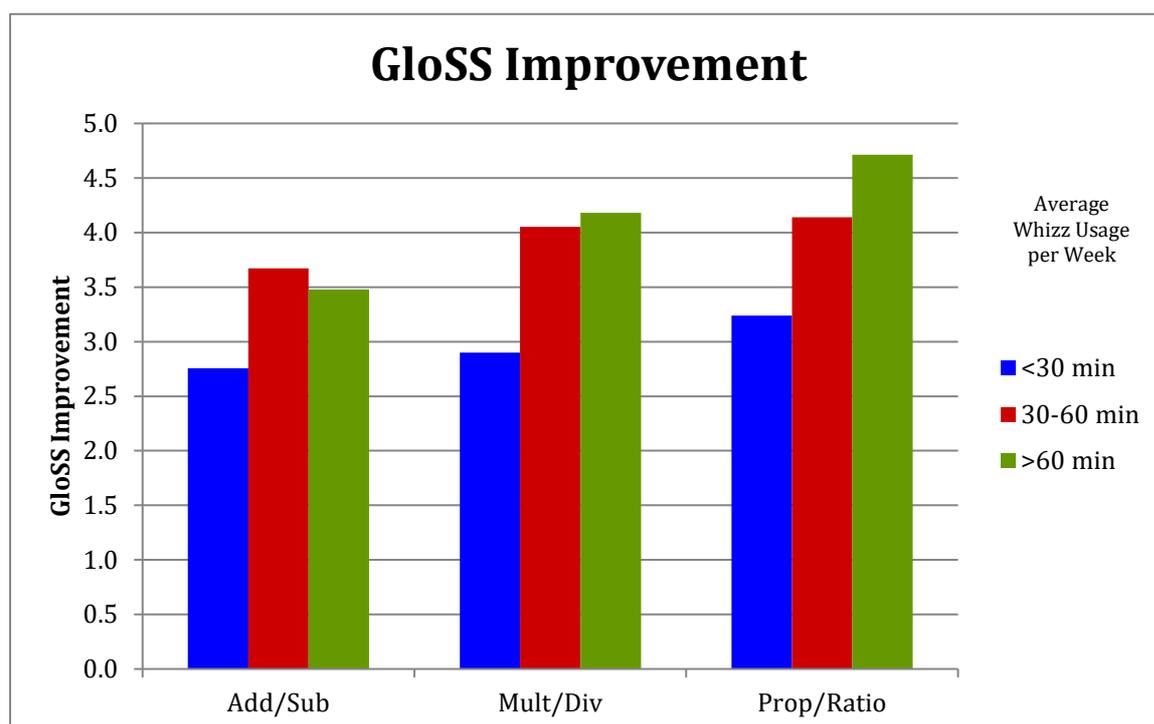
Math Age

Just under 10% of the overall sample used Math-Whizz for more than 60 minutes per week (best practice suggests that accelerated learning will happen when Whizz is used as an integrated part of a student’s numeracy program, for between 60 and 90 minutes per week). These students showed accelerated growth in their math age, improving at a rate faster than their corresponding chronological improvement. This is even more significant when an analysis of the Math-Whizz initial assessment data showed that this group (students who used Whizz for more than 60 minutes per week), started the year with their Math-Whizz Maths Age over 2 years lower than their chronological age and are now showing, possibly for the first time in their schooling, that their math age improvement is at least keeping up with their chronological age increase and in many cases closing the gap between Math Age and Chronological Age.



Other worldwide studies have shown that students averaging 90 minutes per week will result in accelerated learning of between 2 and 2.5 times the corresponding chronological increase for each student

GloSS Improvement at Pt. England School



Add/Sub

In Add/Sub there appeared to be greater improvement in the students who used Whizz for more than 30 minutes per week. While Whizz is clearly making a difference between the low users and moderate users, the lack of difference between the moderate users (30-60 minute group) and the high Whizz users (>60 min) could be indicative of effective teaching in the school in the area of Addition and Subtraction.

In other strands there was a noticeable relationship between Math Whizz Usage and improvement in GloSS stages.

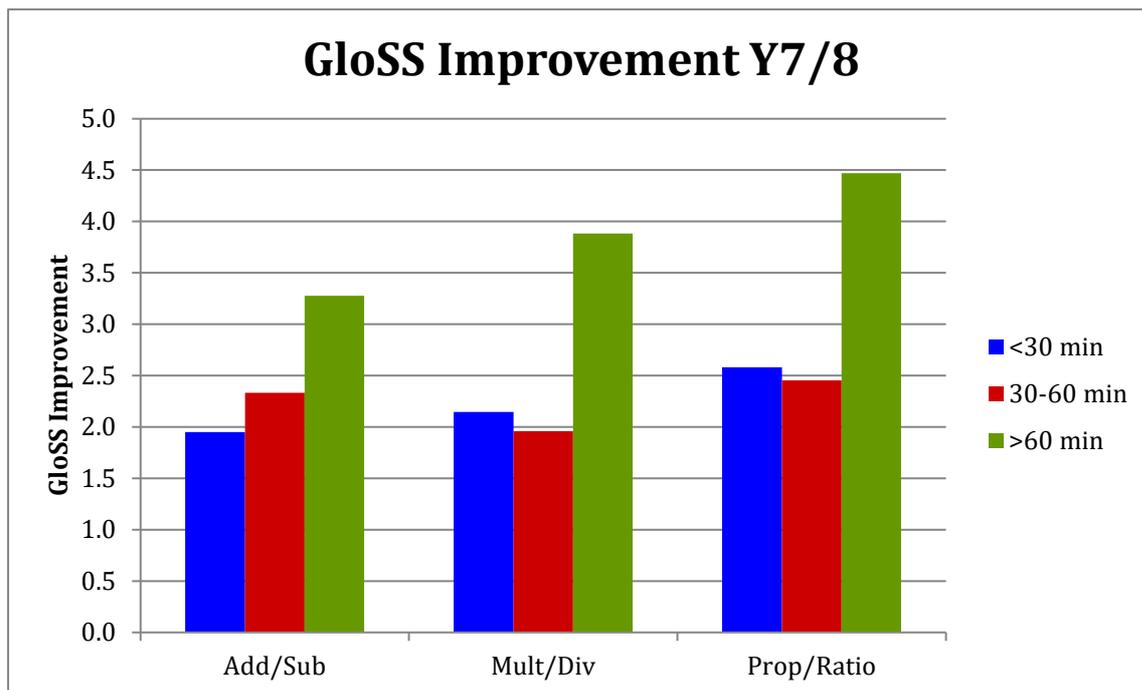
Mult/Div

Students using Math Whizz for more than 30 minutes per week were improving in their GloSS stages at a faster rate than those using Whizz for less than 30 minutes, with even greater improvement for the high users.

Prop/Ratio

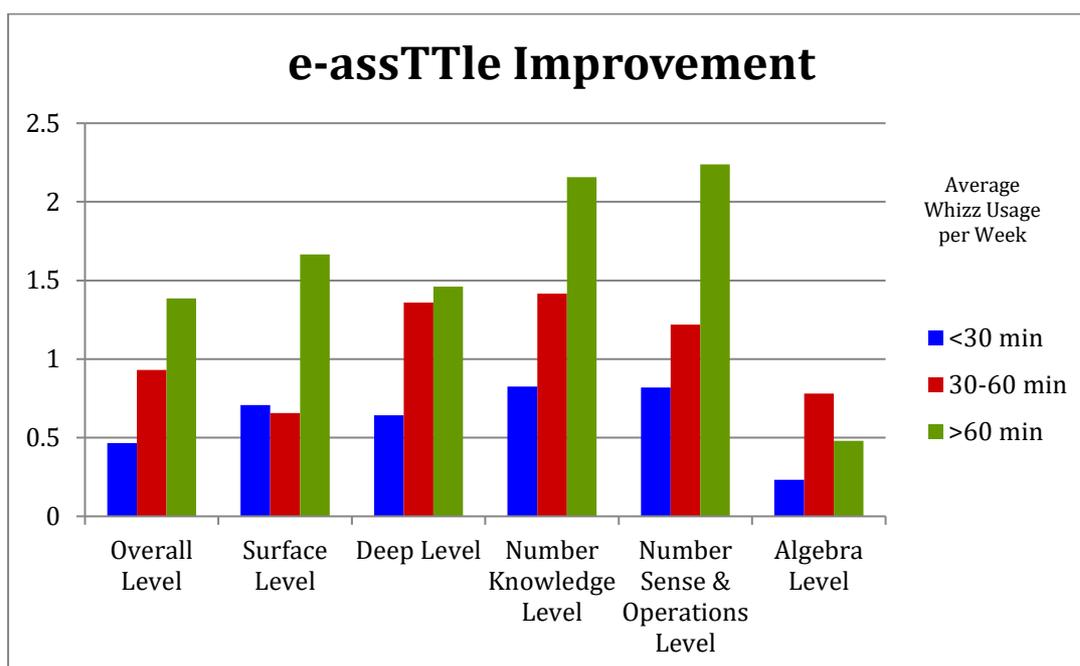
Students using Math Whizz for more than 30 minutes per week were improving in their GloSS stages at a faster rate than those using Whizz for less than 30 minutes. There was also a corresponding increase in GloSS performance and progress for the students using Whizz for more than 60 minutes per week.

What may be of interest is further analysis by Syndicate/Year Level. For example this is the same analysis done just looking at the Year 7/8 cohort.



e-

asTTle Improvement



Trends of accelerated learning were reflected in the e-asTTle analysis where students using Whizz for more than 60 minutes per week were improving faster than the moderate users and at nearly twice the rate of the low users across all strands. The only slight anomaly was in Algebra where although moderate and high users were progressing faster than low users, there was a drop from the moderate cohort to the top cohort. Once again worth noting is the sample of high users is relatively low in size compared to the overall population so some variance is to be expected due to this.

Conclusion

Extensive data analysis shows a strong correlation between Math Whizz usage and Math-Whizz Math Age increases. These trends are reflected in Pt. England data with users average more than 60 minutes per week showing accelerated improvement in their mathematics ability.

When overlaying Whizz usage with GloSS achievement data, those using Whizz for more than 30 minutes per week showed significant gains as compared to students who used Whizz infrequently.

When overlaying Whizz usage with e-assTTle achievement data, those using Whizz for more than 30 minutes per week showed significant gains as compared to students who used Whizz infrequently. This trend was stronger again for students using Whizz for more than 60 minutes per week in all but one strand.

Overall, students with even a basic level of usage in Math Whizz outperforming the rest of the sample group in GloSS and e-assTTle assessments. For these students using Whizz for the recommended 60 – 90 minutes per week, their progress was even greater when compared to the rest of the sample group.

Appendix B – Contact information

For additional documentation, or to trial Math-Whizz with a dummy teacher login/password information please get in touch with the Whizz Education Customer Success team.

Contact Information:

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