

Results from Math-Whizz: An Intervention in Classrooms - Student Usage results in Content Improvement

Dr. Patti Whetstone

Consultant, Assistant Professor at Western Kentucky University,
former State Director of Special Education, and always a
teacher.

Introduction

The purpose of this independent research analysis was to determine whether students who participated in the Math-Whizz instructional program demonstrated an increased achievement level in math skills as measured by the Math-Whizz assessments. A basic premise of this research is whether the utilization of online tutoring and educational software will support the achievement of the mathematics goals as identified through No Child Left Behind (NCLB).

Fall of 2008, 60 elementary (K-5) classroom teachers were brought together as part of grant initiative by Green River Regional Educational Cooperative (GRREC). The Math Alliance grant project utilized a two pronged approach to improve education in Central Kentucky. First, increase teacher knowledge of mathematical concepts and procedures. Not only were teachers provided with content information, but they also received information on the delivery of quality instruction paired with effective evaluation. The second goal of the project was the improvement of student achievement in mathematics. The focus of this report is to share the outcome of the first Math Alliance year and how the utilization of Math-Whizz affected student learning.

Students were provided with opportunities to practice math skills using the web based software designed for one-on-one tutoring. All students were provided with access to the program during the school day. Designed for students aged 5 to 13, Math-Whizz calculates "Math Age" which is an indicator of student achievement in comparison to the program expectations for students at various age levels.

A total of 1006 students in 59 classrooms resulted in an overall improvement of .6 year Math Age. It should be noted that these students utilized the intervention for only 6 months. The publisher's recommended weekly usage is 90 minutes for students below grade level, 60 minutes for students on grade level and 30 minutes for students identified as Gifted and Talented. The publisher recommends the total minutes per week be delivered over the course of 2-3 sessions.

The classrooms involved in the study realized a greater increase in Math Age scores for those classrooms that spent more time interacting with the tutoring program. The findings validate the publisher's claim that usage of the program yields significant results and also substantiates the grant research that student achievement can be enhanced through the use of student interventions and teacher effectiveness.

Research Methodology

Participants:

Participants were recruited to this grant project based on grant criteria and the willingness and commitment to participate in all components of the three year project. Grant criteria included the following: a) schools not currently participating in other math related initiatives; b) schools willing to make a commitment to the release days for teachers and access to data collection; and c) teachers recommended by building principal identification of teaching staff that demonstrate an eagerness to

learn, enthusiasm in the classroom and the ability to work well with other adults in a learning community.

All schools were located in South Central Kentucky and are part of the GRREC service region. Schools and classrooms involved in the project administered several assessments over the course of the grant research. Some assessments for which data was collected were the statewide math scores, GMADE, MAPS, Think Link, teacher made formative assessments as well as qualitative data collected through teacher survey and anecdotal information. For the purposes of this paper, the data collected through the Math-Whizz software will be used to ensure that only data from classrooms that actually utilized the computer based tutoring program determined significance.

The data from all students utilizing the Math-Whizz program were grouped by grade level classroom teacher. Individual student data was not disaggregated for the purposes of this report. Results were reported based on teacher and classroom identifying information. All individual student information was kept confidential.

The Math-Whizz software recorded the number of minutes students used the program and those minutes were calculated as an average weekly minute usage per student, per class. Additionally, student improvement on the mathematical concepts and knowledge was calculated based on Math Age.

Math-Whizz, aligned with state and national math standards, is designed with embedded formative and summative assessments that provide feedback to the individual user as well as to the teacher. This feedback cycle allows the teacher the opportunity to adjust instruction and to provide additional support for students. Students who struggle with a single concept will be provided with multiple practice opportunities until mastery is determined. Likewise, students who demonstrate proficiency at grade level activities will be provided with mathematical concepts and problems that encourage and challenge student progress and thinking.

In this study, Math-Whizz was used as a universal intervention with all students as a component of the core curriculum. It should be noted that none of the classrooms reported usage that mirrored the publisher's recommendation. The publisher recommends students who are performing below grade level use Math-Whizz for 90 minutes over 2-3 sessions per week. Students who are at grade level can maintain their skills by using Math-Whizz 60 minutes a week over 2-3 sessions. Students who are above grade level are recommended for 30 minutes a week over 2-3 sessions. Classrooms in this study reported that they used Math-Whizz for 1 to 56 minutes. Despite usage that did not meet the publisher's recommendations, students demonstrated an improvement in Math Age.

Methodology:

Data was collected on each classroom of students. All students were evaluated for their beginning Math Age level at the initiation of the project and at the conclusion of the first year. The results of individual students were not disaggregated for this report; rather students were grouped by classroom unit for combined comparisons. Math Age was calculated to identify achievement as an effect of the intervention. A correlation between the math improvement and the number of minutes the program

was accessed was calculated using tests run through the computer based analysis software, SPSS (Statistical Package for Social Sciences)

The first analysis involved calculating the number of minutes and grouping students based on the usage. The number of minutes per week of Math-Whizz usage ranged from 1 to 56, with an average usage of 21.16 overall. Initial data review and analysis grouped the classes into 4 groups based on the number of minutes per week of Math-Whizz usage as compared with Math Age growth. The following chart illustrates the group identification based on the number of minutes per week of usage, the average number of minutes for the entire group and the average increase in Math Age for the students in each classroom group.

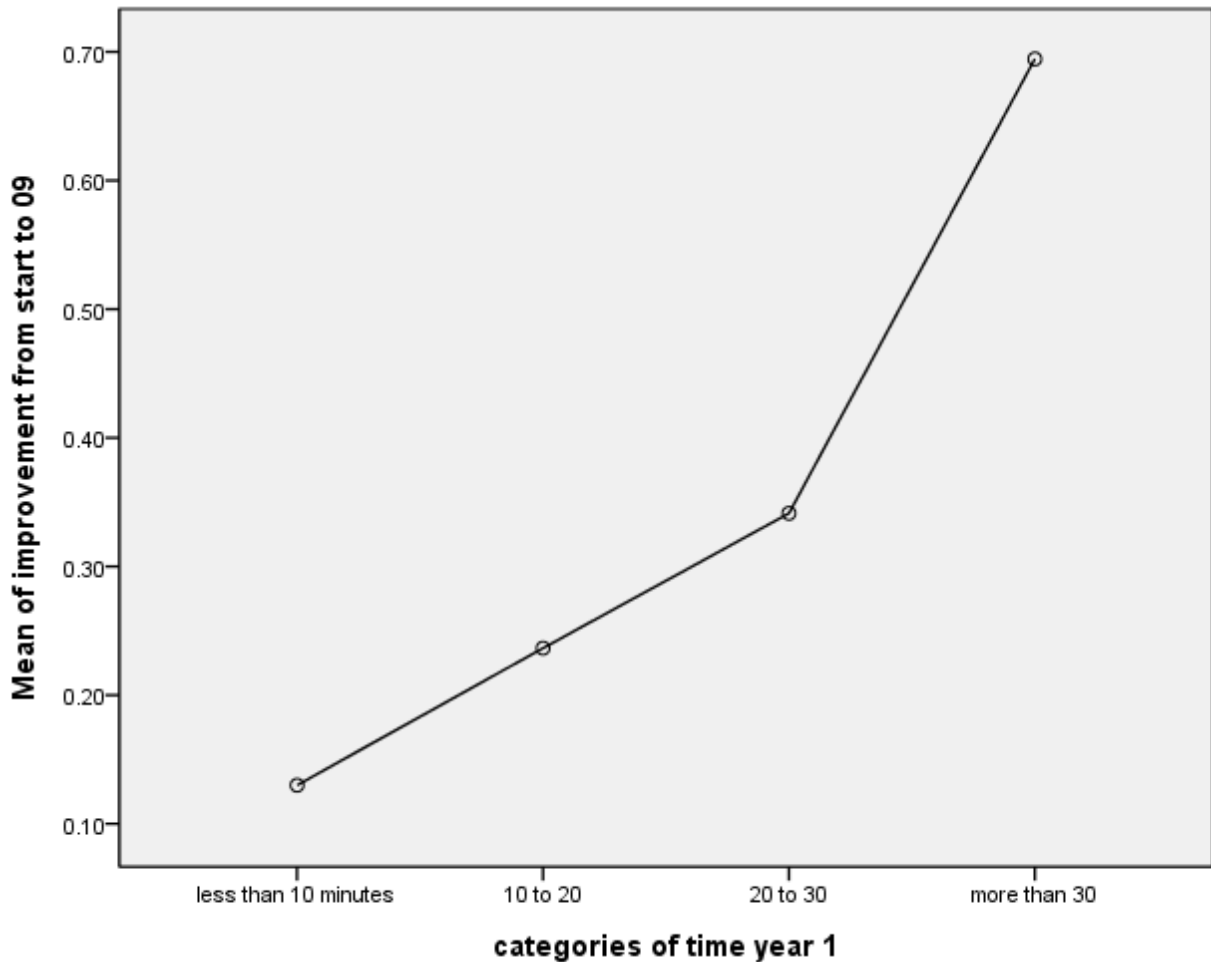
Group Name	Number of minutes per week of usage	Average number of minutes per week for this group	Average increase per group in Math Age
Group 1	< 10 minutes per week	6.75 minutes	.13
Group 2	10-20 minutes per week	15.5 minutes	.24
Group 3	20-30 minutes per week	25.59 minutes	.34
Group 4	> 30 minutes per week	37.5 minutes	.69

Discussion:

Students in Group 1 used the tutoring program the least amount of time and yet netted a Math Age gain of .13. Students in classrooms that used the program for an average of 37.5 minutes (Group 4) compiled a combined increase in Math Age of .69. The above evidence, based on the usage of Math-Whizz with 1006 students, in 59 classrooms lends itself to the conclusion that the more time and involvement, students have with the tutoring program, the greater the benefit. In fact, the students in Group 4 demonstrated the greatest gain but also the greatest usage per week. Yet the gain ratio of times spent versus benefit increases with usage of the tutoring program. Improvement in Math Age is compound, it increases based on the more it is practiced with Math-Whizz.

Analysis of Variance or ANOVA calculates the group means with the introduction of a variable. In this case, the group means are the Math Age scores of the students in each of the 59 classrooms. The variable was the amount of time spent on Math-Whizz. The result is the amount of improvement for students. The outcome of the One Way ANOVA yielded a correlation significance of .004, which demonstrates a positive correlation with a significant relationship, that is, it is clear that the greater number of minutes that students in the Math Alliance grant project spent on Math-Whizz, the greater their academic improvement scores. The following table illustrates the outcome of the two tailed ANOVA analysis indicating the difference of student improvement dependent upon the amount of time students interacted with Math-Whizz.

Mean amount of time on task and improvement for year one



Math-Whizz compounds the learning and retention of mathematical concepts the more it is put into use. Students who use the tutoring program in amounts that more closely align with the publisher recommendations could anticipate substantial gains. Although there may be several variables in any given classroom, further analysis using Tukey and LSD post hoc comparisons indicates that 30 minutes or more of usage of the intervention (Math-Whizz) can be attributed as the difference for students making progress in mathematical concepts and achieving gains in math skill.

Conclusions

1006 students were included in a grant project that proposed to increase the teacher knowledge and pedagogy of mathematics instruction in the elementary (K-5) grades. The ultimate outcome of the grant project was to demonstrate increased student achievement in mathematics. To that end, a variety of interventions were utilized that intended to meet the goals of the project. To measure individual student progress and to provide specific and targeted intervention on math concepts and skills, the project directors utilized the online computer software Math-Whizz. Data collected on the classrooms

of students indicated that students demonstrated improvement in math content and skill when provided with the web based tutoring of Math-Whizz. Further, it is positively correlated at a statistically significant level that students who spent more time engaged with the program demonstrated the greatest improvement.

The implications for student use of this program are evident. Despite the fact that the grant project participants did not follow the publisher recommended usage, gains were made with students. One can only predict the student data that would be reported if all students in the research project had used the program as directed by the publisher.

In the future, it is recommended that classrooms and teachers fully commit to use of the program and students be provided with the opportunity to interact with the tutoring computer program per the publisher's recommendation. Further analysis of the compounding of student gains based on usage will provide valuable guidance for schools seeing to remediate, maintain or extend learning in mathematical concepts.

It is further suggested that additional assessment data be collected and data disaggregated for individual students. It is anticipated that Math-Whizz may prove to be a beneficial component of Tier 1, 2 and 3 in an RtI (Response to Intervention) framework. Further study should focus on the individual student outcomes to determine whether the effect is positive when disaggregated by special education or at risk classification.

About the Author: Dr. Patti Whetstone

Dr. Patti Whetstone is a 30 veteran of education. She has been a general education classroom teacher, special educator, consulting teacher, educational diagnostician and the State Director of Special Education for the State of Wyoming. Dr. Whetstone has conducted research and served on research teams for issues related to standards and assessment. Dr. Whetstone has been on the state leadership team for Positive Behavior Support (PBS) and the implementation of Response to Intervention (RtI) in schools. Dr. Whetstone has presented at various state and national conferences on issues related to education.

Currently, Dr. Whetstone is an Assistant Professor at Western Kentucky University. She teaches undergraduate, graduate and doctoral coursework in behavior management, methodology of teaching, curriculum, assessment and educational leadership. Dr. Whetstone serves on several doctoral committees and university wide committees that focus on quality curriculum, instruction, assessment and leadership among educators.