Prekindergarten Experiences: An Action Research Project Exploring Prekindergarten Experiences that are Supportive of Kindergarten Students’ Success in Mathematics

Patti LaTurner

University of Washington

Drs. Sylvia Bagley and Elham Kazemi

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Abstract
For my action research project, I studied Kindergarten students’ early learning experiences regarding which were most and least supportive of student success and confidence with Kindergarten mathematics. Through analyzing parent interviews, student work rubrics, and student survey responses, I was able to learn about students’ pre-Kindergarten experiences and how they viewed themselves as a mathematicians. I found that parents’ involvement with school, students’ early numeracy skills, and students’ ability to persevere on a task promoted success in mathematics with my students. Factors that inhibited success were students having limited experiences with formal “school math” and problem posing, and parents’ lack of comfort or confidence with “school math”. As I look forward to future years of teaching, my focus will be on creating stronger partnerships with families and communities, incorporating student and family voice into my planning, and finding new ways to support students where they are as individual mathematicians and learners.

**Introduction**

Every year I get the amazing and unique opportunity to teach a bright-eyed group of students during their first experience in a formal, elementary school setting. These students come into my classroom with a variety of prekindergarten experiences. Some of these prekindergarten experiences are in formal learning environments (private or non-profit preschool programs), and other students’ experiences occur in informal settings (in their home, another family member’s home, daycare, etc.). During the 2016-2017 school year, I observed, informally, that the students that exhibited the most success in mathematical problem solving and had the highest levels of self-efficacy towards mathematics came with a wide variety of pre-kindergarten experiences. For my action research project, I define mathematical success as being able to have a strategy to solve a mathematical problem that has been posed for the student. Also,
I think about self-efficacy as the student’s confidence, willingness and belief in one self to take risks in mathematical problem posing. I also observed that a student’s attendance in a formal preschool setting was not a strong predictor of mathematical success. In fact, many of the students that had attended preschool in a formal setting did not feel confident as mathematicians and/or struggled with developing strategies to solve mathematical problems. I learned about the variety of experiences students had in both formal and informal settings through informal interviews with students and their families. These observations and informal conversations led me to want to examine the early learning settings that exist for the students in my community and how to strengthen these programs so students enter Kindergarten feeling confident.

These conversations and observations of the students in my classroom led me to pose two questions for my action research project.

1. What pre-Kindergarten experiences support students learning throughout Kindergarten in being successful in mathematics, specifically in problem solving strategies and self-efficacy/confidence?
   
   a. What factors seem to promote success in mathematics throughout Kindergarten?
   
   b. What factors seem to inhibit or discourage success in mathematics throughout Kindergarten?

2. How can I (and other teacher leaders) use this information to help support pre-kindergarten students in both formal/informal settings?
   
   a. How can we use this information to support our current students in their mathematical progress, specifically through implementation of a Cognitively Guided Instruction approach to curriculum?
b. How can we use this information to bridge the gap between formal/informal pre-kindergarten experiences and Kindergarten, for future students coming to my school and other elementary schools within the Renton School District?

These questions are important because I want all students, even those coming from lower socio-economic status (SES) households, to feel successful upon entering Kindergarten. According to Chien et al. (2010), “Children’s classroom engagement may also be linked to their poverty status” (p. 1536). Each year, in my Kindergarten classroom, there are students from a variety of socio-economic statuses so it is important that my research is supportive of students from varying backgrounds. I want their experiences, whether in formal preschool or in a more informal setting, to help prepare them for future success in Kindergarten and beyond.

For this research project, I categorized the students’ pre-Kindergarten experiences as either formal or informal settings. Formal settings included preschool (not daycare) environments that are outside the home and where the care is provided by someone other than a family member. These included state-funded programs (such as Head Start or ECEAP) or tuition based preschools. ECEAP stands for Early Childhood Education and Assistance Program, which is a Washington state based preschool program that provides preschool access to students based on their income. Head Start is another federally funded preschool program that is based on parent/guardian income to provide 3 and 4 year olds with an opportunity to attend preschool. I defined informal settings as students that are cared for by a family member or a friend either in their own home or in the home of a family member/friend. In addition, daycare settings were also considered informal settings, since formal instruction generally doesn’t occur.

My mathematics instruction this year is focused on using a cognitively-guided instruction (CGI) approach to pose problems and encourage problem solving with my students. This is our
second year using this approach to mathematics, but we are still in the early stages of learning and implementing this approach. Cognitively-guided instruction focuses on how students make sense of problems and their development of mathematical thinking (Carpenter, Fennema, Franke, Levi, & Empson, 2015). In addition, the Renton School District has begun an initiative called the Renton Innovation Zone (RIZ). This initiative provides schools that are considered lower performing and who have higher percentages of students receiving free and reduced lunch, as well as buildings with large English Language Learner populations and high student mobility, with additional supports intended to increase student achievement. RIZ provides these schools with instructional support in the form of bi-weekly Professional Learning Community (PLCs) meetings with the support of a mathematics instructional coach and literacy instructional coach. Professional learning communities are collaborative teams that collectively work together to establish curriculum, develop assessments, and use data to make decisions (DuFour & Reeves, 2016). Schools in RIZ also receive funding for a minimum of four “labs” a year where grade level teachers are provided a full day of release time to attend in-building professional development which includes time to meet collaboratively to plan, co-teach a lesson and reflect on their practice. These labs can be a combination of mathematics focus or literacy focus and can include administrators, other building staff and/or other community members (district administrators, other school staff members, etc.)

In this action research capstone, I will explore the current research in the field on high-quality early learning programs to set the foundation for my own action research project. I will share the results I gathered from three formal parent interviews, student work with problem posing, and student surveys (both informal and formal surveys). I will then discuss what my next steps are with my findings and how I will support future Kindergarten students.
Literature Review

The years from birth to 5 are critical years for developing critical thinking skills, communication skills, social-emotional skills, and positive behaviors (Bakken, Brown, & Downing, 2017). Early learning experiences can be a predictor of later academic and social-emotional success, so it is important to look at what makes high-quality early learning experiences as well as what kind of supports are needed to support early learning educators in their environments. I organized my research on the topic of early learning mathematicians into three areas: defining high-quality prekindergarten experiences (specifically in regards to mathematics), supports needed to improve early learning education, and the importance of equitable access to high-quality prekindergarten environments.

High-quality Prekindergarten Experiences

High-quality prekindergarten experiences and environments can look very different, but still provide students with quality experiences. The central ingredients for a successful preschool program are effective teacher-child interactions, the teacher’s implementation of effective developmentally appropriate curriculum, and an appropriate environment (Pianta, Barnett, Burchinal, & Thornburg, 2009). Weiland and Yoshikiawa (2013) state that “high quality early childhood education equips children with the cognitive skills required for success in elementary school and beyond” (p. 2112). These experiences can take place in formal settings or informal settings, but high-quality prekindergarten experiences tend to share similar qualities across the different settings. As I begin to define what makes prekindergarten experiences high-quality I will examine effective mathematics curriculum, the teacher’s role, and the early learning environment.
**Curriculum.** Early learning curriculum must be reflective of the real world with an emphasis on the importance of problem solving and questioning, especially in learning mathematics through a problem-solving approach. The curriculum in mathematics must focus on the fundamental concepts that develop prior to kindergarten, which include one-to-one correspondence, number and counting, shape, spatial sense, logical classification, comparing, and parts and wholes. This sets the foundation for later mathematics instruction and problem solving with addition and subtraction (Charlesworth & Leal, 2012). Jung and Conderman (2013) emphasize the importance of intentional teaching, which includes intentional planning, authentic mathematic instruction, and use of mathematics manipulatives. It must also consider the children’s level of development (Lopes, Grando, & D’Ambrosio, 2017). Lopes et al. (2017) also emphasize that a “curriculum plan for early childhood must foster artistic, musical, logical-scientific, and pictorial experiences in diversified spaces in contexts appropriate for children” (p. 253).

**Teacher’s role.** The teacher plays an important role in an early learning environment. High-quality teacher and student interactions are pivotal to successful early learning experiences. A teacher’s intentionality is key. This can include intentionally posing problems for individual students after listening to discussion, or scaffolding their work through questioning and discussion techniques, or helping the students to authentically mathematize their world and see the mathematics in their lives (Lopes et al., 2017). Lopes et al. (2017) also emphasize the teacher’s role as an active listener and facilitator, by asking questions, allowing the students to make conjectures, formulating arguments, and giving voice to his/her students.

The teacher’s role is one of a facilitator that is supporting students’ engagement with each other and the environment (Chien et al., 2017). The teacher must skillfully combine academic
instruction through positively building student-teacher relationships in social and emotional classroom climates (Howes et al., 2008). In addition to facilitation and active listening, the teacher must be flexible and respond individually and sensitively to individual needs (Pianta et al., 2009). The interactions between the teachers and students must be positive, fair, and warm. Charlesworth and Leali (2012) also emphasize the teacher’s role while children are working on mathematics, noting that teachers should informal ask questions, make comments, provide scaffolds for learning, and help guide their students’ thinking.

**Environment.** The early learning environment is critical in developing the child’s engagement with mathematics. It is important that teachers create a mathematical culture in their classroom in which the environment allows for students to freely communicate their mathematical ideas (Jung & Conderman, 2013). The environment must be collaborative and promote problem solving experiences that are tied to the real world and reflect the democratic nature of society (Lopes et al., 2017). Lopes et al. (2017) also state that it is important that the learning environment promotes spaces where knowledge can be socially produced, as well as taking into consideration students’ interests and natural curiosities. The classroom must be a place where there is questioning, contextualizing, and formulating especially around mathematics. Additionally, the classroom must be a place where the students and the teacher are both actively listening to each other and creating an interactive process of learning. In addition to the social and cognitive aspects of the environment, Chien et al. (2017) encourage early learning teachers to think about how the physical space is organized to be supportive of a variety of students and materials that are available for the students to explore, learn, and work within the classroom.

**Supports to Improve Early Learning**
Providing a rich, high-quality learning environment for all students cannot occur without adequate support and training for teachers. To prepare students for success in Kindergarten, early learning teachers and providers need a variety of supports, which include teacher professional development, coaching, and helping teachers become aware of their mindsets and beliefs. It is important that early learning teachers are calibrated in their beliefs and share similar expectations of students to support a smooth transition from preschool to Kindergarten.

**Teacher professional development and coaching.** Teacher training and education assist early learning teachers in providing high quality education and supporting prekindergarten students in learning about the formal school setting. In addition to the benefits of a teacher holding a bachelor’s degree or master’s degree, ongoing professional development and coaching has been shown to have a significant impact on producing students that are prepared for Kindergarten (Weiland & Yoshikawa, 2013).

Coaching is a professional development model in which a coach (usually an expert early learning teacher) supports teachers in a variety of ways. Coaching may include modeling instruction, conducting observations, providing feedback, and offering curriculum support. Coaching in early learning settings can produce higher levels of mathematical knowledge gains, curriculum implementation fidelity, and higher quality instruction (Weiland & Yoshikawa, 2013). Early learning coaching, when done effectively and with fidelity, helps teachers to pay more attention to the individual thoughts and actions of their students because the coach (while observing) can focus on what individual children are doing. This can help build a teacher’s efficacy to attentively listening to their students and focusing on their problem-solving skills through observation (Lopes et al., 2017). In addition to coaching, mentoring of early learning teachers by coaches/other early learning educators can support early learning teachers in
developing their practice and reflection. Practices that support early learning teachers in reflecting on their practice can help to create higher quality learning environment for pre-kindergarten students (Early et al., 2006). Unfortunately, according to Pianta et al. (2009) preschool teachers rarely get the opportunity for field-based coaching and feedback.

Professional development for early learning teachers must be targeted and supportive to meet their unique needs and context. Pianta et al. (2009) state that the most effective professional development is focused on proving early learning providers/teachers with relevant information on developmentally appropriate practices (learning targets and progressions) and support in using instructional strategies (i.e., effective teacher interactions and implementation of curriculum). They note, “Professional development approaches should optimally be designed for high-priority skill targets, such as preschool language and literacy or mathematics” (p. 75). In addition, Pianta et al. (2009) state the importance of professional development that is grounded in viewing multiple video examples of high-quality instruction, as well as providing skills training in appropriate instruction and opportunities for individual feedback. Professional development that is grounded in helping to raise an early learning educator’s confidence also prove successful in creating more positive learning environments for preschool students (Guo, Piasta, Justice, & Kaderavek, 2009). Abry, Latham, Bassok, and LoCasale-Crouch (2014) assert that professional development and teacher training should support aligning teachers’ beliefs and expectations for Kindergarten students to positively impact prekindergarten students and their environments. For example, this may occur in the form of joint professional development opportunities within districts between preschool and Kindergarten teachers.

**Mindsets and beliefs around preschool and kindergarten.** Much of the research I found referred to Kindergarten “readiness.” This can convey a deficit belief that some students
are ready for Kindergarten and other students are not. This language around “readiness” is prevalent in much of the research and common language used in preschool/Kindergarten settings. For my action research project, I am using this language in my literature review due to the commonality, but in my own action research project and next steps I will not be using language around readiness because all students are capable and we must build on student strengths and not deficits.

Teacher mindset and beliefs around what the research refers to as Kindergarten readiness can impact the early learning environment. Rimm-Kaufman, Pianta, and Cox (2000) indicate that teachers’ judgements and beliefs about students’ transition to school can potentially make the transition smoother and influence their success in kindergarten. According to Abry et al. (2014), misalignment between Kindergarten teachers’ and preschool teachers’ beliefs about what children need to know and be able to do upon entering Kindergarten can lead to a negative transition and an early learning environment that is not conducive to the things needed to be successful in Kindergarten. Allowing time for transition meetings, aligning early learning providers’ and kindergarten teachers’ expectations, and sharing information about students can help support the transition to Kindergarten as well as individual children’s success in Kindergarten (Abry et al., 2014). Abry et al. (2014) also note that misalignment between teacher beliefs most negatively impacted at-risk students, so focusing on creating equitable learning environments from preschool to Kindergarten is inherently an issue of equity.

**Equitable Access**

Early learning is the foundation for students’ success in school. As noted by Fuson, Clements, and Sarama, 2015, “Closing the income and race/ethnicity gaps in preK and kindergarten is crucial for improving mathematics learning in this country, particularly because
mathematics knowledges at these ages predicts school achievement in mathematics and in other topics, such as reading” (p. 66). There are many aspects that impact this learning. Howes et al. (2008) state that pre-kindergarten programs exist to enhance academic and social skill learning for all students, but more specifically address the concerns around school readiness for students in poverty. There are three major social structure aspects that impact student learning: poverty, ethnicity and family dynamic. Of these three, the structural conditional of poverty has the strongest effects on impacting schooling (Entwisle & Alexander, 1993). Brophy (2006) suggests that children that come from a disadvantaged background (low socio-economic status) display lower levels of school readiness and lower school success late, both academically and socially. This can be attributed to the conditions of people’s circumstances and access to opportunities. Supporting students in starting Kindergarten from a place of confidence and success is a goal in addressing equity issues with the variety of prekindergarten experiences. Equitable access for disadvantaged students is vital to later school success.

**Access to high quality environments.** Not only is access to early learning important, but so is access to high quality early learning programs. Abry et al. (2014) looked at at-risk students from low socio-economic backgrounds (low family income or low parental education) and found that these students can gain the most from developmentally appropriate and supportive early learning environments to lead to later success. The impact on the learning of at-risk or disadvantaged students is significantly less when the early learning environments are of low-quality. In addition, low quality learning environments are unsupportive of helping disadvantaged students start Kindergarten with the same skills as their peers who attend higher quality pre-kindergarten learning environments. Abry et al.’s (2014) research is especially important considering that I work in an environment where many of students have a lower socio-
economic status. It makes access to formal learning environments for these students important, but also it is important that these formal learning environments are high quality. My action research project and next steps are important to support students from a variety of backgrounds get equitable access to quality early learning experiences, whether in formal or informal environments.

**Informal Environments**

Finally, in my action research, informal environments are an important early learning environment to understand given that a number of my students experience this before Kindergarten. However, it is important to note that the research on informal environments is limited, especially in regard to recognizing it as an environment where children learn or become prepared for Kindergarten. Research by Holloway, Rambaud, Fuller, and Eggers-Pierola (1995) states that parent education level and parents’ beliefs about school or education had the most impact on preparing their children for school. In addition, Palley (2010) focused on race, ethnicity and social class as a predictor of the early learning opportunities that were provided for students. She states that students with parents of a lower social class experience a lack of unification for a social movement focused on quality of early learning care or finding resources for early learning care. As I continue my action research project and career in early learning, I will focus on learning more about informal environments as well as how to support students/families that are unable to find care and resources.

**Methods**

This action research project was conducted at a school in the south Seattle Skyway neighborhood during the 2017-2018 school year with my Kindergarten students and their families. It is part of the Renton School District. Our total population for Kindergarten fluctuates
throughout the year but stays around 72 students. This year included lots of movement amongst the classrooms due to the fact that our school had to close a classroom early in the year because our numbers were well below the targeted number and equally disperse the students amongst are three remaining classrooms, only to re-open the classroom later with a new teacher. This accounts for some of the variance in numbers between the initial parent interviews and the parent interviews at conferences. Our free and reduced lunch population is approximately 70% and our students are culturally, linguistically and socio-economically diverse in many ways.

My action research project includes the perspectives of students, families and the members of my Professional Learning Community (PLC). The following sections will provide more detail about my setting and participants. In addition, it will describe the mathematics instruction and problem posing as well as the methods I used for collecting and analyzing the data.

**Settings and Participants**

The primary participants for this project include the 18 Kindergarten students in my classroom along with their families. As I gathered data, however, I also informally included the 54 other students in my grade level through formal and informal conversations within my PLC. My PLC is comprised of my Kindergarten teacher teammates my mathematics coach and my Assistant Principal My PLC served as “critical friends” during this action research project, helping me to reflect on the research and process (Mills, 2011). Additionally, I used information acquired from former students and their families with whom I have already had informal conversations. Since most of the anecdotal data and inspiration from the project came from the students in my classroom in the previous year (2016-2017), I included some of these students and families in my project as well, through surveys and interviews. As I move into my research
and collaboration in the future, I hope to include Early Learning staff from the preschool facility within my school district, called Meadowcrest Early Learning Center, as well as our district Early Learning Facilitator. Meadowcrest serves preschool students through Head Start, ECEAP, and inclusive preschool programming.

With our mathematics instruction focus being grounded in a cognitively-guided instruction (CGI) approach, we (my Kindergarten colleagues and I) pose problems and encourage early number sense. Also, we have adopted schoolwide norms for mathematicians. which helped my students develop the habits of mathematicians and build my students’ understanding and awareness of being mathematicians (Kazemi & Hintz, 2014). This developed common language with the students around what habits of mind mathematicians possess, which helped students self-assess their own habits of mind. The students self-assessed their habits of mind through reflecting on the schoolwide mathematical norms and how they feel about themselves in relation to our norms. In addition, in conjunction with my team, we created problem solving rubrics through the comprehensive work that is done during bi-weekly professional learning community meetings and mathematics labs. These rubrics helped me to better understand each individual student’s problem-solving approaches, strategies, and confidence with these types of problems.

Data Collection

During the scope of the project, several sources of data were collected to measure which pre-Kindergarten experiences support students in their self-efficacy towards mathematics and problem-solving sense making ability. Data gathering instruments included surveys, student work, parent interviews, informal conversational data with my PLC members, informal
observational data in my classroom and during PLC meetings, and personal reflections in my field journal.

**Surveys.** In October, I posed two word problems for my students (see Appendix A). After giving the word problems, I conducted a survey to dig into how the students felt about themselves after doing the word problems. This survey (see Appendix B) included two Likert scale items (thumbs up, thumbs to the side and thumbs down) and several open-ended questions that focused on the problems they had just solved as well as how they felt about themselves as a mathematician. Although this form of data collection was a written survey, because of my students’ ages (5 and 6), I scribed for my students, thus turning the survey into more of an interview. I followed the same process in February, presenting my students with two problems and a follow-up survey to gather if their feelings about problem solving and their efficacy about themselves as a mathematician had changed throughout the year so far. In addition, when posing problems throughout the course of my action research project I also informally used the same Likert scale format to ask my students how they felt about solving the problem and how they felt about themselves as a mathematician, and recorded these scores in my field journal.

**Student work.** The student work that is included in my data collection is the work from the formal problem posing that occurred two times during the action research project. I designed this formal assessment to understand student thinking in a formal paper-pencil way. In addition, I informally collected, took pictures of, and reflected on student work samples both individually and with my PLC. Also, we used the problem-solving rubric (see Appendix C) that we created collaboratively to look at student work samples formally.

**Parent interviews.** Due to the state of Washington’s investment in developing partnerships with families, I had the opportunity to meet with all my students and families before
the school year started in August. During those meetings, I engaged in informal conversations with my families around my action research project and conducted a quick interview asking the families about their preschool experiences. I began by asking the families if the students attended preschool. If they did attend preschool, the follow up question was to ask which preschool the student attended and if the child did not attend preschool, the follow up question was to ask about what their experience was like and who they stayed with. This information is presented in Table 1 below.

Table 1: Current students’ prekindergarten experiences (n=18)

<table>
<thead>
<tr>
<th>Student Initials</th>
<th>Pre-K Environment Type</th>
<th>Pre-Kindergarten Environment Experiences</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.A.</td>
<td>Formal</td>
<td>Head Start</td>
<td></td>
</tr>
<tr>
<td>C.L.R.</td>
<td>Informal</td>
<td>Daycare</td>
<td></td>
</tr>
<tr>
<td>D.B.</td>
<td>Informal</td>
<td>Home with Mom/Dad</td>
<td></td>
</tr>
<tr>
<td>E.M.</td>
<td>Informal</td>
<td>Home with Mom/Dad</td>
<td>Spoke Spanish primarily at home</td>
</tr>
<tr>
<td>F.I.</td>
<td>Informal</td>
<td>Home with Mom and/or cousin</td>
<td>Spoke Somali at home</td>
</tr>
<tr>
<td>J.B.</td>
<td>Informal</td>
<td>Home with grandparents</td>
<td>Grandparents primarily speak Tagalog</td>
</tr>
<tr>
<td>L.G.</td>
<td>Informal</td>
<td>In Guatemala</td>
<td></td>
</tr>
<tr>
<td>L.G.</td>
<td>Formal</td>
<td>Tuition Preschool</td>
<td></td>
</tr>
<tr>
<td>M.V.</td>
<td>Formal</td>
<td>Tuition Preschool</td>
<td></td>
</tr>
<tr>
<td>M.M.1</td>
<td>Formal</td>
<td>Tuition Preschool</td>
<td></td>
</tr>
<tr>
<td>M.M.2</td>
<td>Formal</td>
<td>Montessori</td>
<td></td>
</tr>
<tr>
<td>N.R.</td>
<td>Informal</td>
<td>Home with Mom</td>
<td>Spoke Spanish primarily at home</td>
</tr>
<tr>
<td>N.B.</td>
<td>Formal</td>
<td>Head Start</td>
<td></td>
</tr>
<tr>
<td>N.M.</td>
<td>Informal</td>
<td>Daycare</td>
<td></td>
</tr>
<tr>
<td>O.H.</td>
<td>Informal</td>
<td>Home with Mom</td>
<td></td>
</tr>
<tr>
<td>P.S.</td>
<td>Formal</td>
<td>Head Start</td>
<td></td>
</tr>
<tr>
<td>S.G.</td>
<td>Formal</td>
<td>Tuition Preschool</td>
<td></td>
</tr>
<tr>
<td>Z.J.</td>
<td>Informal</td>
<td>Daycare and with family</td>
<td>Once dad had custody, Z started attending Head Start for last 2 months</td>
</tr>
</tbody>
</table>

In addition to the beginning of the year meeting, I conducted a formal structured interview in November during our report card meetings. I interviewed 14 of the 18 families in
person and conducted the other four interviews via e-mail or phone conversations. This formal interview focused on learning more about the student’s prekindergarten experiences with mathematics, both in preschool/early learning settings and/or what experiences with mathematics happen in the home. I conducted follow up interviews based on the data I collected around early learning experiences and self-efficacy towards mathematics in February. These interviews took place in person (if possible) and an interpreter was provided for two families. I asked questions regarding parent’s education level, mindsets, and beliefs about mathematics and education. In addition, throughout the process I communicated with families around our mathematical learning and instruction within the classroom, and strongly encouraged families to contact me if they had any questions, so that communication remained two-way.

For my case study to answer my second research question, I selected Lo. G as my focus student. He was selected because of his attendance in a formal preschool environment and because of his initial score on the problem posing rubric. His initial score was 7.5, which put him in the lower third of the students that had attended a formal preschool environment. An initial score of 7.5 also meant that he scored a two or lower in multiple areas of the problem posing rubric, which allowed for me to track his growth over the various rubric criterion. In addition, I selected Lo. G because of his parents’ involvement and comfort with support him at home.

Additional data. To supplement the qualitative and quantitative data sources, I also used a variety of informal data sources. The informal data included notes on informal conversations within my PLC, informal observational and conversations with students, and informal conversations with families. In addition, my personal reflections within my field journal helped to ground the work within my individual practice and stay focused on supporting the students in my classroom and community.
Data Analysis

For my data analysis, I used what Mills (2011) calls a mixed methods design to interpret and understand my data since there was both quantitative and qualitative data. I used a triangulation method where the qualitative and quantitative data were collected simultaneously and compared (p. 144). This data was used to understand student progress in mathematics problem solving and self-efficacy in relation to their pre-kindergarten experiences.

Qualitative data analysis. My qualitative data sources include student surveys, parent interviews, informal conversations/observations, and my field journal. I coded this information to identify themes. Using the parent interviews, I identified themes around what pre-Kindergarten experiences the students had as well as what early learning experiences were provided in the home outside of informal/formal preschool. Student surveys and informal conversations were used to dig deeper into students’ beliefs and identify themes around how students feel about themselves and why they feel that way.

Quantitative data analysis. Quantitative data was gathered through scores on problem solving rubrics and the Likert scales on surveys. The problem-solving rubrics gave students an overall score based on their ability to make sense of the problem, explain their thinking, model the problem with precision, and use appropriate tools. These problems were posed two times throughout the year and a numerical value (zero to 16) was given to each student depending on their total score in each area (with four points possible in each area of the rubric). Likert scales (in the forms of thumbs up, down, and to the side) were used for the students to self-assess their confidence in solving problems, as well as their beliefs about themselves as mathematicians. The Likert scale scores were also given a value: a score of one given to a thumb down, a two for a thumb to the side, and a three for a thumb up. This score was tracked formally two times when
the problems were formally posed for students, but also used informally when problem posing occurred during the formal mathematics block. Each student’s individual score for each measure (problem solving rubric and Likert scale) was attributed to them and tracked throughout the year.

The information I gathered from the qualitative data was compared to the quantitative data I gathered around pre-kindergarten experiences to measure their success in relation to their experience.

**Findings**

I organized my findings for this action research question into two sections based on my two research questions. The first section of findings focused on answering the question: What pre-Kindergarten experiences support students throughout Kindergarten in being successful in mathematics, specifically in problem solving strategies and self-efficacy/confidence? My findings are organized based on my sub-questions, which are: what factors seem to promote success in mathematics and what factors seem to inhibit or discourage success in mathematics? I identified several themes that emerged for each sub-question and explored these themes under the sub-question heading.

The second section of my findings is focused on answering my second research question: How can I (and other teacher leaders) use this information to help support pre-kindergarten students in both formal/informal settings? In order to answer this question, I present a case study of a focal student (L.G.) to answer my sub-question: How can we use this information to support our current students in their mathematical progress, specifically through implementation of a Cognitively Guided Instruction approach to curriculum? My second sub-question for this section was: How can we use this information to bridge the gap between formal/informal pre-kindergarten experiences and Kindergarten, for future students coming to my school and other
elementary schools within the Renton School District? I answered this question through describing my next steps around collaboration and parent education.

Below is a table (Table 2) that tracks students’ scores based on the problem posing rubric that was created by my team. It shows that all students made growth or stayed the same (albeit with high scores) in their rubric score from the initial problem posing in November to the second problem posing in February. It is important to name that the paper-pencil assessment I created to gather more information on students problem solving skills does not give a complete picture of the whole child as a mathematician. Paper-pencil assessments can have limitations around the information it is able to provide because it requires the student to produce a product, which can not give an accurate representation of who they are as problem solvers.

Table 2: Students’ problem posing scores (n=18)

<table>
<thead>
<tr>
<th>Student Initial</th>
<th>October Problem Posing Score (out of 16)</th>
<th>February Problem Posing Score (out of 16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.A.</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>C.L.R.</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>D.B.</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>E.M.</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>F.I.</td>
<td>8</td>
<td>13.5</td>
</tr>
<tr>
<td>J.B.</td>
<td>6.5</td>
<td>12</td>
</tr>
<tr>
<td>L.G.</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Lo.G.</td>
<td>7.5</td>
<td>11</td>
</tr>
<tr>
<td>M.V.</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>M.M.1</td>
<td>6</td>
<td>12.5</td>
</tr>
<tr>
<td>M.M.2</td>
<td>10</td>
<td>12.5</td>
</tr>
<tr>
<td>N.R.</td>
<td>7</td>
<td>12</td>
</tr>
</tbody>
</table>
I am also including two tables that show students’ scores on the Likert scales (see Tables 3 and 4 below). Overall students made growth in their confidence both in solving the mathematical problems that were presented and their self-efficacy about themselves as a mathematician. The average score on the initial Likert scale for November was a score of 2.3 out of 3 in their confidence in solving a mathematical problem and it grew to an average score of 2.7 in February. In addition, the average score on the initial Likert scale for November for their confidence in themselves as a mathematician was 2.4 and in February the average score improved to a 2.7. Although the average scores improved, I will address individual student scores and outliers in the following sections as I describe factors that promote or inhibit success/confidence with mathematics.

*Table 3: Students’ confidence with solving a mathematical problem (n=18)*

<table>
<thead>
<tr>
<th>Student Initials</th>
<th>October</th>
<th>December</th>
<th>January</th>
<th>February</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.A.</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>C.L.R.</td>
<td>3</td>
<td>-</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>D.B.</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>E.M.</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>F.I.</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Student</td>
<td>J.B.</td>
<td>L.G.</td>
<td>Lo.G.</td>
<td>M.V.</td>
</tr>
<tr>
<td>---------</td>
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<td>------</td>
</tr>
<tr>
<td>Initials</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
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<tr>
<td>October</td>
<td>1</td>
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<td>3</td>
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<td>December</td>
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<tr>
<td>January</td>
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<td></td>
<td>3</td>
</tr>
<tr>
<td>February</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

Table 4: Students’ confidence in themselves as mathematician (n=18)
Factors that Promote Success and Confidence in Mathematics

I initially thought that a student’s enrollment in a formal preschool setting would be the primary indicator of higher success and confidence, in comparison with students who were in informal settings. Indeed, I found that the average score for students who attended a formal setting was 12.25 for the final problem posing in comparison to 10.35 for students who attended an informal setting. However, I found that both students who attended formal and informal environments experienced growth in their scores. The eight students who attended formal environments scores grew collectively by 26.5 points and the ten students who attended informal environments grew by 29.5 points. Both groups of students thus made meaningful gains in problem posing, so I found it important to look beyond their history with informal or formal
environments to suggest reasons for my findings. Also, in looking at confidence in problem solving scores for students attending formal environments, they scored an average of 2.7 in contrast to students that attended informal environments, who scored an average of 2.8. These scores are very similar. In addition, students that attended a formal environment scored an average of 2.75 on their confidence in themselves as a mathematician in comparison to students from informal environments scored an average of 2.6 – again, very similar.

As I analyzed the student survey, parent interview data, and student work on the problem posing, several themes emerged around what factors supported students in being successful and confident mathematics in Kindergarten.

1. Parent involvement with school
2. Students’ early numeracy skills
3. Students’ perseverance

I describe each of these in greater detail below.

**Parent involvement.** Whether or not a student attended a formal/informal environment, parent involvement was a key factor in students’ success and confidence with mathematics. Parent involvement included the academic opportunities that families provided their students in the home (both with mathematics and other subject areas). Some ways that families provided academic opportunities were questioning, talking about mathematics, and using resources to support students in their mathematical learning.

In the second round of interviews (conducted in February), I asked parents about their comfort with supporting students at home using a scale that ranged from one to five with a one being the least comfortable supporting their child in mathematics and five being the most. For this final parent interview, I received 12 responses. The scores ranged from three (the lowest
self-reported score) to five (the highest reported score) in parent confidence with supporting their student with mathematics at home. Three of the parents scored their comfort level as a three, and these three parents’ students scored below 10 (out of 16) on the final problem posing rubric. This correlation suggests that if parents do not feel confident in supporting their student at home then they may be more reluctant to support their students, which could impact their success in mathematics. Eight of the families scored themselves as a five on the scale. Of these eight students, six of them scored 12 out of 16 or higher on the second problem posing rubric. In addition, five of these six students scored themselves as a three out of three on both confidence Likert scales, with two of them improving over time by one or more levels in confidence. These parents felt comfortable supporting their students and shared ideas or strategies they had for supporting their student. One parent stated that they provided a variety of mathematics opportunities in the home: “[I do] counting, talking about mathematics and doing mathematics problems. Answering the question what time is it? Also, counting things in her life, counting pictures, crayons, figuring out how many gumballs you get, counting the dolls and comparing the numbers in a group.” This student scored a 15 on the problem posing rubric and had an increase of one level in both confidence Likert scales. This is in direct contrast to a parent that responded they needed “homework, mathematics games or worksheets” from me because they did not know how to help their child and rated themselves as a three (out of five) on their comfort with supporting their student at home scale. I wonder if part of the reason that families do not feel comfortable with working with their students are home is because they are trying to replicate “school” math rather than thinking about the ways we can use mathematics in our daily life (counting snack, measuring for a recipe, etc.). This student scored a seven out of 16 on the final problem posing scale and did not increase their level of confidence in either Likert scale. This
suggests that perhaps involvement and understanding of the tools/resources that are available in your own home indicates students may have more success in mathematics.

**Students’ early numeracy skills.** Kindergarten students with stronger early numeracy skills positively impacts students’ confidence and success with mathematics. Early numeracy skills include counting skills, flexibility in thinking about numbers, and ability to construct a model of a mathematical situation. Students that could count to 31 or beyond by November (in comparison to the students that were only able to count to 20 or less by November) had more success in the initial problem posing. The ten students that scored a ten or above on the initial problem posing were able to count to 31 and beyond by November in comparison to the five students who scored a six or below, who were all only able to count to 15 or less by November. Early numeracy skills supported their mathematical growth and confidence as measured by their scores on the Likert scale survey. In the student surveys that followed the problem posing, several students commented that counting, learning more, and listening would support them in learning and growing. That showed students self-awareness around the importance of early numeracy skills and how it supports confidence. In the final student survey, M.M. 1, who improved by two levels in her confidence in solving the problems, stated that “(it was easy to solve) because I counted them and I am a good counter.”

**Students’ perseverance.** Students that showed higher levels of motivation, dedication and attention to the task at hand exhibited more success in solving the problem posed, according to informal observations and notes taken in my field journal. This ties directly into mathematics practice standard 1, which is “makes sense of problems and perseveres in solving the problem.” D.B. is an example of a student with strong early numeracy skills and involved parents, but because he does not have focus or perseverance to the task at hand he made little growth on the
problem posing rubric from the initial problem posing (scoring a four out of 16) to the final problem posing (scoring 5 out of 16). D.B. experienced mathematics in a one-on-one setting with his Mom counting, writing numbers and practicing skills that Mom had seen his sister learning when she attended Kindergarten. In the final survey that my Kindergarten students responded to, three of the students commented on the importance of trying and persevering. N.M. stated that “solving problems are hard if I am not trying.” M.M. also stated that even when you get stuck, you can still revise your thinking: “(Our mathematical norms support us) when we revise our thinking, like when I say 13, not 14 and a friend comes up and says 14, I can keep trying and thinking and revise to say 14. I say Oh, I’d like to revise my thinking and I just keep learning.” The three students that noted the importance of “keep trying” on their follow-up surveys were also students that reported a score of three out of three in both final Likert scales on confidence. One of the two students whose score went down a level in the Likert scales (Z.J.) said that “(I would feel better about myself as a mathematician) if the problems were easier and I did not have to try as hard.” This leads me to believe that students’ engagement and motivation impacts their confidence both positively and negatively.

Factors that Inhibit or Discourage Success and Confidence in Mathematics

As I analyzed my data, several findings and themes emerged around what factors seemed to inhibit or discourage success with mathematics in Kindergarten.

1. Limited math experiences with problem posing in Pre-Kindergarten environment (both formal/informal).

2. Parents comfort level and confidence with “school” math

   **Limited math experiences with problem posing in Pre-Kindergarten environment.** The scores on the problem posing rubric indicate that students that had limited opportunities to make
Prekindergarten Experiences

sense of problems or had little exposure to real-life problem posing, showed less success in solving the posed mathematical problems. If their early learning environment, whether it was formal or informal, was not rich in these type of activities, then the students scored lower on the problem posing rubric where they were asked to make a model or choose a tool. The ten students whose pre-kindergarten experiences would be classified as informal environments averaged a score of 7.2 out of 16 on the problem posing rubric for the first problem, with scores ranging from four to 15. Many of the students from the informal environment had lower scores in the making sense of the problem section of the rubric and creating a model to represent their thinking for both the addition and the subtraction problems. Those students from informal setting who could make sense of the problem could select an appropriate tool to solve (cubes, fingers or drawings). Three of the students from informal pre-kindergarten settings had blank papers for both problems and did not select a tool to solve the problem, which resulted in their score of 4. This is reflective of the variety of different experiences that students had before attending Kindergarten and not predictive of the growth they have made.

I have eight students whose pre-kindergarten experiences are classified as formal. Their average score on the first problem-solving rubric was 8.9 with scores ranging from 4 to 15. Overall, the students who attended formal kindergarten environments could make sense of the addition problem more easily, but still struggled with making sense of and making a model of the subtraction problem. These findings were similar for the second problem posing. This leads me to believe that students who had more experiences with mathematical problems were able to make sense of both problems with a higher rate of success, but I found that all students exhibited less success in making a model to represent subtraction. These experiences that students had with problem posing did not have to occur in a formal school mathematics way, often these rich
problem posing experiences occurred through every day experiences. N.B.’s family shared that they would count everything and then ask questions about what they counted. These experiences with real world mathematical problem posing helped support N.B. in making sense of problems when presented in a more formal way.

Parents comfort level and confidence with "school math". All families are interested in supporting their students. Parent comfort level and familiarity with “school math” was a factor that seemed to impact success and confidence with mathematics. This included parents’ comfort level and how confident they felt about their ability to support their students in mathematics. The parents’ education level and feelings towards school seemed to make a difference in their confidence in supporting their child. In the second round of interviews, I asked parents to share what their experience was like in school with 5 being the best experience and with 1 being the worst experience. The two parents that ranked their experiences as a one, were also parents of two of the three students (L.G. and D.B.) with the lowest scores on the second problem posing rubric. One of the parents commented that “I personally didn’t enjoy school. I disliked the lack of communication between myself, my parents, and teachers to better help with my academics.” Later in the survey she stated that therefore she is actively trying to be involved in her children’s academic and social-emotional efforts, saying, “Please continue to be as amazing, communicative, and supportive as you have been. It truly makes all the difference in the world to have teachers that are like you that give children a brighter future for their education.” It is also important for myself and other teachers to remember that families lives and personal experiences can be very complicated but there are ways in which schools can be uninviting places for families. Also to remember that families can be uncertain about their role in relation to teachers and what their role is in formally teaching.
Supporting Current and Future Students

Now I will share the findings of my second research question: How can I (and other teacher leaders) use this information to help support pre-kindergarten students in both formal/informal settings? To address my findings in regards to the current Kindergarten students in my class, I will present a case study of one student in my class. I selected one student that attended a formal preschool learning environment, but still received a score of less than half of the total points (16) on the first problem posing rubric. To address my findings in regards to future students, I will share my next steps and follow-up on these ideas in my discussion section.

Supporting current students. I will present a case study of a student that is in my class. The student is Lo.G., who is a six-year-old male. Lo. G. attended a formal prekindergarten environment, Cedar River Preschool. He attended the preschool three days a week for two and a half hours a day for one year. Mom explained that it was not a preschool that was focused in academics; she stated “there was a disconnect for his learning. He was away from Mom for the first time, so he was learning how to be an independent.” She also stated during our initial parent interview that “until he started Kindergarten he had no interest in doing academics at home.” She informed me that he was interested in playing video games, playing with his toys and spending time with his family. Since starting Kindergarten, “he recently is into counting everything.” This helps to shape who Lo. G. is as a student.

In the initial problem posing, Lo. G. scored a 7.5 out of 16 on the rubric. He scored a 7.5 based on his ability to persevere while solving the problem and selecting appropriate tools, but needed support in selecting an appropriate model and executing the problem solving. He used cubes to model the addition problem, but was inaccurate in the number of cubes he used and was unable to explain his thinking. When asked to solve the Joron subtraction problem, Lo. G. just
counted out cubes to explain his thinking but was not able to connect what he was doing with the cubes to the information in the problem. During the follow-up survey to the problem posing he selected a thumb up for both how he felt about solving those problems and himself as a mathematician. He stated that he would feel better as a mathematician by “counting more numbers.” He also stated that Miss LaTurner could help by being a “better teacher” and his friends could help by working “harder.” This shows that Lo. G. is a determined, focused learner.

Lo. G scored himself in the initial problem solving Likert scale as a three out of three. This number did not change through the process. He scored himself as a two originally in his confidence as a mathematician, which grew by one level to a score of a three in the final Likert scale. Lo. G shared that friends helped him in growing and learning and that “our classroom (norms) helped us learn from each other. When I talk to friend, I can think about what they say.”

I used information from the initial problem posing to support Lo. G’s progress throughout the current school year. Also, Lo. G.’s individual progress was noted during activities that were planned in conjunction with my professional learning community that included the implementation of Cognitively Guided Instruction (C.G.I.) These activities included opportunities to informally model mathematical problems, mathematics games focused on students being able to represent addition/subtraction on their own, and intentional questioning.

After meeting with my PLC and using a protocol where we sorted our students’ work into similar problem solving strategies based on C.G.I.’s trajectories, we noticed that Lo. G did not have an effective strategy to connect what the problem was asking and how he would execute solving it. This meant that he was not making sense of what the problem was asking and instead was just trying to perform an operation on the numbers without connecting it to the action that the problem stated.
In order to address this, we implemented a “Three Reads” protocol to help support our students in understanding what is happening in the word problem. When using the Three Reads Protocol, teachers and students read through the problem together, the first time, without the numbers or the questions. The students then turn and talk to their partner about what is happening in the problem. A student shares what they think is happening in their own words and we clarify what the problem is together. We sometimes make predictions about what we think the mathematical question will be, but we did not do that in this case. The second time we read it with the mathematical question in, but still without the numbers in the problem. We then clarify what is happening in the story again, focusing on what the numbers in the story will mean. The third time we read the problem we insert the numbers and ask the students to think about how they will get started (not what the answer is). We also planned questions to ask of students like Lo. G. and others that exhibited similar strategies while they are working. The questions we planned are: What does the number ____ tell you? Are there any tools that can help? How will you use that tool? How can you show what action happened in the story? What does that action look like? By providing specific feedback to Lo. G.’s work and helping to support his partial understandings, I was able to ask intentional questions while he was working that helped to support his learning.

Another focus for Lo. G. that my PLC and I planned together was to think intentionally about how we can insert problem posing into other parts of the day. We decided that we would find opportunities throughout the day that we would turn into real-life mathematical problems. For example, “Miss LaTurner has 7 mighty mustangs and she gives one to Lo. G. How many does she have now?” and then we could model it, use other tools and record our thinking together. In addition, we decided to brainstorm ways to insert problem posing into workshops so
students had more opportunities to practice creating their own problems and solving. The workshop period of our mathematics block is a time where students are independently working in small group mathematical activities (mathematics games, number writing, counting, etc.) and I can individually support students. One of my professional learning community colleagues noted it is “important to provide a range of contexts for students to have experience with rather than solely a removal context.” This helped us to write word problems that gave students exposure with a variety of problem types.

After giving Lo. G. specific feedback, planning intentional activities, and questioning and supporting Lo. G where he is on his trajectory, he made growth from the initial problem posing to the final problem posing in February. His initial score was a 7.5 and then his final problem posing score was 11. He accurately represented and modeled addition using tools/drawing. He was also able to make a model of the subtraction and persevere in solving, but only showed a partially accurate solution. Although his confidence with problem posing stayed the same, his confidence in himself as a mathematician increase by one level. He reported feeling “happy and Miss LaTurner teaches and my friends listen.”

**Future students.** As I look forward it will be important to think about the importance of creating partnerships. These partnerships will include early learning providers (both Meadowcrest and other early learning providers that serve our families), the early learning facilitator, Kindergarten teachers, and families of future Kindergarten students. These partnerships will be integral to support the alignment of social-emotional and academic instruction between Kindergarten and preschool. Also, these partnerships will help families and early learning providers with learning more about Kindergarten and building a relationship with the formal school setting. These partnerships will be created by first identifying the early
learning providers that serve our students and identifying the families of our future Kindergarten students. This is a huge task, but an important first step to identify who we are supporting.

Once the partnerships are created, it will be important to share my findings from my action research project as well as to provide families with ideas to support their students with Kindergarten. This may be done through Kindergarten information sessions (in addition to our Kindergarten Countdown event), parent education classes, or Kindergarten “boot camp” type activities that provide an exposure to what Kindergarten will look like. Other activities may include a drop-in day for future families during the current school year, summer day camps at our school, or going out into the community (library, apartment complex, etc.) to meet with students/families. Also, it will be important to support families where they are and find out what kind of support they are interested in being provided.

**Discussion**

This action research project allowed me to be reflective of the assumptions that I make about students before they enter my classroom. I previously had an assumption that the students entering my classroom that had attended formal preschool environments were more prepared to be successful in Kindergarten. Through my action research project, I did not find that formal preschool environment attendance is the biggest predictor of success. Although attending a preschool environment did not appear to have a negative impact on student success and confidence, it was not the most important contributing factor. Doing this action research project helped to challenge my own assumptions and think creatively about how we can support Kindergarten students from a variety of settings.

I thought, going into this project, that I would collaborate intentionally with the preschool environments that my students attended, but now I am thinking about how I can support future
Kindergarten students who come from a large variety of backgrounds. It seems that parent comfort level and academic support in the home are the biggest predictors of student success and confidence in my setting, so it is important to think about how I can support this learning and growing for families. Parents are their student’s first and most important teacher, so it is important to think about the variety of supports parents can provide.

Also it was also a reminder to think of my students from a learner stance. All students are capable learners and it is important to think about the whole child in relation to who they are as a mathematician. The formal paper-pencil assessment that I used to gather data could have served as a limitation for understanding each individual child and the strengths they have as a learner and mathematician. Moving forward it will be important to keep in mind individual child’s strengths and finding ways to learn more about who they are through a variety of different forms.

Next Steps as a Teacher and PLC

My initial next steps as a teacher and PLC are to continue our work around with Cognitively Guided Instruction and our strong PLC structures. Our bi-weekly PLC meetings with a focus on supporting students, developing assessments, and looking collectively at data/student work supported my students’ incredible growth in mathematics this year. Our collective approach supports thinking about all students, which DuFour and Reeves (2016) state that if a PLC is a true PLC, they take collective responsibility for all students, which is what we do at my school.

As I look forward I want to incorporate parent interviews and providing them with a voice in their child’s education more intentionally throughout the year. As a kindergarten teacher, I am fortunate to have dedicated time at the beginning of the year to meet with each family, but how can I include parent voice on a more regular basis and what kind of questions
can I include to focus on giving them a voice? I plan to ask families more questions about their pre-kindergarten experiences during the initial parent meetings, but also to learn about their experiences and comfort with mathematics so I can support families in supporting their students. Throughout the school year it could also look like sending home quarterly parent surveys to gather information on supporting families with helping their families. These surveys can be focused on supporting students with academics at home or supporting families in accessing resources. It can also look like including questions during report card conferences that ask families more about their backgrounds and experiences. In addition, parent voice is important in building the home-school connection so continued focus on parent engagement will support all students moving forward.

Parent voice is important, but so is student voice. This year I gave myself the time and permission to individually meet with students to learn more about their experiences with mathematics and their confidence. These surveys and interviews helped me to think intentionally about who the students are as individuals and support their individual next steps. Also, these surveys and interviews helped me to develop relationships and build trust with students. When students shared that I could support them by reading a question another time or letting them have quiet space to work, I could be adaptive and responsive to these needs in my instruction and work time. If I had not asked these questions, I would have never known that my student needed that kind of support. Looking forward, I will want to think about where I can incorporate these kinds of questions and embed student voice into my instruction.

**Next Steps as a Teacher Leader**

As I stated before, I had thought that my next steps were going to be a focus on collaborating with early learning providers throughout the Renton School District service area. I
have since found that supporting and partnering with families will be my focus moving forward as a teacher leader. I will need to think about how I can identify the students and families that will be attending our Elementary in the future. This could look like working with families who have younger siblings, working with apartment complexes, and thinking creatively. It could also involve working with early learning providers to identify if they have students in attendance that will be attending my school. In addition, a focus on changing the language I use when thinking about Kindergarten and future Kindergarten students. Changing from using language around Kindergarten readiness which can convey a deficit mindset to just thinking about ways we can support all students in feeling happy and confident as learners at school even before beginning Kindergarten.

Once I have identified my target audience, I plan to provide parent partnership classes that can support families in supporting their children in building a relationship with the formal school environment and supporting their child at home. This parent partnerships classes will be targeted in supporting families in learning more about Kindergarten and the formal school setting. This could look like support in registering for Kindergarten, support in developing early literacy/numeracy skills, accessing resources at home, and learning about school skills. I have found through informal conversations that some families are not aware of what Kindergarten is like currently. I have had families say things like M.V.’s Mom said during our parent interviews, “It is so different from when I was in school, no nap, and lots to learn.” If families were aware of the expectations for Kindergarten prior to entering the school year it could help them to feel comfortable in supporting their students. Holloway, Rambaud, Fuller, and Eggers-Pierola (1995) presented case study research on this topic and found that often parents did not know what Kindergarten or the formal learning environment looked like. These parents (like the parents in
my class) may have the desire to support their students at home, but do not know how to help or what the expectations of Kindergarten may look like. Therefore, parent partnership classes will be the most important next steps in supporting all students. It is also important that these are called parent partnership classes as families know their child the best and there is a lot of learning that we can do from the families about their child which helps in supporting the whole child. It also helps us to learn about the child’s interests and what kind of rich every day experiences the child has had with academic concepts.

In addition to parent partnership classes, a future goal as a teacher leader would be to help support Kindergarten students themselves before they start Kindergarten. It could look like a program where the students get to tour the school, learn the expectations, and spend time making friends. It could also be a time to preview curricular items like the alphabet linking chart, counting collections, and fine motor skills. This could be a way to support the transition to Kindergarten to not be as difficult for students and could help in placing students in classrooms equitably.

**Next Steps as a Teacher Researcher**

This year has taught me a lot about time management, organization, and flexibility. Through the numerous classroom changes, transitions in my classroom, and the high mobility rate of students, I had to continue to stay flexible throughout the process. In addition, the many classroom changes impacted my instruction this year and my ability to meet with students/families individually. I learned that my organization skills were supportive for keeping track of information, but that I needed to be sure to keep daily notes in my field journal and stay on top of interviewing students/families. Mills (2011) continually references the time that is needed to conduct action research in teachers’ busy daily schedules and although it can a
constraint like I found in my research, but Mills also stresses the importance of making the time for this important reflective process.

In addition to organization and flexibility as a researcher, I learned a lot about how supportive and receptive the families are within my school community. The families’ support, responsiveness, honesty, and encouragement throughout the whole process helped to energize me as a teacher researcher and teacher in my building. It reaffirmed that I am teaching in the right school and making a positive impact with the students/families within my care.

This action research project has also led me to consider a few other ideas worth researching. In the parent responses to my second interview, many of the families kept expressing that they wanted more information on how to support their student at home. This leads me to think about a couple questions.

1. How can I help to support families in feeling more connected to our school?
2. As a building that has a no homework policy, how can I effectively communicate what students are learning and how families can support their child at home?
3. How can I support families in developing their confidence and comfort level with supporting their students with mathematics and other academics at home?

Limitations

Time has been a huge factor for me with my research project. This has been a year full of extreme change within my classroom composition and classroom size, so the amount of time that I have had to meet one-on-one with students and families has been limited. In addition, due to the capstone deadline schedule there have been limitations around my problem posing. I originally had planned to do three problem posing questions to continue to assess growth over time, and I was only able to do two. Also, we are currently in our unit that is focused in on
problem posing so the growth that my students will make between now and the end of the school year will likely be significant, but my project will only provide a small glimpse into the growth the students make. Time also has impacted my ability to collaborate with my Professional Learning Community (PLC) as intentionally as we would like. We have met bi-weekly (at least), but our time together has been more focused on management, supporting students that may be struggling, and instructional tools to support all learners rather than a focus on digging deeper into mathematical practices.

Another limitation has been the movement of Kindergarten students amongst our classrooms and students moving out of district. This had a direct impact on my sample size and my focus group. Of the 24 families and students that I met before the school year, I only have 16 of those students in my classroom currently. This has not only changed the dynamic in my classroom community but also my instruction, as I have had to be flexible to support students with varying skills entering my class.

However, despite these challenges positive changes occurred for all students. Through implementation of solid mathematics instruction grounded in best practices and collaboration within my Professional Learning Community all students made growth in both their confidence and problem solving. Also, I learned the importance of incorporate student and parent/guardian voice in make decisions, supporting families and informing my instructional decisions.
References


Pianta, R.C., Barnett, W. S., Burchinal, M., & Thornburg, K.R. (2009). The effects of preschool education: What we know, how public policy is or is not aligned with the evidence base, and what we need to know. *Psychological Science in the Public Interest, 10*(2), 49-88.


Appendices

Appendix A: Problem Posing

Name: ______________________

Maria had 3 cookies. Lorenzo gave her 2 more cookies. How many cookies does she have now?

Name: ______________________

Joron had 4 goldfish. He ate 2 of his goldfish. How many goldfish does Joron have now?

Appendix B

Student Surveys

What made solving that problem easy?

What made solving that problem hard?

How can Miss LaTurner support you with problem solving?

How can you support each other?

When you get stuck when working on a problem, what makes it hard to solve the problem?

How do you feel about yourself as a mathematician?

How can you feel better about yourself as a mathematician?

How can Miss LaTurner support your confidence in yourself as a mathematician?

How can friends help support you growing as a mathematician?

How do our classroom mathematical norms (like attached) help support you in becoming a mathematician?

Anything else you would like me to know about yourself as a mathematician?
## Appendix C: Problem Solving Rubric

<table>
<thead>
<tr>
<th>Overall Practice Standard</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mathematical Content</strong></td>
<td>The student was unable to represent word problems with pictures or objects without adult support.</td>
<td>The student explained the problem and showed minimal perseverance when identifying the purpose of the problem, and selected and applied an appropriate problem solving strategy to lead to a partially complete and/or partially accurate solution.</td>
<td>The student explained the problem and showed perseverance in identifying the purpose of the problem, and selected and applied an appropriate problem solving strategy to lead to a generally complete and/or accurate solution.</td>
<td>The student explained the problem and showed perseverance by identifying the purpose of the problem and selected and applied an appropriate problem solving strategy that leads to a thorough and accurate solution.</td>
</tr>
<tr>
<td><strong>Mathematical Process</strong></td>
<td>The student was unable to explain the problem and showed minimal perseverance when identifying the purpose of the problem.</td>
<td>The student explained the problem and showed some perseverance in identifying the purpose of the problem, and selected and applied an appropriate problem solving strategy to lead to a partially complete and/or partially accurate solution.</td>
<td>The student explained the problem and showed perseverance in identifying the purpose of the problem, and selected and applied an appropriate problem solving strategy to lead to a generally complete and/or accurate solution.</td>
<td>The student explained the problem and showed perseverance by identifying the purpose of the problem and selected and applied an appropriate problem solving strategy that leads to a thorough and accurate solution.</td>
</tr>
<tr>
<td><strong>What does the student DO?</strong></td>
<td>The student was unable to explain the problem and showed minimal perseverance when identifying the purpose of the problem.</td>
<td>The student explained the problem and showed some perseverance in identifying the purpose of the problem, and selected and applied an appropriate problem solving strategy to lead to a partially complete and/or partially accurate solution.</td>
<td>The student explained the problem and showed perseverance in identifying the purpose of the problem, and selected and applied an appropriate problem solving strategy to lead to a generally complete and/or accurate solution.</td>
<td>The student explained the problem and showed perseverance by identifying the purpose of the problem and selected and applied an appropriate problem solving strategy that leads to a thorough and accurate solution.</td>
</tr>
<tr>
<td><strong>Amends to Precision</strong></td>
<td>The student was unclean in their thinking and was unable to communicate mathematically.</td>
<td>The student was precise in clearly describing their actions and strategies, while showing understanding and using appropriate vocabulary in their process of finding solutions.</td>
<td>The student was precise in clearly describing their actions and strategies, while showing understanding and using grade-level appropriate vocabulary in their process of finding solutions.</td>
<td>The student was precise by clearly describing their actions and strategies, while showing understanding and using above grade-level appropriate vocabulary in their process of finding solutions.</td>
</tr>
<tr>
<td><strong>What does the student SAY?</strong></td>
<td>The student was unable to communicate mathematically.</td>
<td>The student was precise in clearly describing their actions and strategies, while showing understanding and using appropriate vocabulary in their process of finding solutions.</td>
<td>The student was precise in clearly describing their actions and strategies, while showing understanding and using grade-level appropriate vocabulary in their process of finding solutions.</td>
<td>The student was precise by clearly describing their actions and strategies, while showing understanding and using above grade-level appropriate vocabulary in their process of finding solutions.</td>
</tr>
<tr>
<td><strong>Model with Mathematics</strong></td>
<td>The student was unable to model the problem either using objects, a diagram, or a drawing to show their thinking.</td>
<td>The student was able to select an appropriate model to solve the problem, but unable to demonstrate their problem solving.</td>
<td>The student was able to select an appropriate model to solve the problem, but unable to demonstrate their problem solving.</td>
<td>The student was able to select an appropriate model to solve the problem, but unable to demonstrate their problem solving.</td>
</tr>
<tr>
<td><strong>Use Appropriate Tools Strategically</strong></td>
<td>The student was unable to select an appropriate tool (examples on the bottom) to solve the problem.</td>
<td>The student was able to select an appropriate tool to solve the problem.</td>
<td>The student selected an appropriate tool to solve the problem and explain why they selected that tool.</td>
<td>The student was flexible in selecting appropriate tools to solve the problem and explain why they selected that tool and why it was most efficient.</td>
</tr>
</tbody>
</table>