

**Bridging the Gap to Math Performance and Confidence among
Students with Learning Disabilities: A Qualitative Analysis of the
JUMP Math After-School Tutoring Program**



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Introduction

JUMP (Junior Undiscovered Math Prodigies) Math is a numeracy tutoring program that has been federally registered as a charitable organization (Mitchell, 2014). This organization is committed to providing an enhanced understanding of math and creating a safe environment for children to develop a passion towards mathematics. JUMP Math is highly dedicated to improving mathematical performance, reducing mathematical anxiety as well as building student and teacher confidence towards mathematical learning (Solomon, et al., 2019). JUMP Math offers diverse and balanced materials that minimize differences in learning capabilities, in the hopes of narrowing the wide gap present in student performances (Preciado-Babb, et al., 2018). Furthermore, JUMP Math sheds light on the myth that only some people are born with mathematical abilities. Instead, JUMP Math highlights the importance of nurturing mathematical talent in every child through using unique methods catered to their own various learning styles (Mighton, 2007). JUMP materials allow instructors to recognize the distinctive needs of students and monitor their mathematical progression through analyzing gaps in fundamental numeracy skills and providing tailored support (Bryce, 2016). JUMP focuses on breaking down mathematical concepts into the most central units for more thorough understanding of math and allows tutors to work at the pace of their students (Solomon, et al., 2019). The core philosophy of JUMP Math aligns well with the mission of the Learning Disabilities Association of Niagara: to ensure every child can be successful at math when given the appropriate materials and assistance (Vancouver School Board, 2007).

Methods

The Learning Disabilities Association of Niagara Region (LDANR) offers numeracy tutoring using the JUMP Math resources for children in Grades 1-8 who are performing a

minimum of one year behind in their math skills due to a suspected or diagnosed learning disability. With the support of an Ontario Trillium Foundation (OTF) Grow Grant, the LDANR offered twenty (20) program spots during the Winter 2020 season to assist children and youth in developing stronger social and emotional skills through a focus on specific math skill instruction and confidence-building. The children met with tutors using the JUMP Math resources two times per week for a duration of one hour, across a six-week period (intended to be an eight-week period but sessions ended early due to COVID-19 closures).

Quantitative measures of numerical skills and confidence were obtained on the first evening of program. These pre-assessments served two purposes: to provide a diagnostic assessment for the tutors to know where to begin instruction and to provide a baseline assessment of numeracy and confidence before the program. Due to pre-emptive and sudden closures for the COVID-19 pandemic in Niagara, all of the winter programming was cancelled immediately with two weeks remaining in the program and the final quantitative assessment of numeracy and confidence skills were not obtained. As a result, no quantitative reports comparing the baseline and final scores of the students enrolled in the JUMP Math program this winter were available. However, Craig (2020) found significant numeracy and confidence gains among JUMP Math participants in the Fall 2019 session.

In order to evaluate the effectiveness of the numeracy tutoring program amid social distancing, qualitative surveys were administered electronically to volunteer-tutors and on-site facilitators, along with caregivers of the children participating in the program to gain more insight on their experiences and make improvements to the program delivery moving forward in the grant. The surveys administered to volunteer-tutors and on-site facilitators evaluated the program training and their first-hand account of the program's ability to improve math

confidence and the mathematical skills of their students. These questions were evaluated on a scale of 1-5, where 1 depicts that they *strongly disagree*, and 5 depicts they *strongly agree*. In addition, the survey evaluated the success of the pre- and post-assessments and welcomed any feedback or suggestions to improve the program. The electronic surveys administered to the caregivers probed about their child's improvement in math confidence and attitude over the course of the program and evaluated the capabilities of volunteer-tutors and on-site facilitators, as well as program adaptability and the overall learning environment. Likewise, these questions were evaluated on a scale of 1-5, where 1 depicts that they *strongly disagree*, and 5 depicts they *strongly agree*. This survey welcomed any suggestions or recommendations for program improvement as well.

Results

Overall, the results received from both the staff and caregiver surveys illustrated positive trends and supportive feedback. Since these questions were evaluated on a Likert scale of 1-5, where 1 depicts that they *strongly disagree*, and 5 depicts they *strongly agree*, the mean values were used to assess each question's average response. There was a total of 14 responses (of a possible 21) from volunteer-tutors and/or on-site facilitators and the results are illustrated below in Figure 1.



Figure 1: Tutor/Staff Survey Question Responses. Majority of these responses were collected on a Likert scale. They were evaluated on a scale of 1-5, where 1 depicts that *they strongly disagree*, and 5 depicts they *strongly agree*. These are mean values of the responses from 14 completed surveys.

For the first question, “Do you feel supported in your role at LDANR?”, the average answer was a 4.71, approximately representing the response of *strongly agree*. For the second question, “Did you feel that the program training provided you with the necessary tools to be successful?”, the average answer was a 4.36 approximately representing the response of *agree*. For the third question, “How much did your child’s confidence improve when doing math as a result of JUMP Math?”, the average answer was a 3.93, approximately representing the response of *agree*. For the fourth question, “How much did your child’s math skills improve as a result of

JUMP Math?”, the average answer was 3.71, approximately representing the response of *agree*. For the final question, “Do you believe the pre-assessment and post-assessment successfully evaluated your child’s math skills?”, the average answer was 3.57 approximately representing a response between *neither agree nor disagree* and *agree*. Overall, all responses from the volunteer-tutor and facilitator surveys illustrated average values representing *agree* or *strongly agree* depicting a positive relationship in regard to a positive experience working with the numeracy tutoring program and the positive impact of the JUMP Math approach on their students (see Table 3 in Appendix A).

For the caregiver surveys, a total of six (of a possible nineteen) questionnaires were completed, collected and analyzed below in Figure 2. For the statements: “My child enjoyed the program”; “I believe that my child benefited from participating in the program”; “I have noticed a positive change in my child’s attitude and confidence since participating in this program”; “The staff/volunteers were knowledgeable and communicated effectively about the progress of my child”; “The program was well adapted to my child’s needs”; “The program was a positive learning environment for my child”; and “I would recommend this program to my family and friends”, the average answer was 4.83 approximately representing *strongly agree*. For the final statement, “I would enroll my child in this program again”, the average answer was 5 representing the response of *strongly agree*. Overall, all responses from the caregivers demonstrate a highly positive experience with the numeracy tutoring program provided by the Learning Disabilities Association of Niagara using JUMP Math resources (see Table 7 in Appendix B).

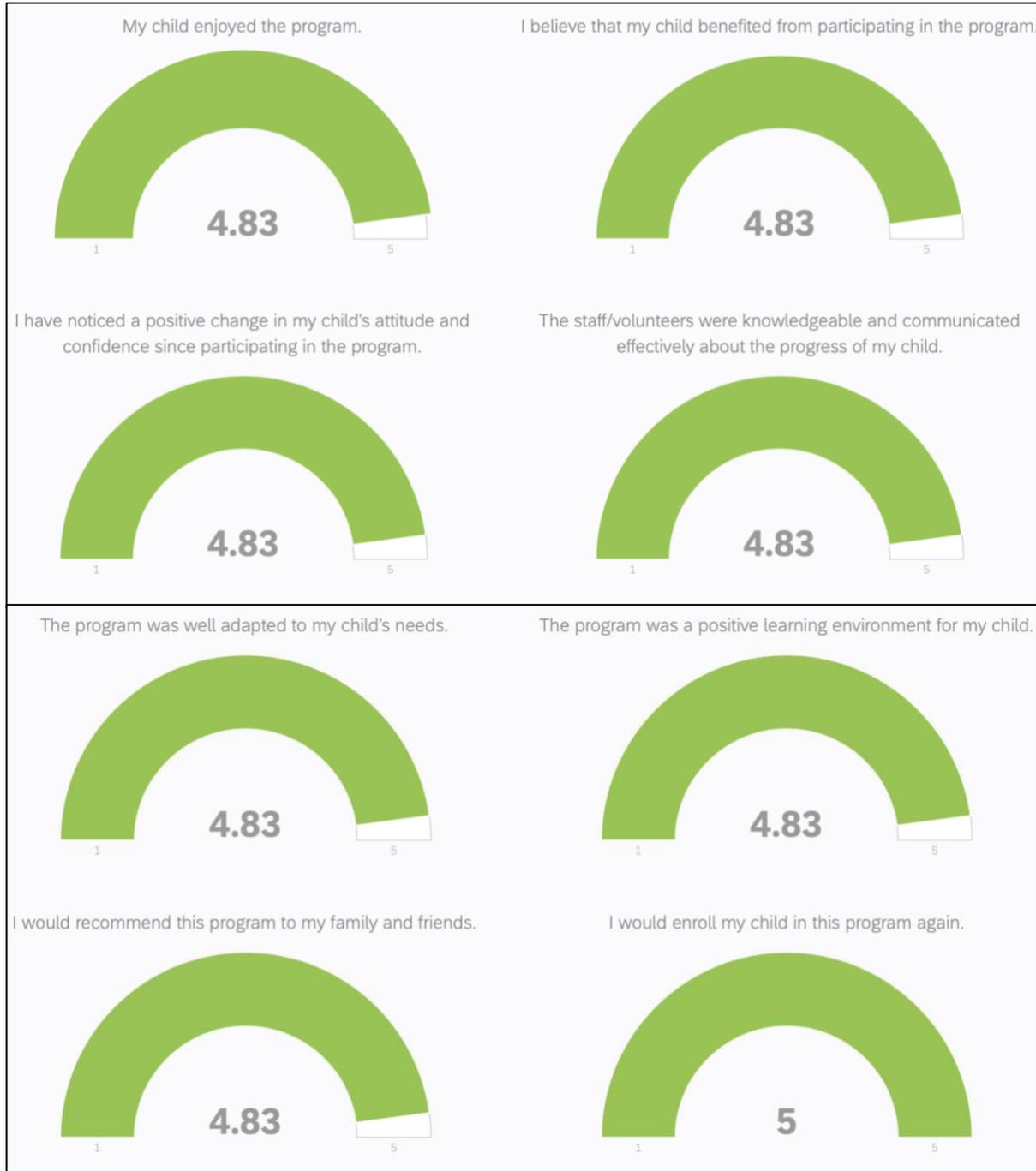


Figure 2: Caregiver Survey Question Responses. These responses were collected on a Likert scale. They were evaluated on a scale of 1-5, where 1 depicts that they *strongly disagree*, and 5 depicts they *strongly agree*. These are mean values of the responses from six complete surveys.

Discussion

Unfortunately, as a result of the COVID-19 pandemic, quantitative post-assessments on numerical skills and math confidence scales of participants were not able to be analyzed. The results from the volunteer-tutor and on-site staff surveys clearly illustrate the positive impact the JUMP Math program had on participants. On average, the tutors believed that their child's math confidence improved by 73.25% as a result of the JUMP Math program. This is consistent with a quantitative report from the Fall 2019, which found that many students who believed they were "bad" or "okay" at math at the beginning of the intervention, instead believed that they were "okay" or "good" at math by the end of the intervention (Craig, 2020). On average, the tutors believed that their child's math skills improved by 68% due to this program as well. This presents a small but noticeable discrepancy with the findings of the Fall 2019 quantitative report, which indicated that more students (89%) benefited from the LDANR numeracy tutoring intervention using JUMP Math resources (Craig, 2020). This discrepancy likely demonstrates the limitations of the qualitative evaluation used in the current project, rather than a reduced efficacy of the program. Since we were not able to collect baseline and post-program scores to compare statistically, we needed to rely strictly on observational reports from volunteer-tutors regarding the perceived gains in math scores and confidence levels which can be difficult to observe accurately without a standardized measure. Optimistically, these results showed that on average, the tutors strongly agreed that they felt supported in their role at LDANR and the tutors agreed that they felt the program training provided them with the necessary tools to be successful.

The response with the lowest level of agreement among volunteer-tutors and on-site staff was 64.25%, when asked if the assessment tools successfully evaluated their child's math skills. Also, the volunteer-tutor and on-site staff surveys welcomed any feedback and suggestions

regarding the assessments, and the program more generally (see Table 4, 5, 6 in Appendix A). In relation to the assessments, the majority of the suggestions recommended using simpler language, making them more kid-friendly and using adapting assessment tools to accommodate various learning styles. Therefore, it would be beneficial to perceive these assessments as an area for improvement for further studies for future program delivery. In relation to the program in general, the feedback was extremely positive! Many volunteer-tutors and on-site staff felt that the one-on-one tailoring of the numeracy tutoring was invaluable for improving math skills and math confidence. The hands-on materials and math resources were also mentioned to contribute to this program's success! The staff and tutors enjoyed the engaging and comfortable environment provided by the JUMP Math program and stated how it better supported the children's math skills and math confidence.

The results from the caregiver surveys illustrate JUMP Math's positive impact on math confidence and reducing math anxiety among the participating children. On average, the caregivers strongly agreed that their child enjoyed the program, benefited from the program, and that they noticed a positive change in their child's attitude and confidence since participating in the program. Also, on average the caregivers strongly agreed that the volunteer-tutors were knowledgeable and communicated effectively about their child's progress, the program was well adapted to their child's needs, was a positive learning environment, and that they would recommend the program to family and friends. All caregivers who completed the survey strongly agreed that they would enrol their child in this program again.

Overall, the results from the caregiver survey evidently portray the immense positive impact the JUMP Math program has been able to provide to families with children struggling to learn mathematics. The caregiver surveys welcomed any suggestions and feedbacks about the

program as well (see Table 8 in Appendix B). The feedback from these questionnaires was very positive. Majority of caregivers shared that their children had low self-confidence and experienced math anxiety before the start of the JUMP Math program. They shared that as the program continued, they observed a direct positive change in their child's confidence towards mathematics as a result of the one-on-one tutoring. Some shared that their children were very excited and bubbly when talking about their night at math tutoring, which was contagious for the whole family! The feedback highlighted the importance and the strong impact of the JUMP Math program on caregivers within the community.

For further research studies, improvements to numeracy assessment tools would be beneficial for the volunteer-tutors and participating students. It is important to note that while certain accommodations may benefit some children with learning disabilities, no single accommodation has been proven to benefit all children with learning disabilities (Fuchs, L., Fuchs, D., & Capizzi, 2005). Even accommodations such as orally reading tests has been shown to be beneficial to some children, while being detrimental to others (Elbaum, 2007). Noise-reducing headphones have also shown promise to benefit some children with learning disabilities, while presenting others with negative impacts. Children with learning disabilities have diverse needs in terms of accommodations (Desoet & Grégoire, 2006). However, visually chunking and the use of representations have been found to improve math skills and confidence for students with mathematical learning disabilities (Zhang, Ding, Stegall & Mo, 2012). After measuring the volunteer-tutor feedback with the recommendations of recent empirical literature, it would be beneficial if the assessments were adapted and adjusted in order to accommodate more effectively for students with diagnosed or suspected learning disabilities. It is recommended to ensure questions use simple language for the children to easily understand what

is being asked of them. The incorporation of more colour and visuals within the assessments is also encouraged (Phillips, Norris, Macnab, 2010). It would be advisable to incorporate various learning styles (i.e. visual, auditory and kinesthetic) to appeal to distinct and diverse needs of each child in the assessment. It was shown that by adapting to unique needs, one can assess their capabilities and math skills more accurately (Desoete & Grégoire, 2006). Therefore, it would be best for the volunteer-tutors to administer the assessment based on the child's needs. For example, if the child works best with noise reduction headphones, that accommodation should be put in place for them to perform to the best of their ability on the evaluation. Also, various question styles should be implemented to ensure that students are able to showcase their math skills in a variety of ways. A limitation to this may be the standardization of the assessment across all the children within the program. However, as long as the guidelines remain the same for the pre-assessment as they are for the post-assessment, one can still reliably measure the progress and changes to the child's math skills.

Conclusion

Through a qualitative evaluation of the findings and responses from the electronic surveys administered to volunteer-tutors, on-site facilitators and caregivers, the JUMP Math program has evidently shown an immense positive impact on the math confidence and math skills of the participants. The results from this project build on the quantitative results obtained in the Fall 2019 indicating the overall effectiveness and efficacy of the JUMP Math program for students with diagnosed or suspected mathematical learning disabilities. Quantitative (Craig, 2020) and qualitative results demonstrate the ability of this one-to-one numeracy tutoring program to increase overall math skills, and subsequently math confidence, among participants from Grade 1-8. The recommendations for the numeracy assessment tools will also play a key

role in supporting participants to achieve their full potential. The JUMP Math program can benefit various children with learning disabilities and provides much needed and timely support to a vulnerable population. Overall, numeracy tutoring with JUMP Math resources evidently improves math confidence and math skills of children with learning disabilities, thus narrowing the gap present in student performances leading to further academic and socio-emotional success.

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Appendix A

Table 3

Tutor & Staff Questionnaire Responses

Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
Did you feel supported in your role at LDANR?	3.00	5.00	4.71	0.70	0.49	14
Did you feel that the program training provided you with the necessary tools to be successful?	3.00	5.00	4.36	0.72	0.52	14
How much did your child's confidence improve when doing math as a result of JUMP Math?	1.00	5.00	3.93	1.03	1.07	14
How much did your child's math skills improve as a result of JUMP Math?	1.00	5.00	3.71	1.03	1.06	14
Do you believe the pre-assessment and the post-assessment successfully evaluated your child's math skills?	1.00	5.00	3.57	1.18	1.39	14

Table 4

Tutor & Staff Feedback Regarding Most Effective Aspects of JUMP Math

What aspects of JUMP Math did you find to be the most effective in improving math skills and/or confidence?
Consistency in meeting with tutors, gaining comfortability in the setting and with the tutors allowed the child to become more comfortable and ask questions/clarification which allowed them to learn more, become more confident, and subsequently improve on skills. The hands-on materials available were excellent resources as well.
Freedom of expression and approach. Tailoring needs to the child. Being able to level with child.
Clear and full of visual supports
I believe JUMP math did a great job at providing lots of different types of materials to help students succeed. The math manipulatives like the base ten blocks, whiteboards and flash cards allowed the student to better visualize topics they had been struggling with. It was much easier to get the student engaged in the lesson if they could see a physical representation of concepts. Additionally, the progression of lessons in the workbook allowed the student to continuously build off of previous lessons. This constant review of concepts contributed greatly to the students' increase in confidence surrounding math. The recommended structure of each lesson which includes mental math, a lesson and then a math game allowed for variety and ensured the student was never feeling overwhelmed. The math games were very helpful in keeping the student excited about the program.
The group games/ end of session games
I feel the playful ways and activities that as a facilitator I had to create to make learning more enjoyable.
Definitely the one on one setting so that the child can have individual attention and lessons that are tailored to where they are in their math skills, I this is a major factor in the success of the program.
Being in a fun work environment where they want to come and learn, and where they are surrounded by kids just like them. Lets them work at their own pace and promotes confidence
The use of learning tools and the role of volunteers as a facilitator. Apart from this, the willingness of children to learn is most effective in improving math skills.
Lots of repetition and having someone there to support the student through when they become unfocused or uninterested.
That it was one-on-one
Resources
The math practice books and some of the math games
I think the ability to use games and the showing of the kids process in the folders was very helpful in keeping the chil focused and engaged on their learning

Table 5

Tutor & Staff Survey General Feedback

Please provide any general suggestions that you may have for future program sessions.
More word-problem like questions that really push the child to use their learned skills and think differently would be a great addition to the workbook.
More in book opportunities to approach subjects for both tutor and student. Non-math major considerations. Lesson on how to teach math
More math games please
In the future, I believe the lessons could include some more variety in the presentation of questions. The workbook was excellent in reviewing skills like subtraction but could have included some word problems within that section to give the student real world applications of the skill. The workbook, however, was very helpful in reinforcing basic skills and ensured the student had grasped the key concepts, which is ultimately the most important thing.
Just keep up the great work the program is doing right now!
I think one-to-one tutoring is productive but to have a more worthwhile experience another way is to teach and supervise a group of learners so that it can help would-be teachers in their profession.
Possibly incorporating some group activities into the sessions so the children get a chance to collaborate with others (ex, 15-minute group activity a week) these could be in the form of math games, practice sessions or mini lessons.
A once a week type test where any number of kids can participate in that challenges them to get in front of the class and figure out a problem (did this on one of the last days where I put a hunch of increasingly difficult math questions on the board and they could come up at any time to try any of them if they pleased)
I experienced that in teaching Jump Maths, only modern methods of teaching are used. In the future session, if there will be a blend of traditional as well as modern techniques, I believe that it will be more beneficial for children.
I think an area that needs more definition is the area where students begin to struggle on the assessments. I had many people asking me what exactly it meant so they knew where to start teaching from and although struggle is a very individual thing some suggestions for where to proceed in training would be beneficial for the tutors (i.e. getting more than 5 in a row wrong, not being able to show how they got the answer for certain questions).
Have more structure
Flexible timings/days
More math games
As a volunteer just be patient and be open to the child's needs in order to help them stay engaged

Table 6

Tutor & Staff Survey Assessment Feedback

Please provide any suggestions/recommendations you may have regarding the assessments.
N/A
Multiple explanations for questions, not assuming things in trying to get at what they know. Simpler language
I am very sorry that because of the urgent health concerns, the program has to be suspended. I did not have a chance to do the post assessment. However, I think the pre assessment helped a lot for my client. Thank you!
I thought the pre-assessment was a great way to gauge what topics the student was already comfortable with. I began my first lesson at the beginning of the unit that was recommended based off of the assessment results. I then used the student's confidence in that lesson to select the specific starting place within the unit to begin the next lesson. Overall, the assessment was a very helpful tool in guiding me to decide what lessons were appropriate to the student's abilities. Although we did not conduct post-assessments, I believe the student would have improved on many topics they were struggling with before the program.
A bit better wording on questions
the idea of pre and post-assessment is beneficial to students as well as to teachers to evaluate the improvement of student.
I think the assessments were a really good tool to evaluate the child's starting level.
N/A
I found this program very useful. This program should be conducted in all the cities of the Niagara region in every term.
The assessments need a thorough edit as there are many mistakes. Some of the wording to certain questions can be difficult to understand even for the adult tutors.
More kid-friendly
No suggestions
Maybe have more math games
I think just to give the volunteers a little more heads up that the assessments are long and difficult and different strategies to help the kid get through them faster

Appendix B

Table 7

Caregiver Questionnaire Responses

#	Question	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Total
1	My child enjoyed the program.	0.00%	0	0.00%	0	16.67%	83.33%
2	I believe that my child benefited from participating in the program.	0.00%	0	0.00%	0	16.67%	83.33%
3	I have noticed a positive change in my child's attitude and confidence since participating in the program.	0.00%	0	0.00%	0	16.67%	83.33%
4	The staff/volunteers were knowledgeable and communicated effectively about the progress of my child.	0.00%	0	0.00%	0	16.67%	83.33%
5	The program was well adapted to my child's needs.	0.00%	0	0.00%	0	16.67%	83.33%
6	The program was a positive learning environment for my child.	0.00%	0	0.00%	0	16.67%	83.33%
7	I would recommend this program to my family and friends.	0.00%	0	0.00%	0	16.67%	83.33%
8	I would enroll my child in this program again.	0.00%	0	0.00%	0	100.00%	100.00%

Table 8

Caregiver Share Your Story Responses

Why did you seek the support of the LDANR? What positive changes occurred from your involvement with the LDANR? What positive impact did it have on you, your child, and your family? Why is this change and/or impact significant?
<p>*My child enjoyed math but was unable to show how he came up with the answers to problems at school. He got the answer in his head and wrote it down but had marks deducted because he could not show the steps he took to arrive at the final answer. Subsequently, he was very frustrated and discouraged. Jump Math gave *my child the tools and knowledge on how to express what was in his head and to put it on paper. He was no longer frustrated or discouraged. After every Jump Math class *my child came home bubbly and talkative. He shared with all of us his "Math Night", so much so that none of us could get a word in. His excitement was contagious, and the entire family felt happy and great! *My child has more confidence and a stronger bond with his family.</p>
<p>Challenges for my daughter with schoolwork and she felt she was dumb and felt no one had the time for her to learn. *My child looked forward to going to tutoring every night and showed herself she can get it! School seemed fun again and that she knew she can do this with help. Does amazing with the one on one teacher if that isn't always available due to over size classes. Children are hard on themselves and must understand that they all learn differently. She needed to be reminded she is smart and learns differently. Thank you again!</p>
<p>My daughter is diagnosed with a learning disability and I am always looking for extra support for her. I think so many kids need help with math, and I wanted to concentrate on this for the term. Will do again in fall and winter. My daughter loves her tutors. The summer program helps because our school does not offer summer school. There is no increase to the time she gets through the board yet her needs increase as she gets older and falls further behind. My daughter has particularly improved her reading. She is more confident. So good to have the programs! I really apply the 1-1 lesson plan. This is a huge bonus. Not everyone can afford private tutoring. I only wish the program could finish because there would be more benefit.</p>
<p>To improve my son's math skills and to learn new strategies. My son has improved in accuracy and completing math homework and tests. His teacher has also noticed an improvement and confidence. Now there is less stress when completing math homework and my son has more confidence when solving math problems. My son is now able to work independently when completing math assignments and homework.</p>

*Child name was retracted for confidentiality purposes, replaced with "my child".