



**NUMERACY INITIATIVES IN SURREY SCHOOLS**  
SEPTEMBER 2021 - JUNE 2022

# A MESSAGE FROM SURREY SCHOOLS

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Surrey Schools is located on the traditional, ancestral, and unceded territory of the Katzie, Kwantlen, Semiahmoo, and other Coast Salish Peoples. It is B.C.'s largest school district where close to 12,000 employees serve over 75,000 children in our diverse multicultural city. We have over 130 educational sites from early learning to adult education.

The district is committed to continuous improvement and success of all students through implementation of evidence-informed practices that enhance student learning, inclusivity and equity outcomes. We welcome and honour diversity while supporting students' holistic growth – mind, body, and heart – a commitment captured in our welcome video, *Éy swayel/Bienvenue/Welcome to Surrey Schools*.



Click to watch our welcome video, [Éy swayel/ Bienvenue/ Welcome to Surrey Schools](#).

## WELCOME FROM THE NUMERACY TEAM

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The Surrey Schools Numeracy Team collaboratively works with – and learns from – teachers from Kindergarten to Grade 12. It is our privilege to be invited into many different classrooms throughout Surrey. Our team supports schools, teams, and individual teachers by:

- Working closely with teachers pursuing numeracy inquiry questions.
- Providing district-wide after-school workshop sessions that address Surrey Schools Priority Practices.
- Facilitating school-based professional learning through workshops, “lunch and learns”, book clubs, and more.
- Meeting with teachers about passions or challenges related to the teaching and learning of mathematics.
- Teaching or co-teaching lessons.

If you are interested in learning more about the numeracy initiatives or how we support school communities across the district, please visit our website. We look forward to hearing from you!



Visit the Numeracy Helping Teacher website [HERE](#).

Chris Hunter, Jessica Kyle, and Marc Garneau



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# NUMERACY IN SURREY SCHOOLS

Numeracy encompasses the knowledge, skills, behaviours, and dispositions that students need to use mathematics in a wide range of situations. Numeracy also involves students recognizing and understanding the role of mathematics in the world and having the capacities to use mathematical knowledge and skills purposely.

To support students in becoming numerate and using mathematics confidently at school and in their lives, elementary and secondary teachers within the district have participated in various numeracy initiatives to explore standards-based mathematics. This report provides an overview of the various numeracy initiatives within Surrey Schools during the 2021-2022 school year.





# OVERVIEW OF NUMERACY INITIATIVES



Surrey schools has partnered with teachers over the past two years to explore evidence-based numeracy instruction and assessment practices. Teachers participated in district led sessions to: (1) improve their articulation of math goals and competencies, (2) deepen student learning of provincial learning standards, (3) design proficiency scales and communicate growth and concepts, (4) gather evidence of student learning, and (5) broaden their understanding of what constitutes student learning in mathematics. Table 1 provides an overview of select numeracy initiatives our district has continued this school year.

Providing support for these initiatives are the Numeracy/Instructional Practice Helping Teachers, who are leaders in the development and implementation of research informed numeracy curriculum within the district. Helping teachers also provide continuous support and in-district training to educators on a variety of numeracy topics.

NUMERACY INITIATIVE	DESCRIPTION
<b>1. Standards-Based Assessment in Secondary Mathematics</b>	In collaborative inquiry teams, teachers explored ways to change their assessment practices (e.g., creating new summative assessments together; designing standards-based grading systems, rubrics, and learning progressions; determining letter grades/percentages; portfolios; looking at sample student work and other evidence of learning, etc.) to better assess and evaluate what students know and can do within secondary mathematics.
<b>2. Standards-Based Assessment in Elementary Mathematics</b>	In collaborative inquiry teams, teachers implemented standards-based assessment practices (e.g., designing rubrics and learning progressions that communicate quality and growth with respect to learning standards; analyzing sample student work and other evidence of learning through the lens of these rubrics/progressions; etc.) to better assess and evaluate what students know and can do within elementary mathematics.
<b>3. Building Thinking Classrooms in Mathematics</b>	Through reading then discussing the professional learning resource, <i>Building Thinking Classrooms in Mathematics</i> at facilitated webinars, teachers learned about and attempted to implement fourteen research based-practices to engage students in deep mathematical thinking.





# RESULTS OF INITIATIVES



# OVERVIEW OF STANDARDS-BASED ASSESSMENT SURVEYS



Teachers who took part in the Standards-Based Assessment (SBA) initiative were surveyed about their experiences with the initiative. The SBA Survey asked teachers to rate their comfort level and the extent to which they implemented a variety of learning and assessment practices, as well as their perceptions of their students' learning on various mathematical competencies. To measure pre- and post-initiative differences, teachers completed a survey prior to, and again immediately following, their participation in the initiative.

There were a total of 11 closed-response items on the SBA Survey. The first four items pertained to teachers' comfortability level with:

1. Gathering evidence and not points in relation to learning standards.
2. Using evidence to identify where students are at and what is next in their learning.
3. Developing proficiency scales.
4. Using proficiency scales.

The next 7 items pertained to teachers' perceptions of the extent to which students demonstrated:

5. Reasoning and analyzing competencies.
6. Understanding and solving competencies.
7. Communicating and representing competencies.
8. Connecting and reflecting competencies.
9. Understandings of content.
10. Disposition toward math.
11. Understanding of where they are in their learning journeys, and what is next.

All items were on a 10-point scale, with 1 indicating either teachers were *not at all comfortable* or students were *not at all able to demonstrate*, and 10 indicating teachers were *completely comfortable* or students were *completely able to demonstrate*.

The SBA Survey concluded with two open-ended questions that asked teachers how participating in the initiative would cultivate growth in student learning, and how the initiative would help teachers foster the ability to assess student learning.

Both the pre- and post-surveys are included in Appendices A and B of this report.



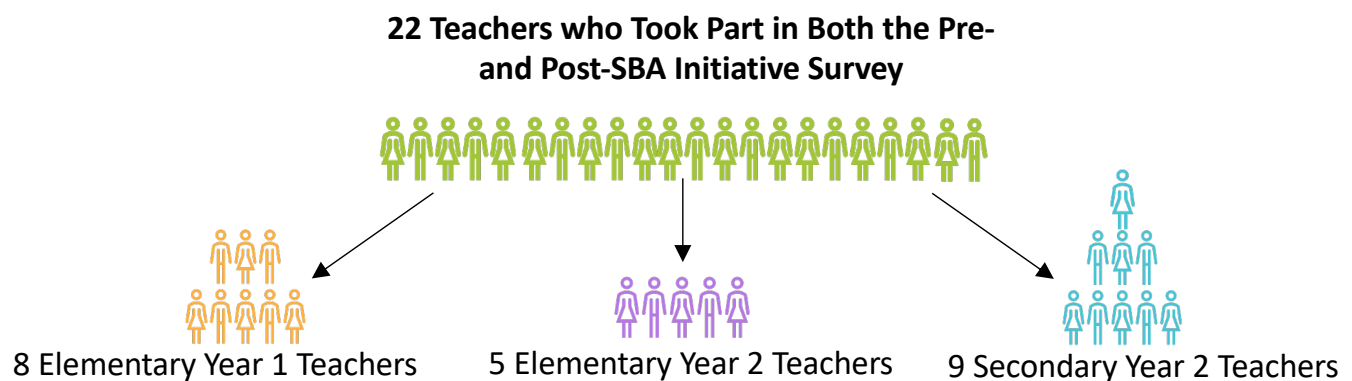
# ANALYSES FOR STANDARDS-BASED ASSESSMENT SURVEYS

There were a total of 22 teachers who completed the SBA Surveys reflecting on their experiences from Sept 2021 to the end of May 2022. As the SBA initiative is in its second year, teacher participants were separated into 3 groups: Elementary teachers who are in their first year in the initiative (Elementary Year 1), elementary teachers who are taking part in the initiative for the second year (Elementary Year 2), and for secondary teachers who are also taking part in the initiative for the second year (Secondary Year 2).

The following pages demonstrate the results of the SBA Survey for all participants (either separated by school level and years in the initiatives, or combined). Data is reported for all groups and considers all items before and after teachers' participation in the initiative.

Please note that it was only possible to test for statistical differences (using one-tailed t-tests) for the pre- and post-test data for this initiative using ALL participant data (regardless of year in the initiative or teaching level), as there were not enough participants in each group to separately analyze Elementary Year 1, Elementary Year 2, and Secondary Year 2.

In regard to open-ended items on the survey, thematic analyses were conducted across all participant items, and pre- and post-initiatives results are presented separately.



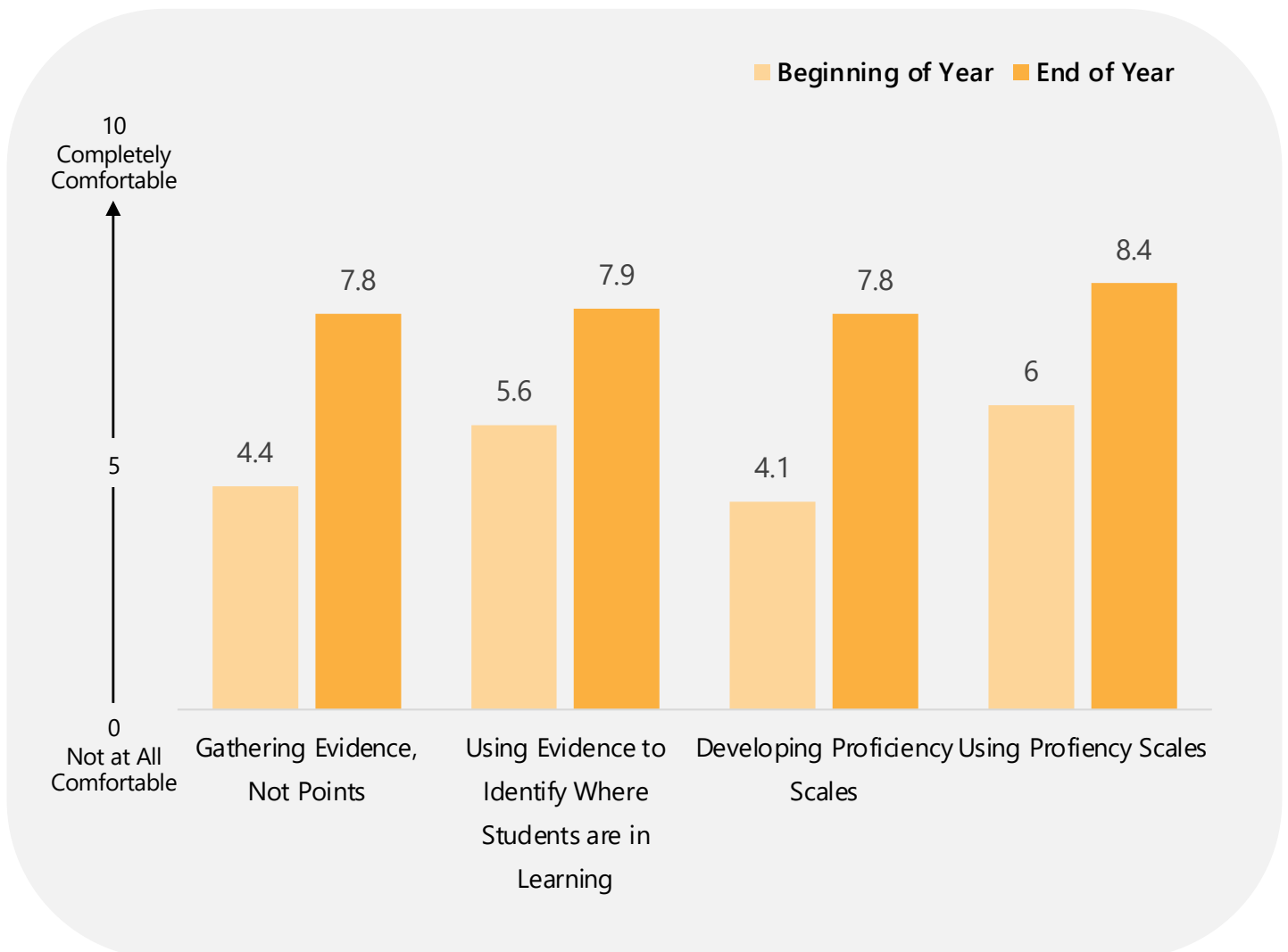


# Standards-Based Assessment – Elementary Year 1

There were a total of 8 elementary school teachers who took part in the standards-based assessment numeracy initiatives for the first time. Although statistical analyses were not conducted due to the small sample size, overall it appears as though teachers demonstrated (1) increased comfortability over the past school year in gathering evidence and not points, (2) using evidence to identify where students are at and what is next in their learning, (3) developing proficiency scales, and (4) using proficiency scales.

**Note:** All items were on a 10-point scale, with 1 indicating teachers were *not at all comfortable*, and 10 indicating teachers were *completely comfortable*.

**Figure 1.** Teacher Comfort Level (Elementary YR 1)

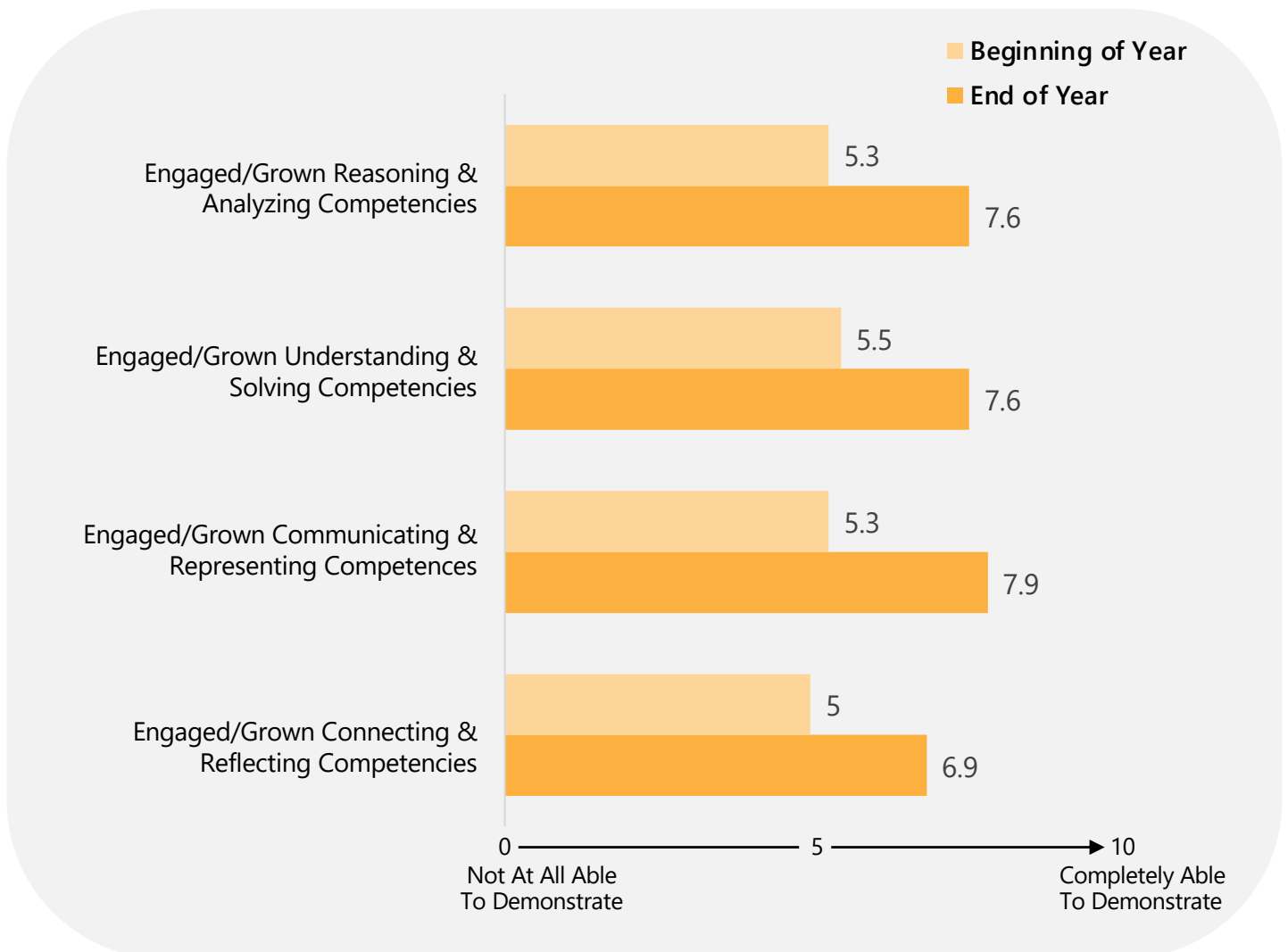


# Standards-Based Assessment – Elementary Year 1

There were a total of 8 elementary school teachers who took part in the standards-based assessment numeracy initiatives for the first time. Although statistical analyses were not conducted due to the small sample size, overall it appears that teachers reported a positive change over the past year in their students' development and growth in (5) their reasoning and analyzing competencies, (6) their understanding and solving competencies, (7) their communicating and representing competencies, and in (8) their connecting and reflecting competencies.

**Note:** All items were on a 10-point scale, with 1 indicating students were *not at all able to demonstrate*, and 10 indicating students were *completely able to demonstrate*.

**Figure 2.** Student Growth and Development (Elementary YR 1)



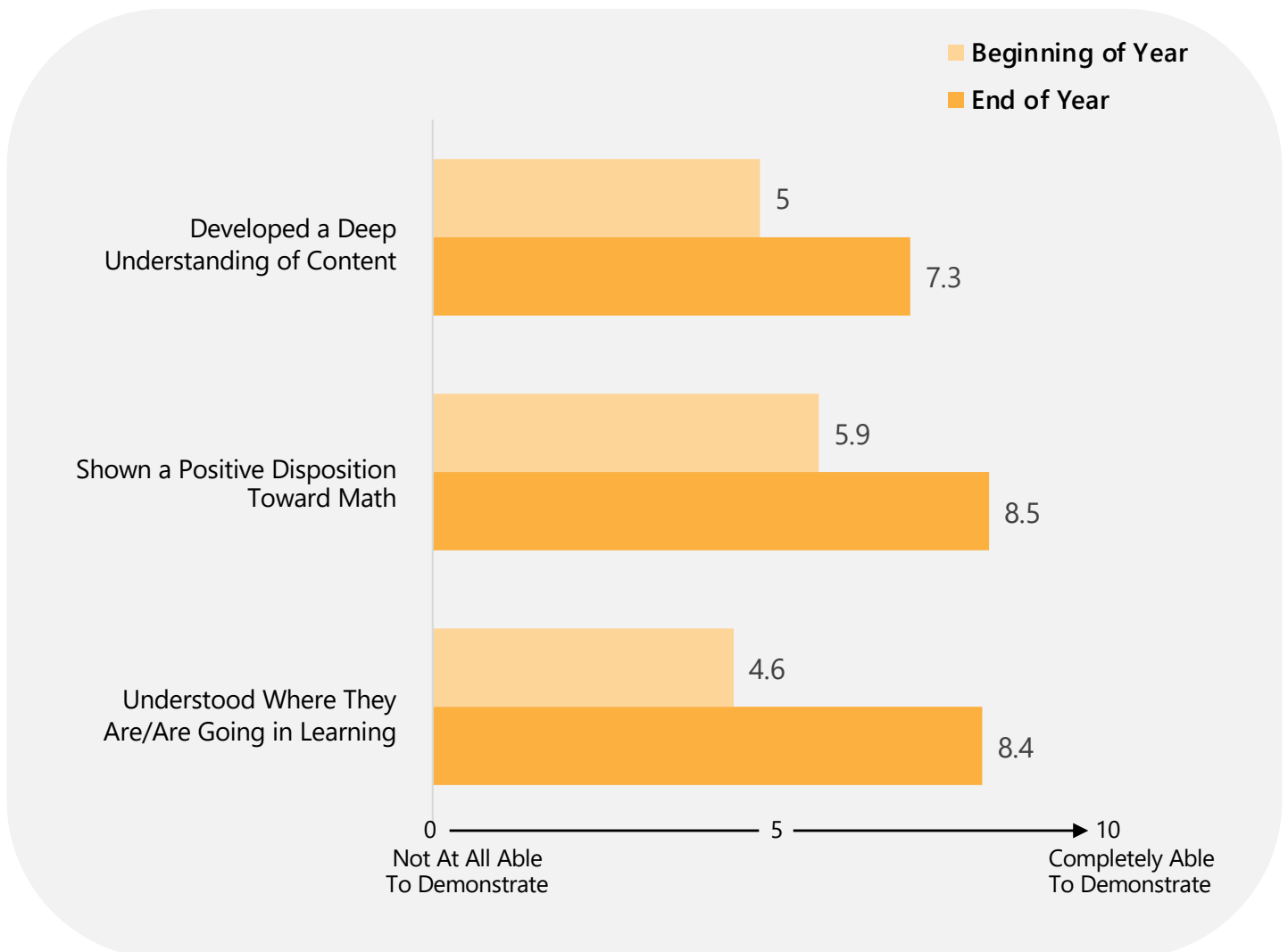


# Standards-Based Assessment – Elementary Year 1

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**Note:** All items were on a 10-point scale, with 1 indicating students were *not at all able to demonstrate*, and 10 indicating students were *completely able to demonstrate*.

**Figure 3.** Student Growth and Development (Elementary YR 1)

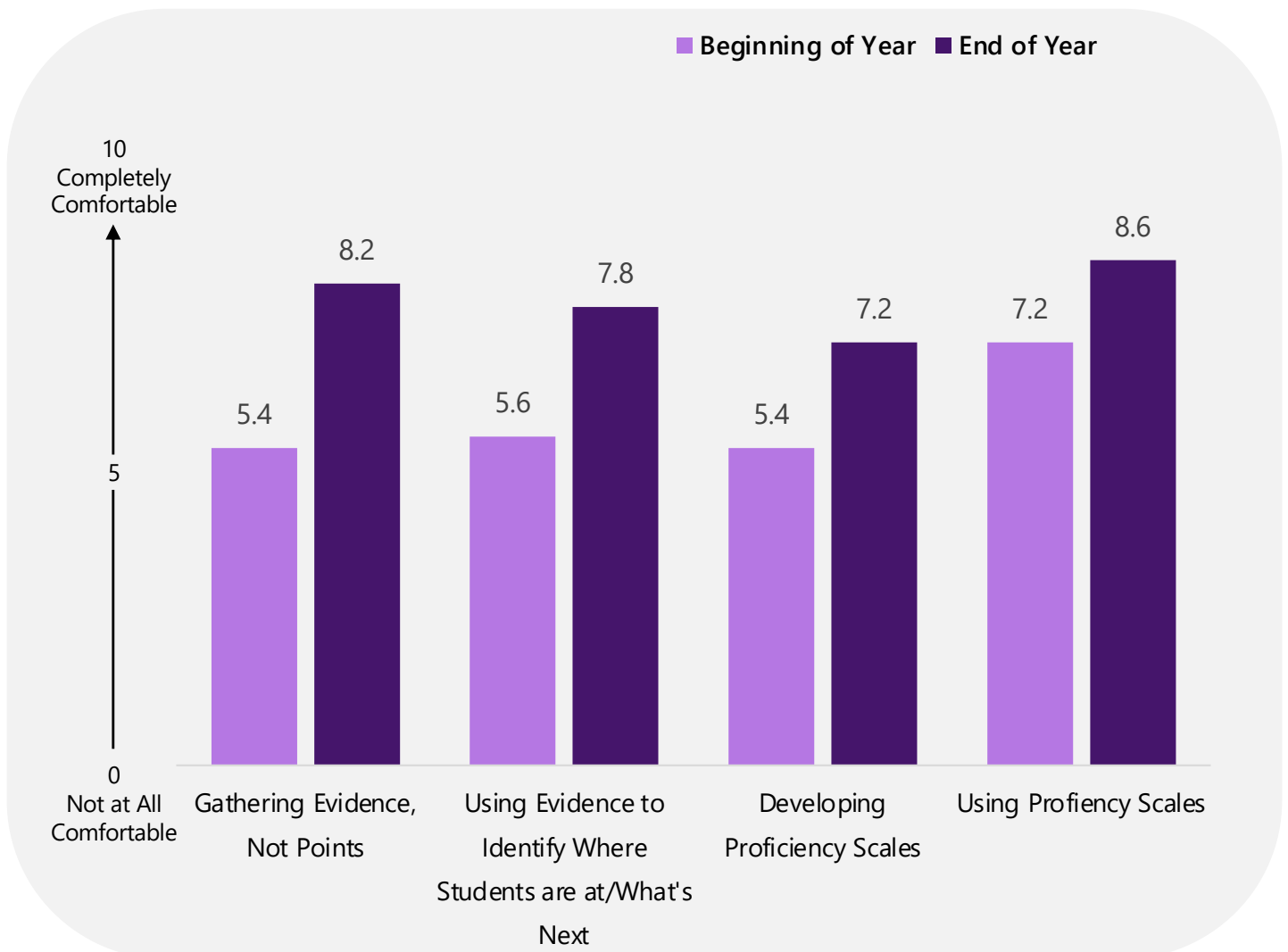


## Standards-Based Assessment – Elementary Year 2

There were a total of 5 elementary school teachers who took part in the standard-based assessment numeracy initiatives for the second year. Although statistical analyses were not conducted due to the small sample size, overall it appears as though teachers demonstrated (1) increased comfortability over the past school year in gathering evidence and not points, (2) using evidence to identify where students are at and what is next in their learning, (3) developing proficiency scales, and (4) using proficiency scales.

**Note:** All items were on a 10-point scale, with 1 indicating teachers were *not at all comfortable*, and 10 indicating teachers were *completely comfortable*.

**Figure 4.** Teacher Comfort Level (Elementary YR 2)

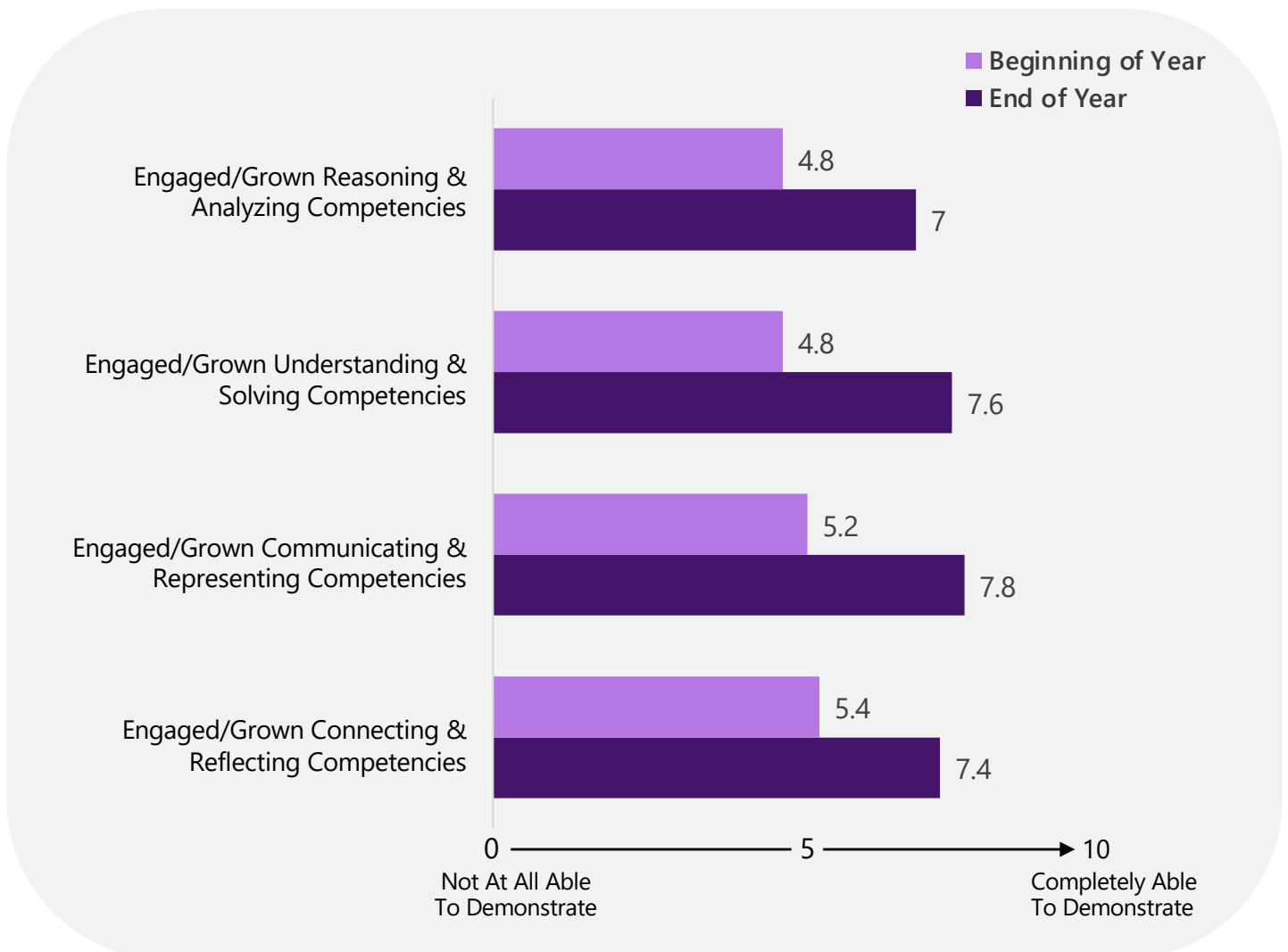


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**Note:** All items were on a 10-point scale, with 1 indicating students were *not at all able to demonstrate*, and 10 indicating students were *completely able to demonstrate*.

**Figure 5.** Student Growth and Development (Elementary YR 2)

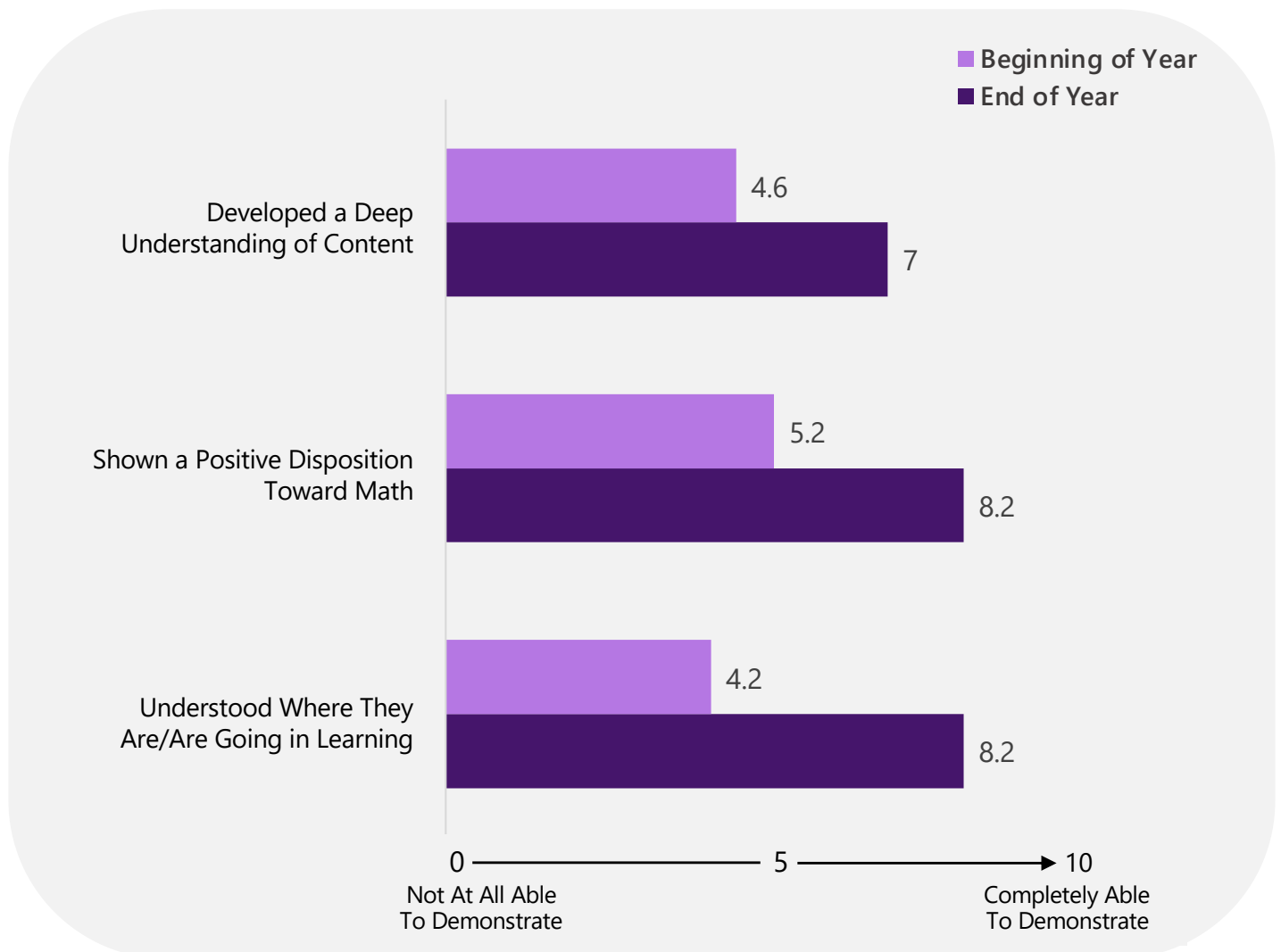


## Standards-Based Assessment – Elementary Year 2

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**Note:** All items were on a 10-point scale, with 1 indicating students were *not at all able to demonstrate*, and 10 indicating students were *completely able to demonstrate*.

**Figure 6.** Student Growth and Development (Elementary YR 2)



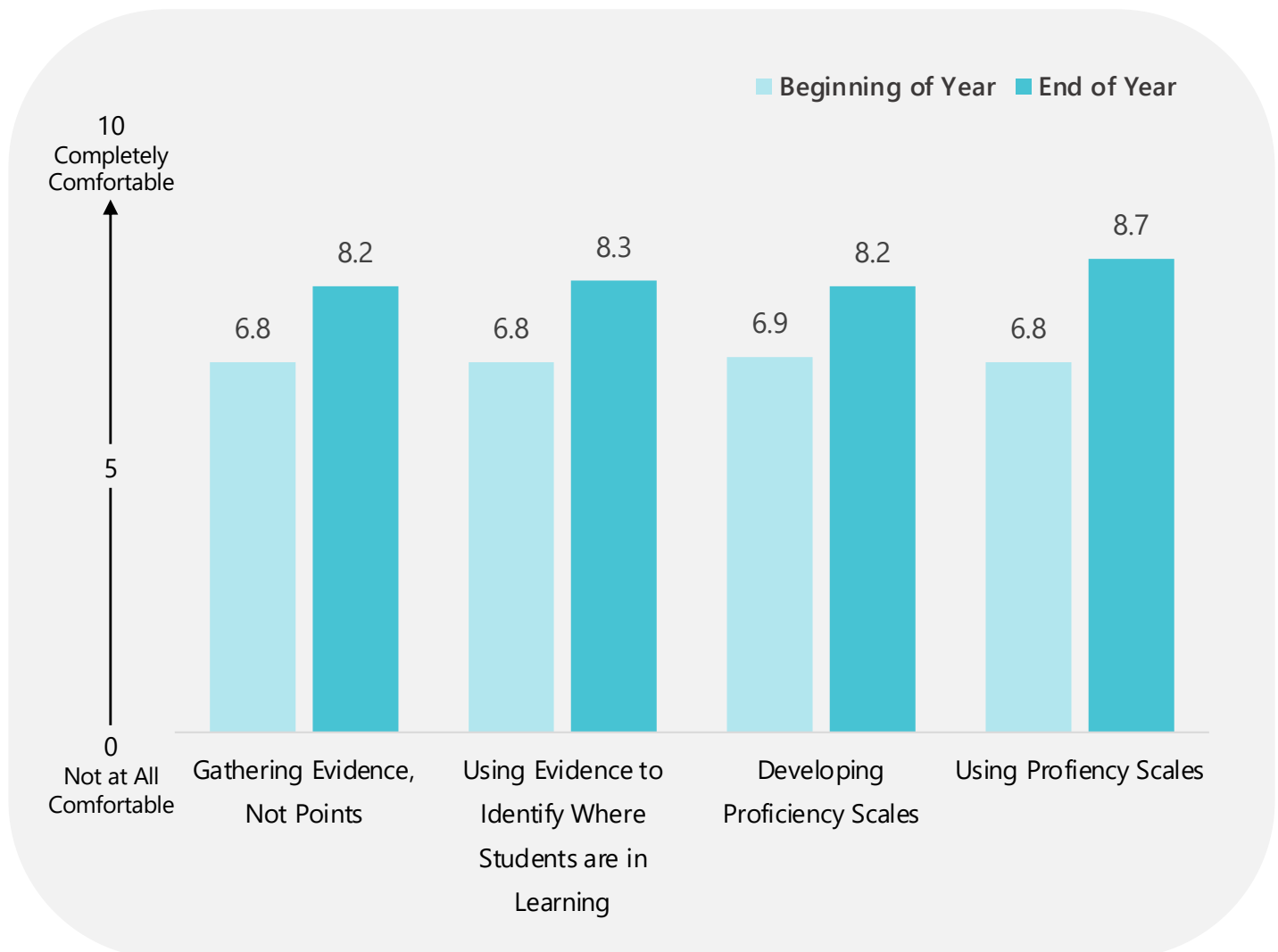


## Standards-Based Assessment – Secondary Year 2

There were a total of 9 secondary school teachers who took part in the standard-based assessment numeracy initiatives for the second year. Although statistical analyses were not conducted due to the small sample size, overall, it appears as though teachers demonstrated (1) increased comfortability over the past school year in gathering evidence and not points, (2) using evidence to identify where students are at and what is next in their learning, (3) developing proficiency scales, and (4) using proficiency scales.

**Note:** All items were on a 10-point scale, with 1 indicating teachers were *not at all comfortable*, and 10 indicating teachers were *completely comfortable*.

**Figure 7.** Teacher Comfort Level (Secondary YR 2)

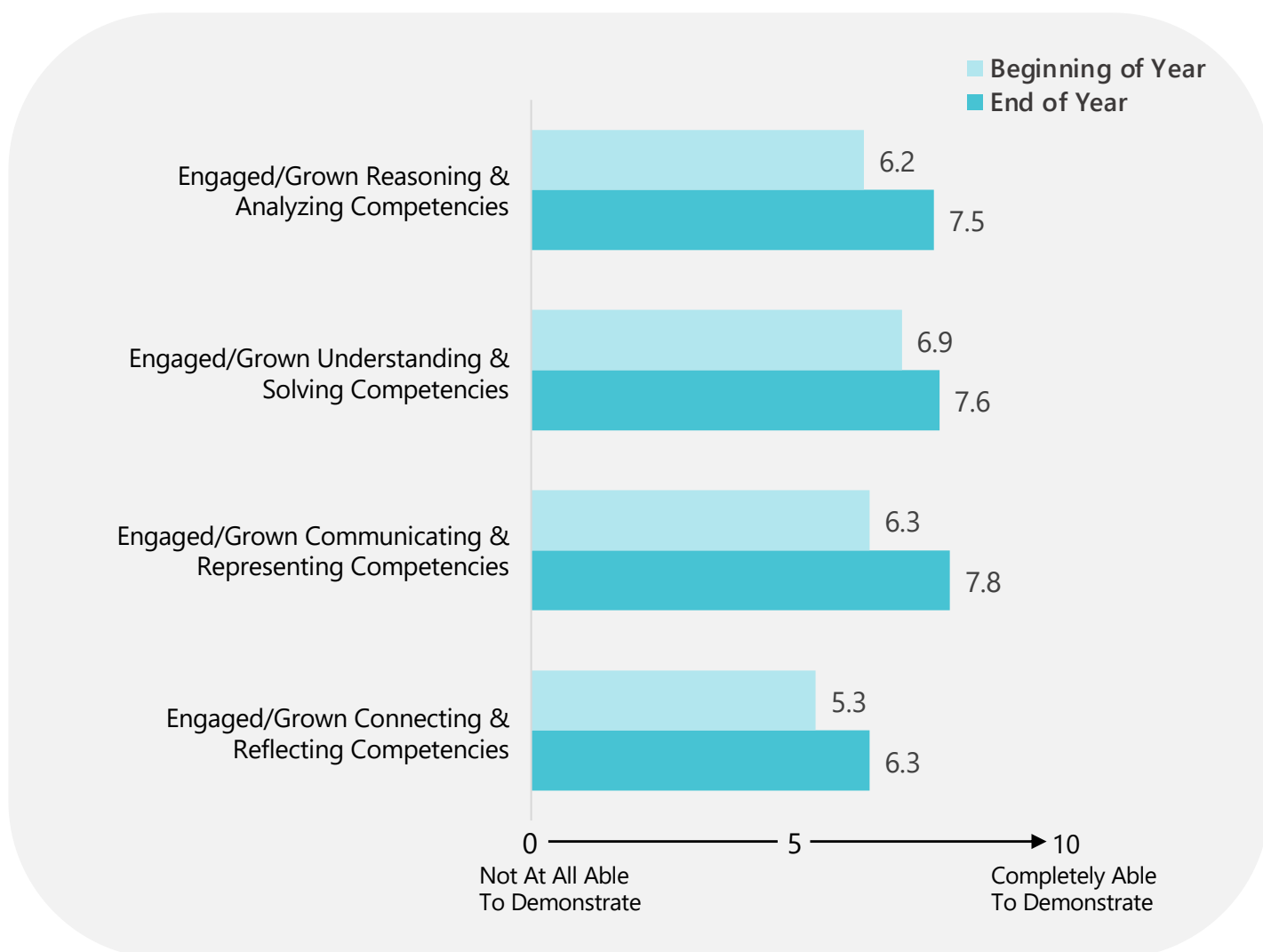


## Standards-Based Assessment – Secondary Year 2

There were a total of 9 secondary school teachers who took part in the standards-based assessment numeracy initiatives for the second year. Although statistical analyses were not conducted due to the small sample size, overall, it appears that teachers reported a positive change over the past year in their students' development and growth in (5) their reasoning and analyzing competencies, (6) their understanding and solving competencies, (7) their communicating and representing competencies, and in (8) their connecting and reflecting competencies.

**Note:** All items were on a 10-point scale, with 1 indicating students were *not at all able to demonstrate*, and 10 indicating students were *completely able to demonstrate*.

**Figure 8.** Student Growth and Development (Secondary YR 2)

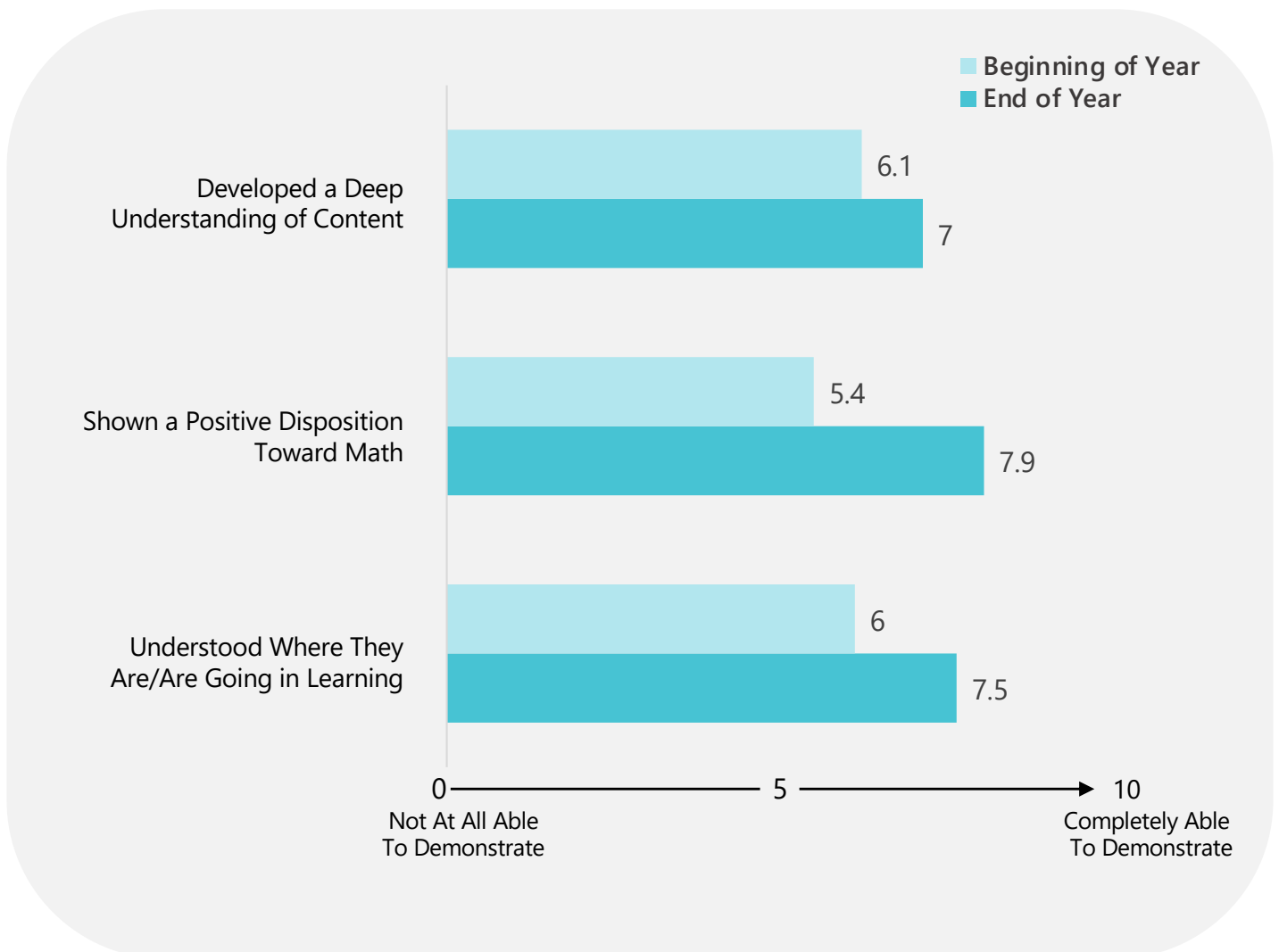


## Standards-Based Assessment – Secondary Year 2

There were a total of 9 secondary school teachers who took part in the standards-based assessment numeracy initiatives for the second year. Although statistical analyses were not conducted due to the small sample size, overall, it appears that teachers reported a positive change over the past year in their students' development and growth in (9) their understandings of content. Teachers also appeared to report over the past year students had (10) developed a more positive disposition toward math, and that students (11) had a better understanding of where they are in their learning journeys, and what is next (see Figure 9).

**Note:** All items were on a 10-point scale, with 1 indicating students were *not at all able to demonstrate*, and 10 indicating students were *completely able to demonstrate*.

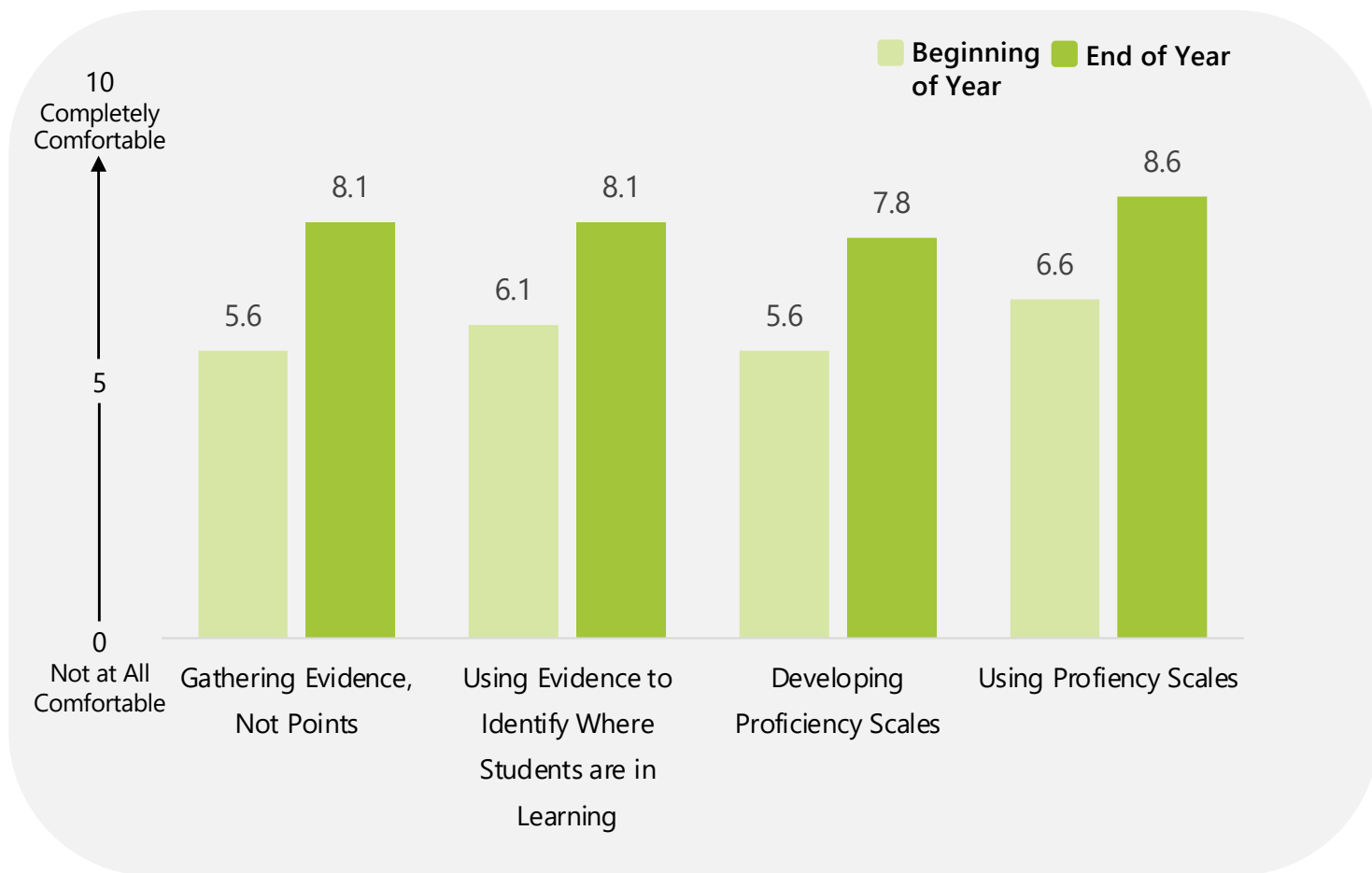
**Figure 9.** Student Growth and Development (Secondary YR 2)



## Standards-Based Assessment – All Years and Grade Levels

Across all teachers in the SBA initiatives ( $N = 22$ ), analyses revealed a significant difference in teachers' level of comfortability from the beginning of the year to the end of the year across all items. Participants felt an increase in their (1) comfort level in gathering evidence, not points, in relation to their learning standards; (2) an increase in their comfort level to use evidence to identify where students are at and what's next in their learning; (3) an increase in their comfort to develop proficiency scales; and (4) an increase in their comfort using proficiency scales (see Figure 10).

**Figure 10.** Teacher Perception of Own Comfort Level (All Groups)



**Note:** Teachers' self-rating of their comfortability level significantly increased from the beginning of the year to the end of the year,  $p < .001$ , across all items (see Table 6 in Appendix C for full analyses). The magnitude of the increases in comfortability (i.e., effect sizes) were large for all items.

A select number of teachers completed interviews regarding their participation in the SBA initiatives. Considering the impact of proficiency scales, one teacher noted:

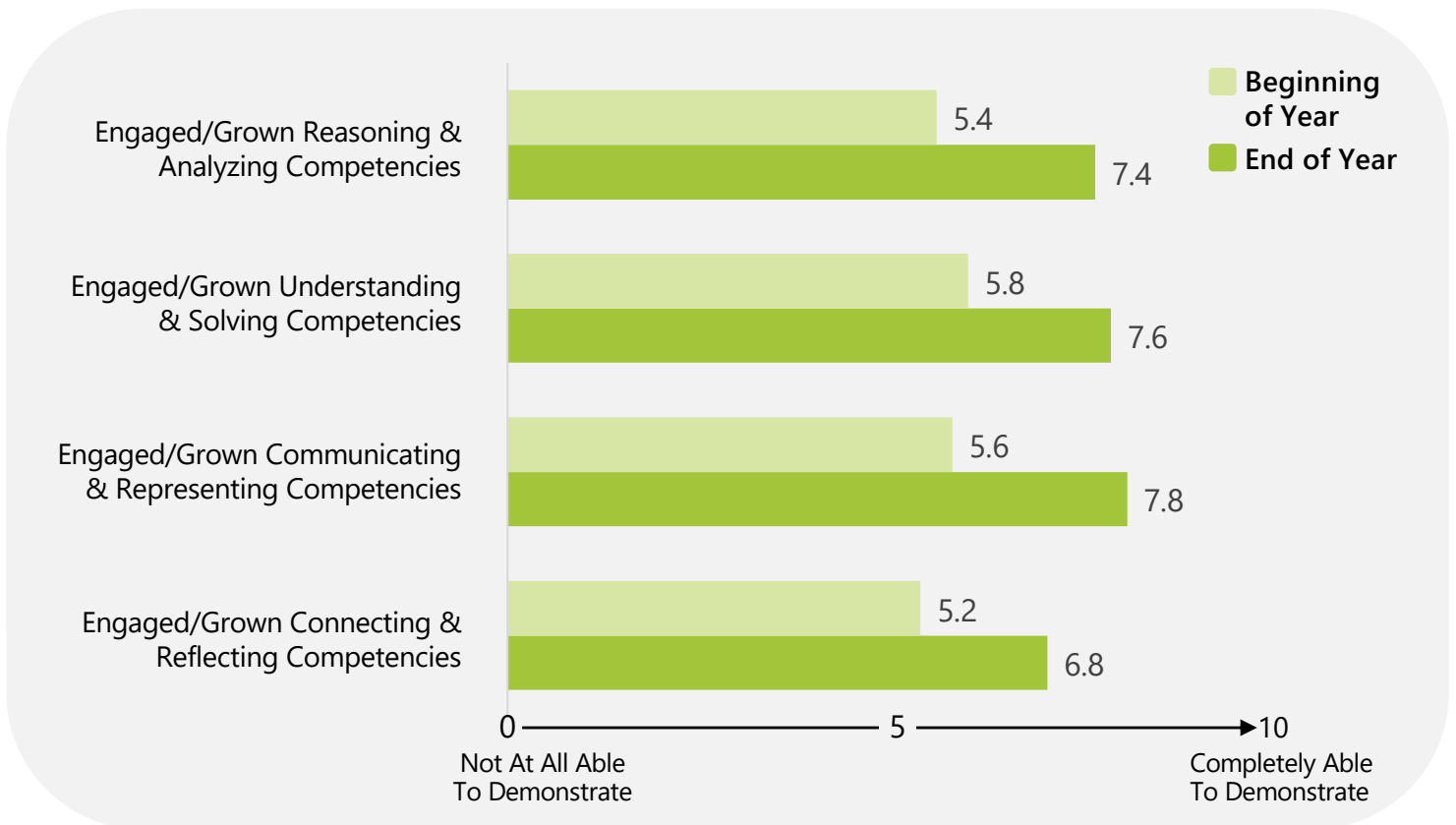
“ [The proficiency scales] really makes me map ... for myself as the teacher, and where is my beginning, and where am I hoping to get to. But also, it forces me to really sit and think about what emerging, developing, proficient, and extending actually mean in relation to a specific standard.... it's more about their progressive and their additive, and a student who is an emerging can do something, and student who's developing can also do something.”



# Standards-Based Assessment – All Years and Grade Levels

Analysis of SBA Initiative surveys completed by teachers ( $N = 22$ ) revealed a significant difference in teachers' perceptions of student growth and engagement from the beginning of the year to the end of the year across all items. Participants perceived that students grew in their (5) reasoning and analyzing competencies; (6) understanding and solving competencies; (7) communicating and representing competencies; and (8) connecting/reflecting competencies (see Figure 11).

**Figure 11.** Teacher Perceptions of Student Growth and Engagement(All Groups)



**Note:** Teachers' ratings of their students' level of engagement and growth in a variety of competencies significantly increased from the beginning of the year to the end of the year,  $p < .001$ , across all items (see Table 6 in Appendix C for full analyses). The effect sizes (i.e., magnitude of the increases in student growth) were large for all items.

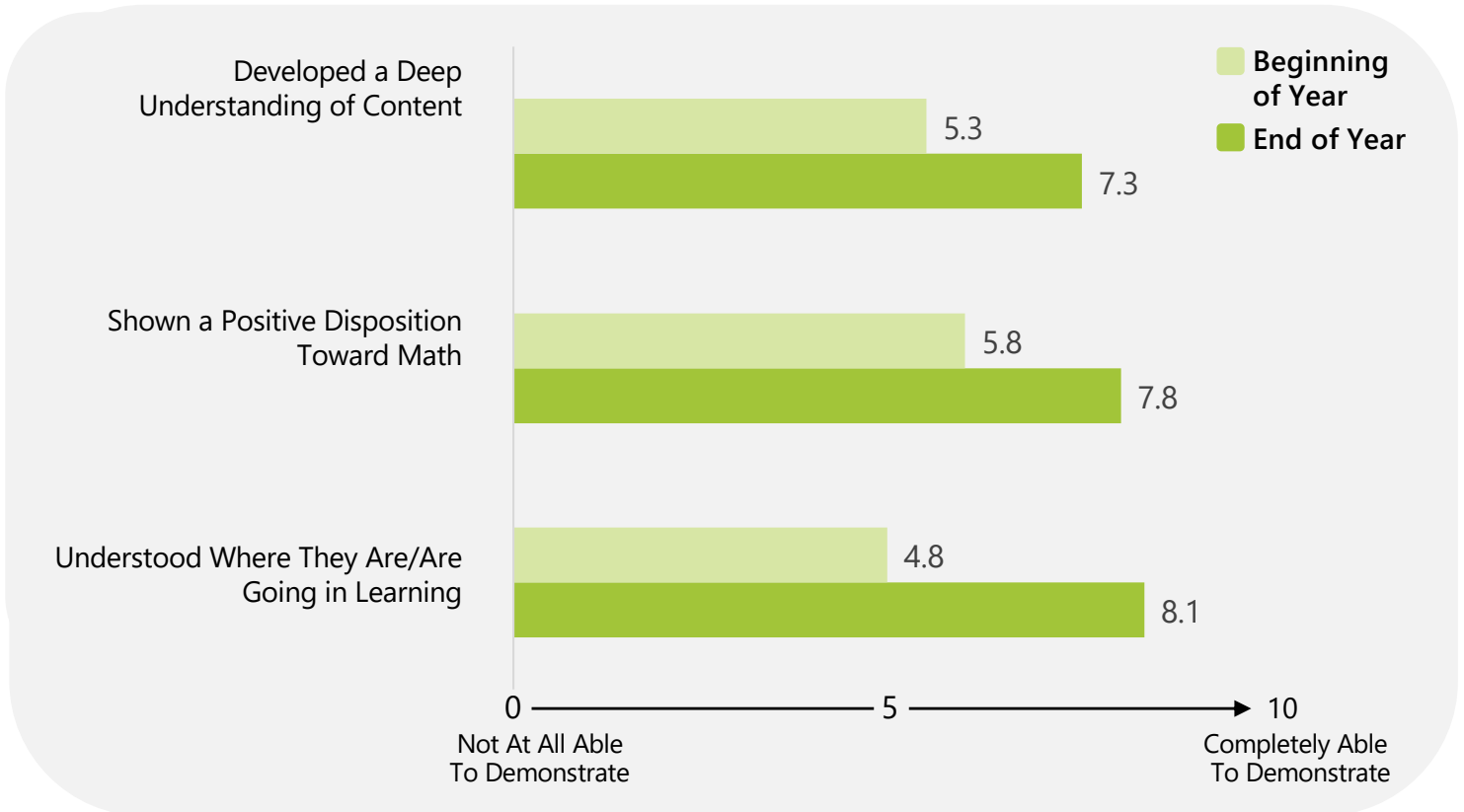
A select number of teachers completed interviews in relation to their participation in the SBA initiatives. Considering the impact of the initiatives on students, one teacher noted:

*“I think the biggest thing is that my students are much more able to self-assess, and use their self-assessing to ask me what they want, reach out to me and say this is what I can do, this is what I want to be able to do, and then we're able to work together to get them going. Their confidence as learners has been huge ... we're focusing on what they can do and then setting goals for what they want to be able to do eventually ... so the confidence is making them way more successful.”*

# Standards-Based Assessment – All Years and Grade Levels

Across all teachers in the Standards-Based Assessment initiatives ( $N = 22$ ), analyses revealed a significant difference in teachers' perceptions of students' understanding of mathematics, as well as their disposition toward the subject, from the beginning of the year to the end of the year across all items. Specifically, participants perceived that students developed (9) a deeper understanding of math content; (10) had a more positive disposition toward math; and finally (11) had more understanding where they are at in their learning and what comes next.

**Figure 12.** Teacher Perceptions of Student Growth and Development (All Groups)



Teachers' ratings of their students' understanding of mathematics, as well as their disposition toward the subject, significantly increased from the beginning of the year to the end of the year,  $p < .001$ , across all items (see Table 6 in Appendix C for full analyses). The magnitude of the increases in student growth (i.e., effect sizes) were large for all items.

Considering the impact of the initiatives on student growth and development, one teacher noted:

*“The biggest thing that the kids have said about it is that they like the idea that everyone starts at emerging, and you can grow from there. It's not, 'here's proficient but you can't do this,' ... It's about what you can do and adding on it, they really like that. They feel obviously more successful, they all feel more positive about it.”*

Next, the teacher described the engagement & positivity students were seeing in their work:

*“They find it easier to do self-assessments because they know what it looks like and they can identify what their strengths are and what they need to work on, so it gives them more language instead of the standard of, 'oh I just want to get better at math.’”*

# Standards-Based Assessment – All Years and Grade Levels: Pre-Test Qualitative Response Item 1 – Assessment Abilities

Prior to participating in the SBA initiative, A total of 32 teacher participants answered the pre-SBA Survey open-ended item, “how do you hope participating in this project will foster your ability to assess student learning in mathematics this year?” Definitions of themes are provided in Appendix C.

**Note:** Two responses were removed due to not answering the question.

**Table 2.** How Will the SBA Initiative Fosters Teachers’ Ability to Assess Student Learning in Mathematics

THEMES	SUB-THEMES	#(%) MENTIONS	SAMPLE QUOTE
<b>1. Better Awareness of Student Learning Journey</b> (n = 24, 28%)	A. Teacher understanding of student	7 (8%)	“I hope that I will learn an authentic way to share what students know with parents...”
	B. Student understanding of self	12 (14%)	
	C. Caregiver understanding of student	5 (6%)	
<b>2. Improved General Assessment Practices</b> (n = 17, 20%)	Clear communication of expectations	6 (7%)	“Hope to be more comfortable in knowing what evidence to collect for assessment.”
	How to use other forms of assessment (i.e., observation, gathering evidence)	6 (7%)	
	Better understanding of curricular competencies	5 (6%)	
<b>3. Better Use/ Understanding of Rubrics &amp; Proficiency Scales</b> (n =24, 27%)	That communicate learning clearly	3 (3%)	“Hoping it will give me time to develop kid friendly language rubrics to help me assess student understanding.”
	That demonstrate where students are in learning	4 (5%)	
	That help differentiate/further learning	4 (5%)	
	How to better understand scales	11 (13%)	
	How to use scales	3 (3%)	
<b>4. Activities to Support Student Learning</b> (n = 13, 15%)	Activities that extend student learning	5 (6%)	“Creating activities for all students to have success in.”
	Inclusive activities for all students to be successful	3 (3%)	
	Activities that demonstrate learning in multiple ways	4 (5%)	
<b>5. Teaching Practice</b> (n = 9, 10%)	To learn from other teachers	5 (6%)	“To create more meaningful assessment by incorporating other’s interpretations.”
	To focus on teaching practice	4 (5%)	
<b>TOTAL Mentions = 87</b>			

# Standards-Based Assessment – All Years and Grade Levels: Post-Test Qualitative Response Item 1 – Assessment Abilities

After participating in the SBA initiative, A total of 22 teacher participants answered the post-SBA Survey open-ended item, “how did participating in this project foster your ability to assess student learning of mathematics this year?” Six responses were removed, as they indicated a lack of time or needing more time to implement changes from the initiative.

Overall, many of the participants in the post-surveys acknowledged the amount of growth and support they received over the SBA initiative which facilitated not only their own teacher development in assessment abilities, but also in the growth and development of their students’ capabilities. Further, many of the teacher participants reported using better assessments as a result of their participation in the SBA initiative.

**Table 3.** How *Did* the SBA Initiative Fosters Teachers’ Ability to Assess Student Learning in Mathematics

THEMES	SUB-THEMES	#(%) MENTIONS	SAMPLE QUOTE
<b>1. Better Awareness of Student Learning Journey</b> (n = 17, 19%)	Teacher understanding of student	8 (9%)	“I feel my students and I have a better understanding of themselves as mathematicians... and what their next steps are in their math journey.”
	Student understanding of self	7 (8%)	
	Caregiver understanding of student	2 (2%)	
<b>2. Improved General Assessment Practices</b> (n = 25, 28%)	Using improved forms of assessment	18 (20%)	“I am more familiar with different types of questioning and how to ask a question that shows a deeper level of understanding.”
	Using more forms of assessment	7 (8%)	
<b>3. Better Use/ Understanding of Rubrics &amp; Proficiency Scales</b> (n = 13, 14%)	Create better rubrics	4 (4%)	“It helped me to understand the proficiency scale progression in the math curriculum, which has help me to build assessment and activities for students.”
	Better understanding of scales	5 (6%)	
	Better use of scales/used more	4 (4%)	
<b>4. Activities that Support Student Learning</b> (n = 15, 17%)	Activities that extend/deepen student learning	10 (11%)	“[Evaluating learning and not output meant that] students were more willing to take risks and make mistakes and learning from the mistakes.”
	Activities to support student growth (i.e., positive disposition, risk-taking)	5 (6%)	
<b>5. Teaching Practice</b> (n = 19, 22%)	Learned from other teachers	14 (16%)	“Having conversations around SBA with colleagues from other schools and with the awesome helping teachers, [this] has been fulfilling and inspiring.”
	Focused on teaching practice	5 (6%)	
<b>TOTAL Mentions = 89</b>			



# Standards-Based Assessment – All Years and Grade Levels: Pre-Test Qualitative Response Item 2 – Cultivating Growth

Prior to participating in the SBA initiative, A total of 30 teacher participants answered the pre-SBA Survey open-ended item, “how do you hope participating in this project will cultivate growth in student learning of mathematics this year?” Definitions of themes are provided in Appendix C.

**Table 4.** How Will the SBA Initiative Cultivate Growth in Student Learning of Mathematics

THEMES	SUB-THEMES	MENTIONS # (%)	SAMPLE QUOTE
<b>1. Better Awareness of Student Learning Journey</b> (n = 18, 26%)	Student understand of where they are	10 (15%)	“I hope... my students will be better able to understand where they are on the continuum, and what their next steps are going to be.”
	Student understanding of next steps	8 (12%)	
<b>2. Support Positive Student Disposition</b> (n = 11, 16%)	Student awareness of math as learning process	5 (7%)	“I hope that [students] will foster more of a ‘it’s a learning process’ in mathematics.”
	General positive student mindset	6 (9%)	
<b>3. Improved General Assessment Practices</b> (n = 10, 14%)	Inclusive assessment (e.g., clear language, incorporate student voice)	6 (8%)	“I hope to use proficiency scales with my students so they can better self-assess themselves.”
	Holistic Approach to Assessment (gathering evidence, rubrics, etc.)	4 (6%)	
<b>4. Activities that Expand Student Learning</b> (n =20, 29%)	Expanding Math Learning	7 (10%)	“[For students] to go beyond just doing and try to critically think beyond simple operations.”
	Communication that enhances understanding	5 (7%)	
	New Activities/Content	8 (12%)	
<b>5. Teaching Practice</b> (n = 10, 14%)	Better teacher understanding of content	3 (4%)	“When a teacher has better understanding it automatically translates into their students.”
	Overall practice development (continue to grow/develop, etc.)	7 (10%)	
<b>TOTAL MENTIONS = 69</b>			



# Standards-Based Assessment – All Years and Grade Levels: Post-Test Qualitative Response Item 2 – Cultivating Growth

After participating in the SBA initiative, A total of 22 teacher participants answered the post-SBA Survey open-ended item, “how did participating in this project will cultivate growth in student learning of mathematics this year?”

Overall, teachers reported participation in this initiative lead to increases in both their own, as well as students, mathematical confidence and ability level. Further, teachers also reported that the SBA initiative supported students in developing more awareness of themselves as learners, as well as developing a deeper understandings of mathematical content.

**Table 5.** How Did the SBA Initiative Cultivate Growth in Student Learning of Mathematics

THEMES	SUB-THEMES	# (%) MENTIONS	SAMPLE QUOTE
<b>1. Better Awareness of Student Learning Journey</b> (n = 22, 30%)	Student able to demonstrate learning/ thinking	6 (8%)	“[Students] became more aware of what they could do and what they could work on to progress with their math.”
	Student developed deeper understanding of content	7 (10%)	
	Student awareness of learning journey	9 (12%)	
<b>2. Support Positive Student Disposition</b> (n = 16, 22%)	Increase in student confidence/risk-taking	8 (11%)	“It was often said in our room that we are mathematicians, and we all make mistakes, it’s okay.”
	Increase in positive mindset	8 (11%)	
<b>3. Improved General Assessment Practices</b> (n =18, 25%)	Better use of assessments	9 (12%)	“My attention to assessing the competencies let me focus on identifying good work/analyzing why it was strong reasoning.”
	Assessments that further learning	9 (12%)	
<b>4. Activities that Expand Student Learning</b> (n = 5, 7%)	Using different activities/tool	5 (7%)	“This project gave me a number of tools to help grow student learning of math.”
<b>5. Teaching Practice</b> (n =12, 16%)	Increase in teacher confidence/ knowledge	4 (6%)	“As I felt more confident in my own abilities, it translated into more confidence with my students.”
	Focusing on student strengths	4 (6%)	
	General development	4 (6%)	
<b>TOTAL MENTIONS = 73</b>			



# OVERVIEW OF BUILDING THINKING CLASSROOMS SURVEY



Teachers who took part in the Building Thinking Classrooms initiative completed surveys asking about their experiences from before and after taking part in the initiative. Specifically, teachers were asked to rate the extent they implemented a variety of teaching practices and their confidence doing so, as well as the extent their classrooms had become “thinking classrooms”. Teachers completed the survey twice, once from before the initiative, and then again from after the initiative finished.

There were a total of 13 closed-response questions which included the extent to which teachers implemented:

1. Toolkit 1 (giving thinking tasks; frequently forming visibly random groups; using vertical non-permanent surfaces).
2. Mobilizing knowledge.
3. Using hints and extensions to maintain flow.
4. Consolidating from the bottom.

Next, teachers were asked to indicate their confidence with implementing:

5. Toolkit 1 (giving thinking tasks; frequently forming visibly random groups; using vertical non-permanent surfaces).
6. Mobilizing knowledge.
7. Using hints and extensions to maintain flow.
8. Consolidating from the bottom.

Teacher participants were also asked to what extent had their classroom become a thinking classroom in relation to:

9. The number of students thinking.
10. How much time students spent thinking.
11. How well students collaborated.
12. How well students communicated their mathematical thinking.
13. Whether students had a positive disposition toward mathematics.

All items ranged on a 10-point scale, with 1 indicating a lack of teacher comfort/confidence with implementation/having a thinking classroom, and 10 indicating complete teacher comfort/confidence with implementation/having a thinking classroom.

Finally, there were two open-ended questions pertaining to how teachers thought participating in this initiative would foster their ability to build a thinking classroom in mathematics this year, and how the initiative would cultivate growth in student thinking in mathematics this year.

Both the pre- and post-surveys are included in Appendices D and E of this report.



# OVERVIEW OF BUILDING THINKING CLASSROOMS SURVEY

There were a total of 5 teachers who completed both the pre- and post-surveys for the Building Thinking Classrooms (BTC) initiative which reflected on teacher experiences from Sept 2021 to the end of May 2022.

Due to the small sample size of teachers who completed both the pre- and post-initiative surveys, the following pages demonstrate the results of the BTC initiative survey for all participants combined as a single group. Data reported considers all items before and after teachers' participation in the initiative.

Please note the following pages present means across the survey items, and that it was not possible to test for statistical differences for the pre- and post-test data, as there were not enough participants to run analyses to test for possible differences.

## **5 Teachers who Took Part in Both the Pre- and Post-BTC Initiative Surveys**

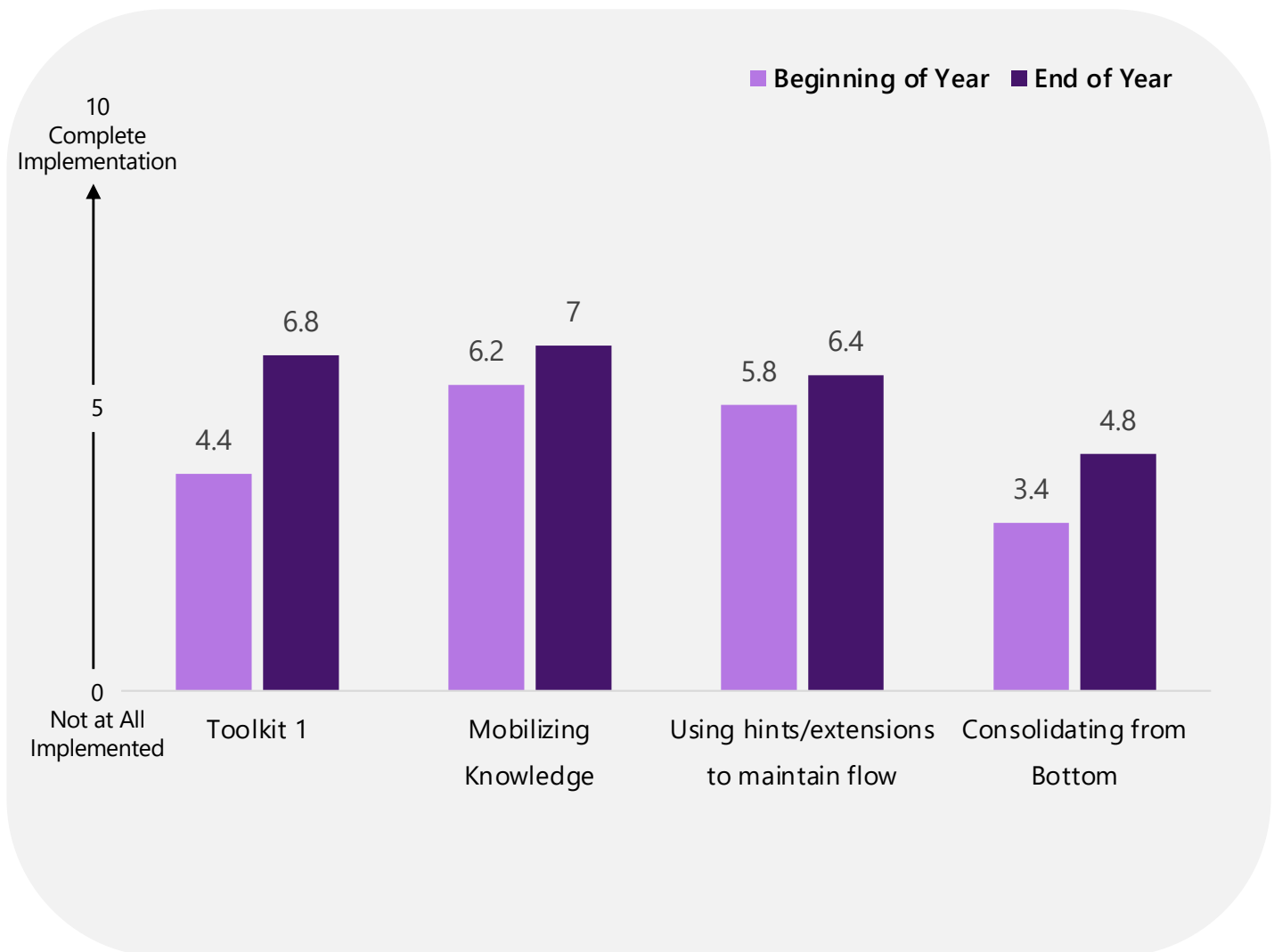




# Building Thinking Classrooms – All Participants

The first set of questions in the Building Thinking Classrooms surveys asked teachers to rate the extent they implemented (1) Toolkit 1 (giving thinking tasks; frequently forming visibly random groups; using vertical non-permanent surfaces), (2) mobilized knowledge, (3) Use hints and extensions, and (4) consolidated from the bottom. Although statistical analyses were not conducted due to the small sample size, overall, it appears as though teachers demonstrated increased comfortability over the past school year across all items.

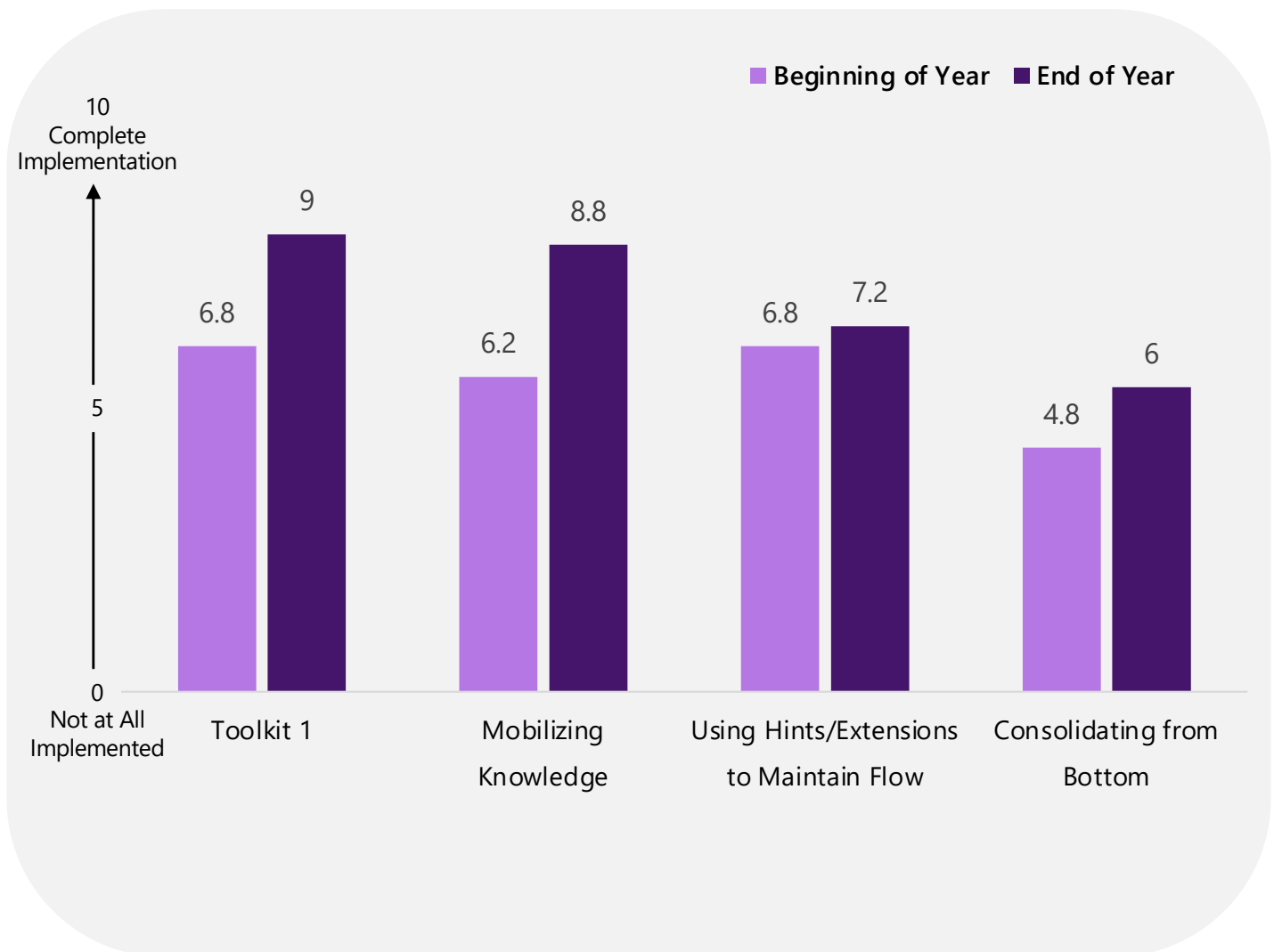
**Figure 13.** Teacher Implementation Level (BTC – All Participants)



# Building Thinking Classrooms – All Participants

The second set of questions in the Building Thinking Classrooms surveys asked teachers to rate the extent they felt confident with implementing (5) Toolkit 1 (giving thinking tasks; frequently forming visibly random groups; using vertical non-permanent surfaces), (6) mobilizing knowledge, (7) using hints and extensions, and (8) consolidating from the bottom. Although statistical analyses were not conducted due to the small sample size, overall, it appears as though teachers demonstrated increased confidence over the past school year across all items.

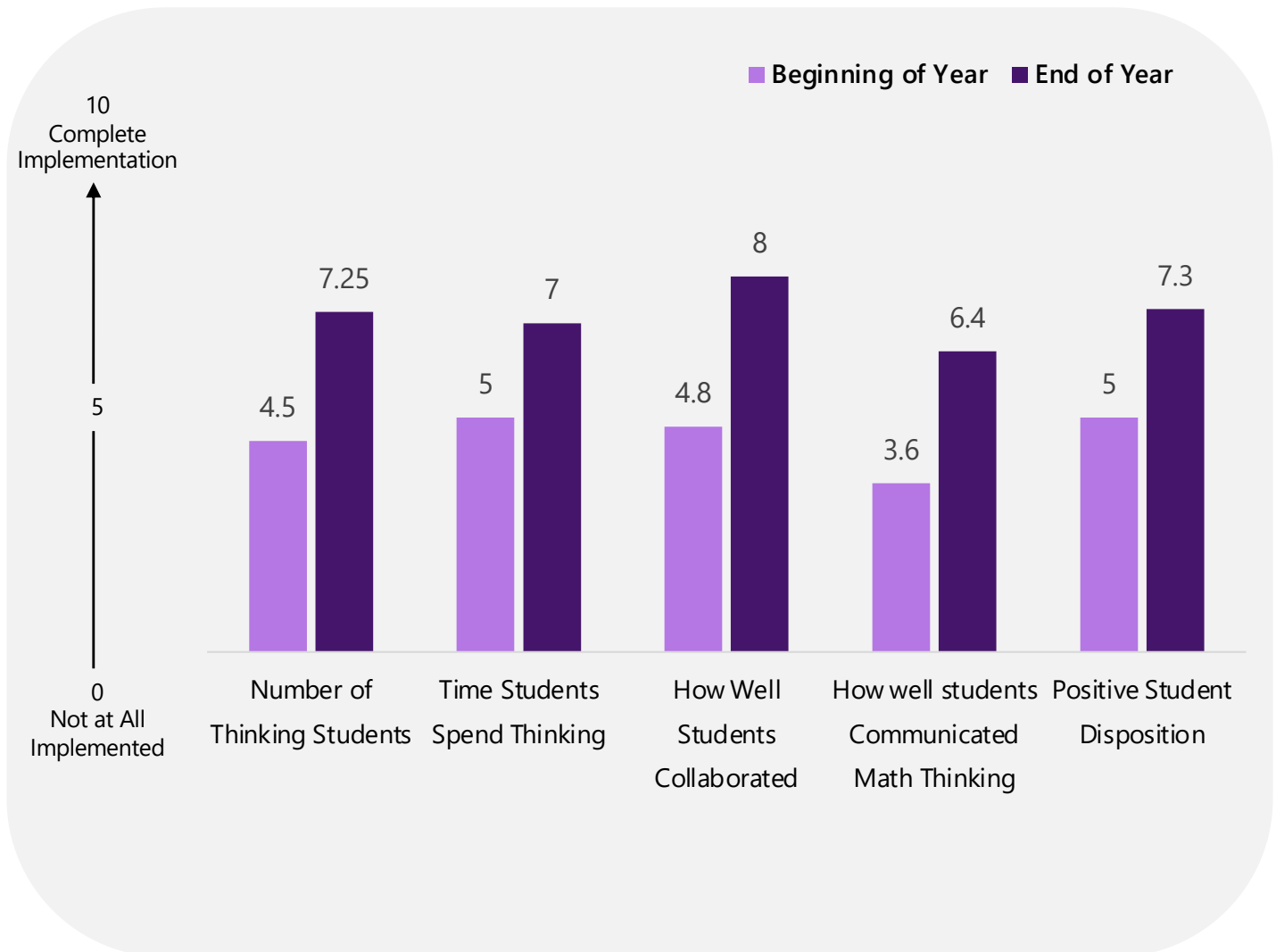
**Figure 14.** Teacher Confidence Level (BTC – All Participants)



# Building Thinking Classrooms – All Participants

The third set of questions in the Building Thinking Classrooms surveys asked teachers to rate the extent their classroom was a thinking classroom in terms of (9) the number of students thinking, (10) how much time student spend thinking, (11) how well students collaborated, (12) how well students communicated their mathematical thinking, and (13) students disposition toward mathematics. Although statistical analyses were not conducted due to the small sample size, overall it appears as though teachers demonstrated increased confidence over the past school year across all items.

**Figure 15.** Teacher Confidence Level (BTC – All Participants)



# SUMMARY OF FINDINGS

Over the past year, both the SBA and the Building Thinking Classrooms initiatives were successful in increasing teacher comfortability and implementation level in a variety of new teaching and assessment practices. Further, these increases have translated into positive impacts for students as well, as participating teachers reported growth in students understandings and learning of mathematical concepts. Overall, these results highlight the need for continued support for teachers to further develop their approaches to numeracy in the classroom, which ultimately have a positive impact on student learning.

Specifically considering the SBA initiative, results demonstrated positive improvements from before to after the initiative in both teacher comfortability and confidence in assessing mathematical concepts. Further, the initiative also demonstrated a positive impact on student learning and self-awareness of where they are in their learning journey. These results were found for all teachers across grade levels and years in the initiative. Qualitatively, teachers reported that participating in the SBA initiative resulted in them creating better assessments that supported students in their mathematical learning journey.

In addition, the Building Thinking Classrooms initiatives also found improvements in the amount of comfortability teachers felt with implementing a variety of math teaching tools. These improvements then translated into participating teachers' classrooms becoming more of "thinking classrooms", further fostering student growth in their understandings of mathematical concepts.







# APPENDICES

# Appendix A: Standards-Based Assessment Survey – Pre-Test

To inform planning and support, we would like to ask you some questions about your teaching experiences and your students' learning in mathematics. This is a pre-survey, so we would like to ask about how things were back at the beginning of the school year. Please know we are not evaluating you or your teaching practices. So that personal anonymity is maintained, your responses will be summarized along with those of others. Thank you for your participation.

## **At the beginning of this school year, how comfortable did you feel about?**

1. How to gather evidence, not points, in relation to learning standards?
  - Answers ranged from 1 (not at all) to 10 (Completely)
2. How to use evidence to identify where students are at and what's next in their learning?
  - Answers ranged from 1 (not at all) to 10 (Completely)
3. How to develop proficiency scales?
  - Answers ranged from 1 (not at all) to 10 (Completely)
4. How to use proficiency scales?
  - Answers ranged from 1 (not at all) to 10 (Completely)

## **At the beginning of this school year, to what extent did your students:**

5. Develop a deep understanding of the mathematical content they are learning?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
6. Engage and grow in their reasoning and analyzing competencies?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
7. Engage and grow in their understanding and solving competencies?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
8. Engage and grow in their communicating and representing competencies?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
9. Engage and grow in their connecting and reflecting competencies?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
10. Have a positive disposition towards mathematics?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
11. Understand where they are at in their learning and what comes next?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know

## **Open-Ended Questions**

12. How do you hope participating in this project will foster your ability to assess student learning of mathematics this year?
13. How do you hope participating in this project will cultivate growth in student learning of mathematics this year?





# Appendix B: Standards-Based Assessment Survey – Post-Test

To evaluate the effectiveness of this initiative, we would like to ask you some questions about the impact of your participation on your teaching experiences and your students' learning in mathematics. Please know we are not evaluating you or your teaching practices. So that personal anonymity is maintained, your responses will be summarized along with those of others. Thank you for your participation.

## **At this point in time, how comfortable do you feel about?**

1. How to gather evidence, not points, in relation to learning standards?
  - Answers ranged from 1 (not at all) to 10 (Completely)
2. How to use evidence to identify where students are at and what's next in their learning?
  - Answers ranged from 1 (not at all) to 10 (Completely)
3. How to develop proficiency scales?
  - Answers ranged from 1 (not at all) to 10 (Completely)
4. How to use proficiency scales?
  - Answers ranged from 1 (not at all) to 10 (Completely)

## **Over this school year, to what extent did your students:**

5. Develop a deep understanding of the mathematical content they are learning?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
6. Engage and grow in their reasoning and analyzing competencies?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
7. Engage and grow in their understanding and solving competencies?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
8. Engage and grow in their communicating and representing competencies?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
9. Engage and grow in their connecting and reflecting competencies?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
10. Have a positive disposition towards mathematics?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
11. Understand where they are at in their learning and what comes next?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know

## **Open-Ended Questions**

12. How did participating in this project foster your ability to assess student learning of mathematics this year?
13. How did participating in this project cultivate growth in student learning of mathematics this year?



# Appendix C: Analyses for Standards-Based Assessment Surveys

## Quantitative Data Analyses:

We conducted paired sample t-tests to determine whether the Standards-Based Assessment initiatives had an impact on teachers' overall comfort and implementation level on a variety of learning and assessment practices within mathematics. T-tests revealed significant differences across all 11 items. All analyses for each item are provide in Table 6 below.

Note: Although 34 participants completed at least one of the SBA surveys, only 22 participants completed both the pre- and post-initiative surveys. As paired samples t-tests require a pre- and post- score for each participant, only those participants who completed both surveys could be included in analyses. Further, some participants who completed both surveys sometimes answered an item with, "I don't know." In these 7 instances, the participant was removed from the analysis for that specific item, however, were kept in for the remainder of analyses.

**Table 6. SBA t-tests Results Pre- Post-Initiatives**

Item	N	Mean (SD)		t-test	df	p-value	Effect size ( $d_z$ )
		Pre-SBA	Post-SBA				
<b>Teacher Comfortability Level In ...</b>							
Gathering evidence, not points in relation to learning standards	22	5.6(1.9)	8.1(1.3)	-5.707	21	< .001	2.02
Use evidence to identify where students are in learning journey	22	6.1(1.3)	8.1(1.3)	-4.919	21	< .001	1.86
Developing proficiency scales	22	5.6(2.1)	7.8(1.1)	-5.908	21	< .001	1.80
Using proficiency scales	22	6.6(1.8)	8.6(0.9)	-5.381	21	< .001	1.70
<b>Extent Students Have Demonstrated ...</b>							
Deeper understanding of content	21	5.3(1.5)	7.3(1.5)	5.382	20	< .001	1.70
Reasoning/analyzing competencies	19	5.4(1.5)	7.4(1.1)	-5.339	18	< .001	1.63
Understanding/solving competencies	20	5.8(1.5)	7.6(1.4)	-5.914	19	< .001	1.36
Communicating/representing competencies	21	5.6(1.5)	7.8(1.4)	-4.649	20	< .001	2.15
Connecting/reflecting competencies	20	5.2(1.5)	6.8(1.8)	-3.470	19	< .001	2.06
Positive disposition toward math	22	5.8(2.0)	7.8(1.4)	-4.062	21	< .001	2.31
Understanding where they are in learning and what comes next	21	4.8(1.7)	8.1(1.3)	-9.906	20	< .001	1.93

**Note.** A  $p$ -value < .05 indicates a genuine difference from the initiative.

**Note.** The effect size indicates the magnitude of the increase in teacher comfort/student growth. All effect sizes were deemed to be large effects.



# Appendix C: Analyses for Standards-Based Assessment Surveys

## Qualitative Data Analyses:

Thematic analyses were conducted for all 4 open-ended questions (2 pre-test and 2 post-test). All participants with responses were included in the analyses, even if they only completed either the pre- or post-test.

Major themes and definitions are presented for both the items, how will/did the SBA initiative foster teachers' abilities to assess student learning in mathematics, as well as the item, how will/did the SBA initiative cultivate growth in student learning of mathematics.

**Table 7.** Themes and Definitions for All Open-Ended SBA Initiatives Items.

THEME	DEFINITION
<b>Better Awareness of Student Learning Journey</b>	The awareness of the teacher, student, or caregiver understanding of where the student is at, and where they need to go in their learning journey. Further, this theme relates to the teacher's ability to relay where the student is at to both student and caregiver, as well as the students' self-awareness of their own learning journey.
<b>Improved General Assessment Practices</b>	The hope or the implementation of the teacher for improving overall assessment practices. Specifically, the use of more types of assessments, or the use of better forms of assessments, than teachers were using before the SBA initiative.
<b>Better Use/ Understanding of Rubrics &amp; Proficiency Scales</b>	Teachers wanting to have a better understanding of how to use rubrics and proficiency scales in their classrooms. Specifically, teachers wanting to create and use rubrics/proficiency scales clearly and in a way that supports student learning and development.
<b>Activities to Support Student Learning</b>	Activities, content, or tools that support and further student learning. These activities provide opportunities for all students to find success and build confidence as mathematicians, no matter where they are currently within their learning journeys.
<b>Teaching Practice</b>	Teachers wanting to further their skills and deepen their teaching practice in a general way. Further, the hope for teachers to learn from and share ideas with colleagues or helping teachers.
<b>Support Positive Student Disposition</b>	Students developing a positive mindset toward mathematics. This includes students developing confidence in themselves, and as a result taking risks.



# Appendix D: Building Thinking Classrooms Survey – Pre-Test

Building Thinking Classrooms: Focus on Implementing: To inform planning and support, we would like to ask you some questions about your teaching experiences and your students' learning in mathematics. This is a pre-survey, so we would like to ask about how things were back at the beginning of the school year. Please know we are not evaluating you or your teaching practices. So that personal anonymity is maintained, your responses will be summarized along with those of others. Thank you for your participation.

## **Prior to this school year, to what extent have you implemented:**

1. Toolkit 1 (giving thinking tasks; frequently forming visibly random groups; using non-permanent surfaces)?
  - Answers ranged from 1 (not at all) to 10 (Completely)
2. Mobilizing Knowledge?
  - Answers ranged from 1 (not at all) to 10 (Completely)
3. Using hints and extensions to maintain flow?
  - Answers ranged from 1 (not at all) to 10 (Completely)
4. Consolidating from the bottom?
  - Answers ranged from 1 (not at all) to 10 (Completely)

## **At the beginning of this school year, how confident did you feel about implementing:**

5. Toolkit 1 (giving thinking tasks; frequently forming visibly random groups; using non-permanent surfaces)?
  - Answers ranged from 1 (not at all) to 10 (Completely)
6. Mobilizing Knowledge?
  - Answers ranged from 1 (not at all) to 10 (Completely)
7. Using hints and extensions to maintain flow?
  - Answers ranged from 1 (not at all) to 10 (Completely)
8. Consolidating from the bottom?
  - Answers ranged from 1 (not at all) to 10 (Completely)

## **At the beginning of this school year, to what extent was your class a thinking classroom in terms of:**

9. The number of students thinking
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
10. How much time students spent thinking?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
11. How well students collaborated?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
12. How well students communicated their mathematical thinking?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
13. Students having a positive disposition towards math?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know

## **Open-Ended Questions**

14. How do you hope participating in this project will foster your ability to build a thinking classroom in mathematics this year?
15. How do you hope participating in this project will cultivate growth in student thinking in mathematics this year?



# Appendix E: Building Thinking Classrooms Survey – Post-Test

Building Thinking Classrooms: Focus on Implementing: To evaluate the effectiveness of this initiative, we would like to ask you some questions about the impact of your participation on your teaching experiences and your students' learning in mathematics. Please know we are not evaluating you or your teaching practices. So that personal anonymity is maintained, your responses will be summarized along with those of others. Thank you for your participation.

## **Throughout this school year, to what extent have you implemented:**

1. Toolkit 1 (giving thinking tasks; frequently forming visibly random groups; using non-permanent surfaces)?
  - Answers ranged from 1 (not at all) to 10 (Completely)
2. Mobilizing Knowledge?
  - Answers ranged from 1 (not at all) to 10 (Completely)
3. Using hints and extensions to maintain flow?
  - Answers ranged from 1 (not at all) to 10 (Completely)
4. Consolidating from the bottom?
  - Answers ranged from 1 (not at all) to 10 (Completely)

## **At this point in time, how confident do you feel about implementing:**

5. Toolkit 1 (giving thinking tasks; frequently forming visibly random groups; using non-permanent surfaces)?
  - Answers ranged from 1 (not at all) to 10 (Completely)
6. Mobilizing Knowledge?
  - Answers ranged from 1 (not at all) to 10 (Completely)
7. Using hints and extensions to maintain flow?
  - Answers ranged from 1 (not at all) to 10 (Completely)
8. Consolidating from the bottom?
  - Answers ranged from 1 (not at all) to 10 (Completely)

## **To what extent was your class a thinking classroom in terms of:**

9. The number of students thinking
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
10. How much time students spent thinking?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
11. How well students collaborated?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
12. How well students communicated their mathematical thinking?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know
13. Students having a positive disposition towards math?
  - Answers ranged from 1 (not at all) to 10 (Completely), or I don't know

## **Open-Ended Questions**

14. How has participating in this initiative fostered your ability to build a thinking classroom in mathematics this year?
15. How has participating in this project cultivated growth in student thinking in mathematics this year?







TITLE: Numeracy Initiatives: September 2021– June 2022

Report and Survey Authors: Katheryn E. Morrison, Matthew Waugh, & Megan Giroux  
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For any inquiries about this report, please contact:  
Kate Morrison | Research Analyst  
Research and Evaluation Department  
E: [Morrison\\_k1@surreyschools.ca](mailto:Morrison_k1@surreyschools.ca) or [Rese-office@surreyschools.ca](mailto:Rese-office@surreyschools.ca)  
A: 14033 92<sup>nd</sup> Ave., Surrey, BC, V3V 0B7