

EXPANDING NUMERACY AND LITERACY LEARNING THROUGH PLAY IN SCHOOL-BASED ENVIRONMENTS

GRAPHIC REPORT

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Family Foundation Inc.



**Early Childhood
Collaborative
Research Centre**



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Land Acknowledgment

This research was conducted in Kjiptuk (Halifax), part of Mi'kma'ki, the unceded ancestral territory which remains the homeland of the Mi'kmaq Nation. The treaties are living agreements that establish the rules for an ongoing Treaty relationship between nations.

We pay respect to the knowledge embedded in the Mi'kmaw custodians of the lands and waters and to the Elders, past, present, and future.



CONTEXT



Environment and Research Context

As the Pre-primary Program has recently joined the Education, Innovation, Programs, and Services Branch at the Department of Education and Early Childhood Development, there is a timely opportunity to explore inter-professional collaboration between early childhood educators and early elementary teachers to support the transition of children across early childhood and school-based curriculums. Further, given the increased focus on effective reading instruction and mathematical learning, it is important to highlight the foundational literacy and numeracy skills gained through intentional play-based environments.

Communities of Practice (CoP) offer opportunities for meaningful exchanges about opportunities and challenges between professionals working in the same field. Understanding that the concept of early childhood does not end when children enter school, we invited Pre-primary early childhood educators (ECEs) and elementary educators to participate in CoP sessions to gain a better understanding of what play-based programming looks like in the early years and to facilitate connections between professionals and their practice.

Play and Numeracy and Literacy

For this research, we view numeracy and literacy as being interconnected and influenced by the social and cultural influences within the environment. Literacy and numeracy are linked through the many ways that foundational concepts like oral and written expression and patterning or measuring go hand in hand. We also believe that numeracy and literacy can be expressed in many ways.

Play provides a space for children to be curious, problem solve, and be an active participant in their environment. Through play, children naturally explore and building foundational numeracy and literacy skills and their confidence. Dr. Peter Gray provides a definition of play that guided our work:

1. Play is self-chosen and self-directed.
2. Play is intrinsically motivated—means are more valued than ends.
3. Play is guided by mental rules, but the rules leave room for creativity.
4. Play is imaginative.
5. Play is conducted in an alert, active, but relatively non-stressed frame of mind.

WHO?



Participants were recruited from five Regional Centres for Education and the Conseil scolaire acadien provincial (CSAP). One group was facilitated in French for educators working in the CSAP.

Early Childhood Educators



7 Pre-primary Program ECEs working in Regional Centres for Education and the CSAP.

Years of experience as ECE ranged from 1.5 years to 35 years.



*...then [the learning] goes so far afterwards when you have that [numeracy and literacy] lens and you're able to help the child to connect those concepts [through play]. It allows us to highlight things that are being learned that might otherwise go unnoticed.**

Early Elementary Teachers



6 early elementary teachers working in Regional Centres for Education and the CSAP. There were four grade primary teachers, one grade 1 teacher and one grade 2 teacher.

Years of experience as a teacher ranged from 6 to 20 years.



“Adding the play-based learning into my practice lets my students who struggle with the social-emotional side of things find an entry point to our activities. When we do activities where it is like “everybody is going to sit and do the same thing”, they often can't find their entry point. But when they get to choose—and I've carefully chosen the materials and kind of decided which way I want things to go—but in offering that choice, they can always find an entry point into the activity. I haven't had a day yet where they didn't find a way in and a way to interact with the materials and show some sort of thinking and learning and growth.”

-Grade 2 Educator

*Please note this quote has been translated from French and is therefore not an exact quotation.

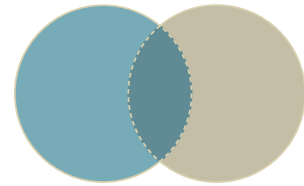
WORKSHOP OVERVIEW



6 monthly online CoP sessions discussing play-based numeracy and literacy learning opportunities



Photos of their learning environments and play.



Discussion of the common themes of each photo, resulting in a final visual for each group (Pages 14-15).

PROJECT AIMS

To enable PPP ECEs and early elementary teachers to record and reflect on how numeracy and literacy is supported through play.

To facilitate communication, information, and idea sharing between PPP ECEs and early elementary teachers.

To gain an understanding of how a community of practice (CoP) approach can influence collaborations:

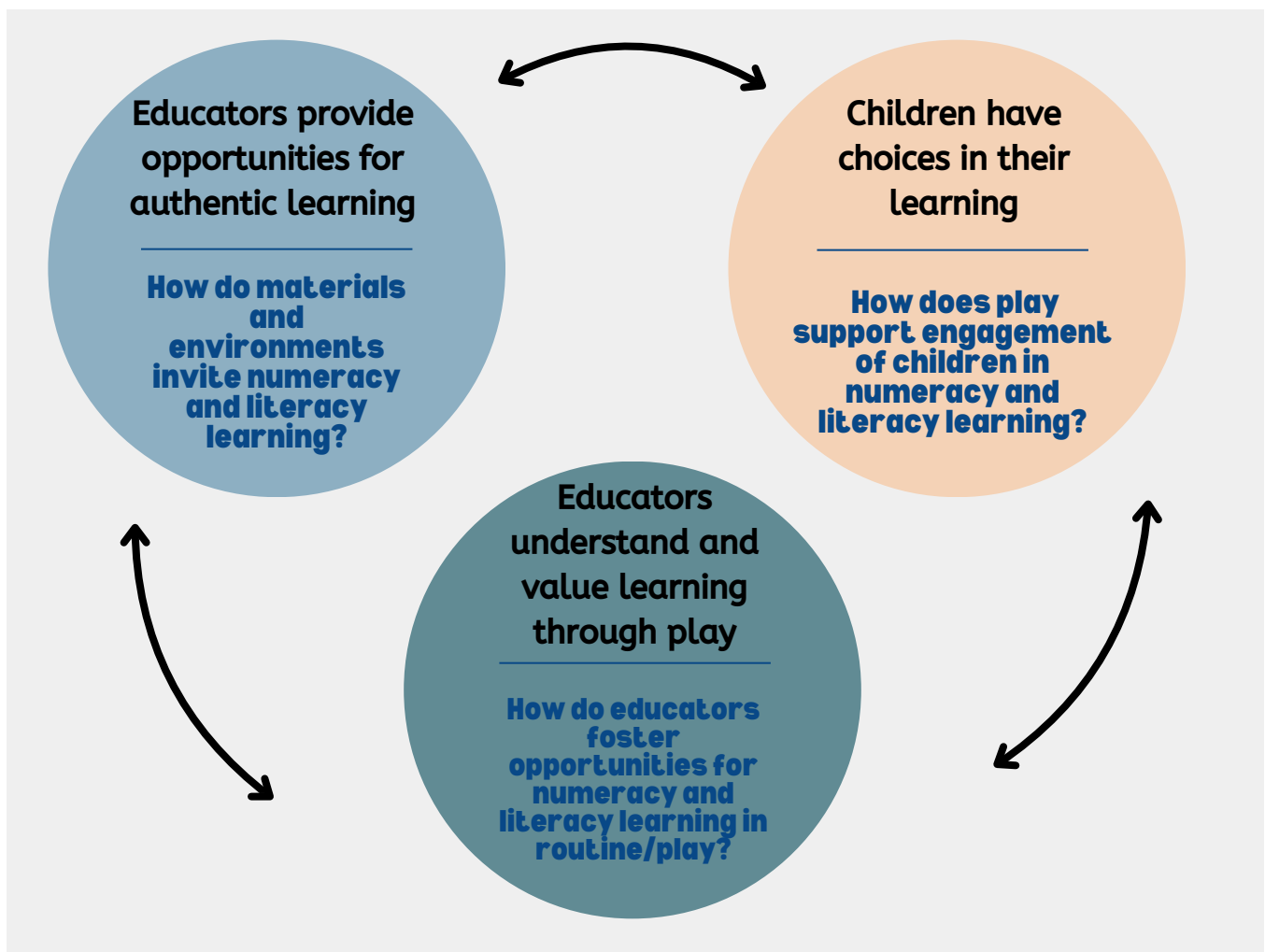
- Between PPP ECEs and early elementary teachers.
- To support numeracy and literacy learning through play in early learning settings.

To facilitate knowledge mobilization to identify how to enhance play-based approaches across early learning settings.

OVERARCHING THEMES

Across the sessions, educators characterized numeracy and literacy in their environments by providing different examples of how children learned through play. Across these examples, three common ideas were illustrated to facilitate play-based learning: 1) educators understand and value learning through play; 2) providing opportunities for authentic learning; 3) children have choices in their learning.

While educators had the freedom to share any photo that they would like, we have organized the report into the following questions and responses that reflect the discussions had over the course of the CoP Sessions.



How do educators foster opportunities for numeracy and literacy learning in routine?

How many friends...

Every morning, a student counts and writes on a little whiteboard the number that represents how many students there are that day in class. If the student needs help, he or she can choose a friend to help with writing the number. It's something small, but I think it's rewarding for the students. Even if they don't know how to write the number, having the chance to try, to choose a friend to help, both spark confidence. And it takes us 30 seconds to do it, so it became a part of our routine very quickly.*

-Grade Primary Educator



In this example, the children's natural curiosity about who was in the classroom led to this numeracy and literacy opportunity. The educator responded by creating a daily opportunity for the children to take part in the routine of reading the question, counting and writing. This also offered an opportunity for the children to support one another, assisting with the counting and writing as a team.

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Looking more closely



"This started with a conversation at circle about some ways that we can keep our classroom safe. The children saw me with a big piece of paper that said 'Our class promises' that I was going to use to write in their words what they had said in our earlier conversation. They asked, 'Can I help you? Can I write on there?' So we followed their lead and encouraged them to write their own promises. Seeing this posted in our classroom every day sparked the interest for the bottom photo, which is in our art area, the children almost realized, 'we can put our work on the wall.' They love seeing their pictures on the wall, it sparks conversation between peers, they ask us to write on it to label their work, which provides more early literacy opportunities.

-Pre-primary Educator

While establishing their class promises, this educator responded to the children's interest in exploring the writing materials and allowed the children to contribute by writing on the paper themselves. Hanging it up in an area they visited frequently inspired them to add more of their own work to the wall. Fostering this interest supports the development of letter recognition and concepts of print, in other words, children are being immersed in their own letter writing and giving it meaning by connecting it to their art.

Through play?

An invitation

*I took this activity out for the first time, it was just on the table as an invitation. The children asked what they were supposed to do and I said, 'Well, I went around the circle, I put a white one, then a green one. It's up to you, you can do anything you want'. As you can see the boy he made a face, the one on the right wanted to match the photo, and the other girl just wanted to do anything. The two children are standing there watching because they were waiting for a turn and wanted to start right away.**

-Pre-primary Educator



In this photo the educator invited the children to engage with the open-ended materials that she had placed on the table. When the children were interested in how the materials could be used, she answered their questions but she also left room for exploration. Free to engage, the children made symbolic representations of faces, patterns, or tried to match a photo. This intrigued the other children who waited for the chance to make their own creations.



Shades of possibility

*The activity was very simple, I had a big box of crayons all mixed up, and I placed a couple of small containers next to it on the shelf. At first there were 3 cups. We evolved to several containers, which the children asked for, in order to put different shades and colors. We discussed primary and secondary colors and how to mix colors to produce a different one (blue and yellow = green). The activity continued throughout the week. The cups multiplied as the children found shades and asked for another cup. The activity took place for a week entirely under the direction of the children.**

-Pre-primary Educator

In this photo, the educator intentionally set up an invitation with materials that the children saw every day but allowed the children to decide how they would interact with them. Their natural interest in wanting to group the crayons based on color allowed them to practice foundational classification skills. Discussing the different colors and hues while organizing them not only supported numeracy concepts, but it also enhanced their vocabulary.

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How do materials and environments invite authentic numeracy and literacy learning?



Meaning of Time



An Inviting Space

"I haven't heard [that word] a lot. The invitation. I like the idea that there are invitations to play, to learn, to take part. I think that's nice."

-Grade 2 Educator, upper right photo



Process Over Product



Conversations about Numbers

"The average person who isn't in the education system wouldn't look at these pictures and say: 'this is how we're gonna teach literacy and numeracy.'"

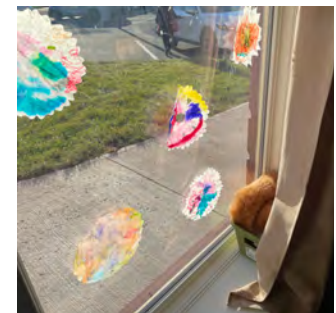
-Pre-primary educator, upper left photo

But I think material is a word that's been used a lot, a variety of diverse materials. The carpet, it's one thing that has a million possibilities. I think it's just that, to be open when you look at certain pieces [materials] or tools. Then try to see all the versatility or all the possibilities that there can be with one thing or a basket of little things.

-Pre-primary Educator, upper left photo



A Place to Experiment



At the Child's Level



Patterns and Space



The World Around Them

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Educators encourage exploration

Multiple representations

*It's really a place for mathematics and numeracy, and there's a poster that says, 'How many ways can you represent a number?' There's natural material, there's manufactured material, there's classroom material too, it's all part of the material we usually get. Then the weightings, that was another thing I'd read too that to provide students not just like the different textures, but also the different weightings that I wouldn't naturally think of providing. There are links that are made in their brains when they hold a small stick of wood, the weight of a toothpick versus a shell which is heavier.**

-Grade Primary Educator



Questions inspire exploration

*Of course, to put new material like this into context, there's always a time for exploration. This was a specific time, but I let them discover and play with the materials: 'OK, but if I put a weight on one side, I can see that it's leaning. Why do you think if I put two on one side? But the same weight on two different numbers, it becomes a tie', so there are questions like that that we're talking about here, [...] it pushes them to go further too, not just to find one way but as many ways as possible. So it's clear to me that it's a guided game with specific intentions but, yes, I can see that the students are pushing themselves to explore their curiosities and go further.**

-Grade 1 Educator



In both of these examples, the educators provided the opportunity for the children to become familiar with the materials that they would be using for their math activities. In *Multiple Representations* the grade primary educator incorporated the same materials present in the photo in with her play materials. The prompt asked children to represent numbers in multiple ways, yet the educator also discussed what children can learn from using materials in various sizes and weights. In *Questions Inspire Exploration* the grade 1 educator allowed time for the children to explore the materials before beginning the activity that she had planned. They spoke about the learning opportunities that emerge when children are free to explore and make connections.

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Children's intentional engagement with materials

Two Dollies Tall

"This measuring tape is still on our floor- it went from the children using rulers, to meter sticks, and it evolved into this. [All of these materials were] accessible at the same time. The children were bringing the dolls over, she would lay her doll down and say, 'the dolly is this tall,' and she did go over to one shelf and say, 'The shelf is two dollies tall'. Then, the little one in the pink shirt who has a toy horse in her hand, said the horse is running a race. She was counting, 'one, two, three,' and going across the whole thing. It's not a standard measurement and not even a standard use."

-Pre-primary Educator



This example showcases children interacting with materials in different ways. While one child used the measuring tape to create a measurement reference for how tall things were in comparison to her doll, another child used her interest and knowledge of horses and their functions (racing) to count her horses' progress. Both children took a multimodal approach to numeracy and literacy, representing their social and cultural knowledge in their play.



F for Francesca* and Flamingos

I heard the girl that has the pencil and the wooden toy say 'Is this it? Is this it?' And the other girl saying, 'No, no, no' like over and over. So they were looking for the letter F for her name, but they couldn't find it in the lower case. When they flipped it over to the upper case, she found it and said 'This is it!' and got all excited... She was using the keyboard because the receptionist at our doctor's office has the keyboard, and that's what she was finding the letters on yesterday. That time she found the 'F' for her name and for 'flamingos'! She absolutely loves flamingos, but I never told her [that they start with F].

-Pre-primary Educator

This is another example of children using traditional materials in non-traditional ways. The educators in the group noticed that switching a lower-case letter to a more familiar upper-case one allowed the children to accomplish their task. Children naturally look for meaning when engaging in literacy play. In this case, the letter F acted as a symbolic representation of things that matter to them, such as their name and favourite animal.

*Please note that all names are pseudonyms

Children engage in meaningful processes

Meaningful Rules

While playing, Wyatt found some blocks and realized that there were blocks with numbers on them. He showed me the nine, and it was as if [it inspired him to] create a set of rules in his game: 'I'm going to build a tower with nine blocks.' That's exactly what he did. Nina* next to him, she also started counting afterwards. She didn't find a block that had a number, but what she did was pick out a color. She said to me, 'I've got two yellow blocks, I've got three purple ones,' then she counted her whole castle, taking the colors and counting them.**

-Pre-primary Educator



In these photos the children have come up with their own mental processes while playing with the same materials. Developing mental rules is an important part of children's play, and this resulted in enumeration (counting) for one child, and classification/enumeration (recognizing similar colours and counting/grouping them) for another. The educator felt that by the children creating their own process and mental rules, it became more meaningful to them.

Yes, it's a pattern



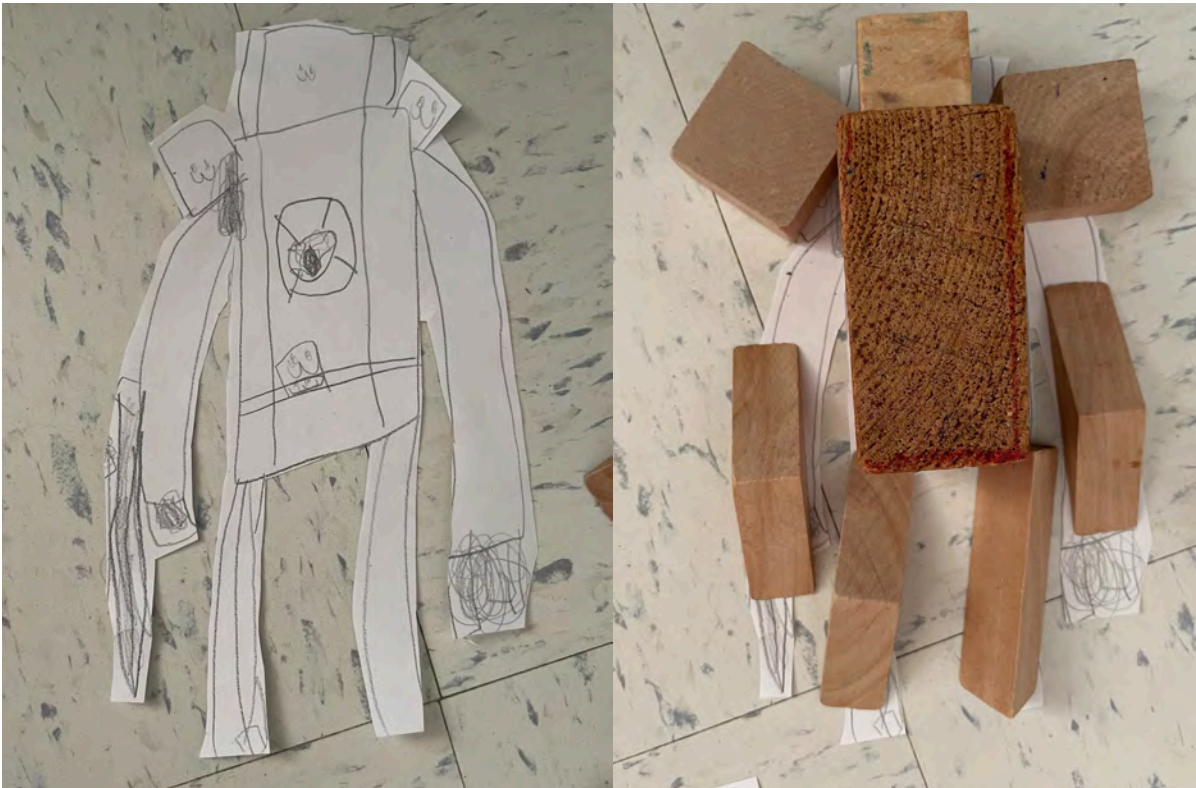
"This little guy was showing me all kinds of patterns. He had several different ones before he showed me this one. Yes, it's a pattern [laughing]. He was so proud of it! [I asked him to tell me about his pattern and] he's like, 'Sure, it's blue and beige, and blue and beige, and blue and beige.' He was counting the table as his beige [part of his pattern]. It was very intentional for sure. [He was] very proud. Especially when I didn't quite get it and he had to explain it to me."

-Pre-primary Educator

The educators in this group found themselves surprised by this photo. They shared that they thought that the deliberate spacing between the squares would have been the focus. They didn't think to consider the table as part of the pattern. Through asking the child to explain his thought process, he was able to confidently demonstrate that he recognized the sequencing of his pattern.

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How does play support engagement of children in numeracy and literacy learning?



Orienting to the 3D

"I have two particular students that really they struggle with emotional regulation and they don't take part a whole lot in class, especially not when it comes to math... this child grabbed one of his drawings that he cut out, (which is what you can see in the first picture), and he said, 'I wonder if I can build this with the blocks.' If a block didn't fit he would move it away and pick another one and put it over top. So he just kept changing it until he was happy with how it looked. At the same time he was also telling this whole elaborate story that he was capable of coming up with but the story would never have been told if he was given instructions and handed a pencil and paper."

-Grade 2 Educator

The educator shared that she was excited by this interaction with the child. When given choice and agency, this child was, by her account, able to tell a story beyond his reading level. This child also exhibited an understanding of symbols, by orienting the 3D blocks to the shapes of his 2D drawing. That understanding is a concept of both numeracy and literacy. He also showcased his language and comprehension abilities through storytelling. A perfect example of multimodal literacy.

Children are given choice

Pride from learning

“I set up math centres with the idea that the children would make shapes and numbers with play dough. In this photo, the child just kind of did his own thing, he made a pattern on his play dough and then he was feeling the bumps and counting them, and talking about how much he loved waffles. It was neat to hear how he had this big story, he's not someone who talks a whole lot. [He was] so proud.”

-Grade Primary/One Educator



While the educator had an intention behind set up of the materials, the child made the choice to engage with them in his own way and rather than redirecting the child to the original intent of the activity, the educator observed the child's interactions with the materials. She observed numeracy skills as the child was observing his pattern and counting out loud. The time and freedom to continue with his interest allowed some literacy skills to emerge from this math centre, as the child felt inspired to talk about what he had made and to connect it to his experiences.

Exploring without direction

“On this particular day I had the blocks out and they were just exploring and there was no direction at all. [The child] sat there the whole time, and he called me over at the end to show me what he had made. You can see the sphere in the middle of the structure, and he built it so that it was a ramp that the sphere would roll down when he took the rectangular prism off. He was so proud of himself. He said, ‘Well, it's a sphere, so it will roll’ and ‘Oh, well I stacked this one here because it has the flat side.’ He was talking about all the characteristics of the 3D shapes. Which was a unit that we had done earlier in the year, but it wasn't something that we were currently talking about or working on.”

-Grade 2 Educator



In this example we see a child who was able to interact with materials in a way that was interesting to him, and explore at his own pace. During his play, he drew on his knowledge of three dimensional shapes from a previous unit. While explaining his reasoning, the child used vocabulary words to describe the characteristics of the 3D shape and to discuss the spatial relations of the shapes and how they worked together to create his structure.

FINDINGS

What have you been thinking about since participating in the CoP sessions?

“After looking through the pictures that I had taken, I realized just how naturally their learning occurs. We put out materials with intention and the [children] blow our minds with what they actually do with it. Finding the numeracy and literacy through [the photos] has been easy, when in the moment, it might not be. Numeracy and literacy might not have been at the forefront of the open-ended activity but their natural curiosities led them there.”

-Pre-primary Educator

“After looking for photos for this session I was like, ‘I haven't been doing a very good job’ and I was kind of kicking myself. I picked a photo that [I thought would] work but then I started thinking about it again and I was like, ‘Well, since then, we have salmon in our classroom, and we have frogs,’ and without even doing any teaching around that, what the students are getting to observe and the conversations that they're having, it is amazing. So I keep going back and forth between kicking myself and then looking at my practices that I'm already doing and thinking, ‘Oh wait it's here’. I'm just still not seeing that *I am* practicing it”.

-Grade 2 Educator

I find there's a kind of validation [from participating in these CoPs], that we're not alone. I find it encouraging. I have a colleague who says, ‘You're really good at doing centres almost every day’, because it takes energy or whatever. I'll say, ‘But for me, it's like the easiest part with my students, because they really like it’. It motivates me even more to continue doing what we're doing.*

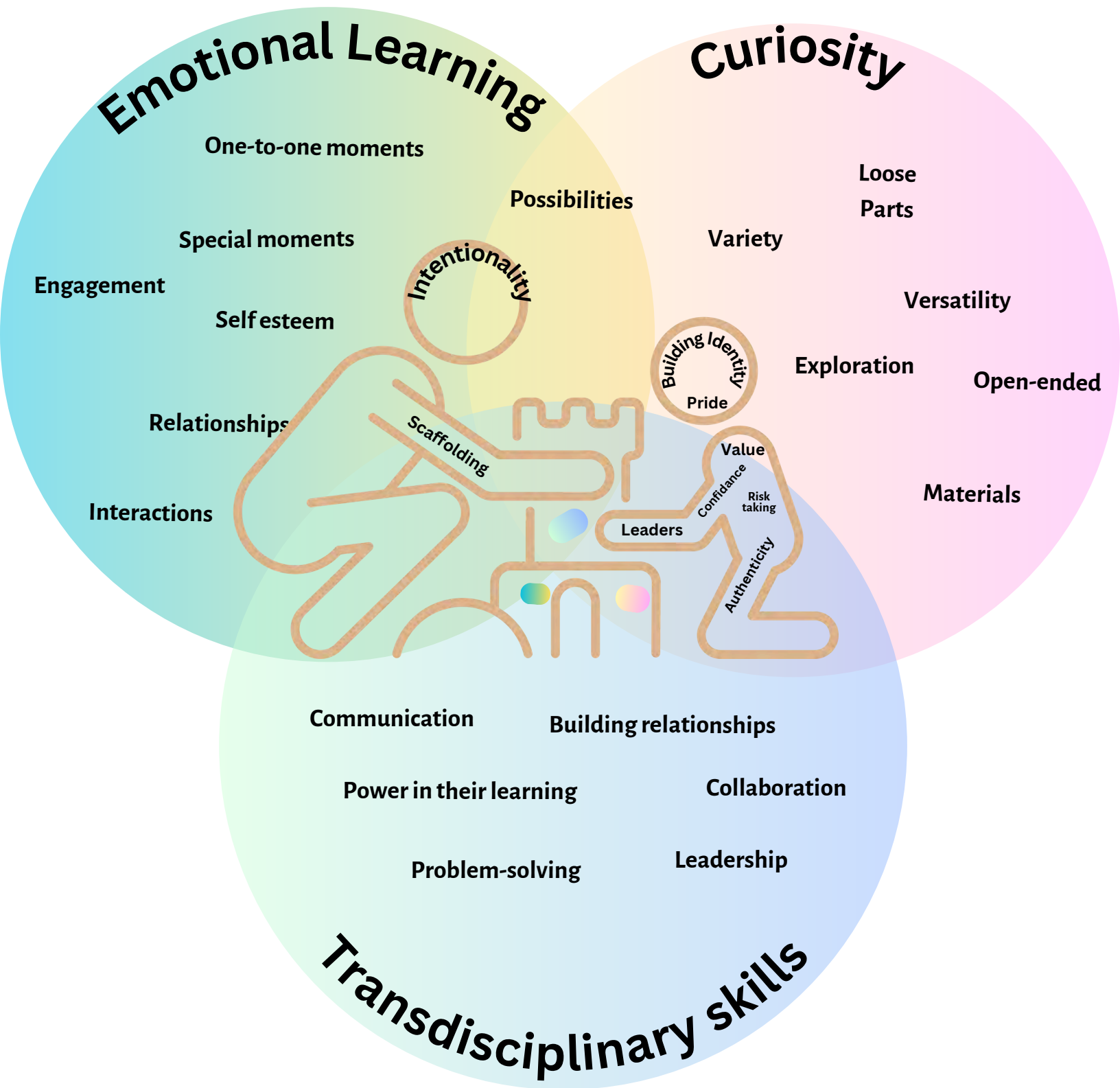
-Grade 1 Educator

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What are the common themes we've seen?

At the end of each photo sharing session we asked participants to brainstorm the common themes that came up in the photos and the discussion. The following two pages are visual representations of the discussions had by the participants.

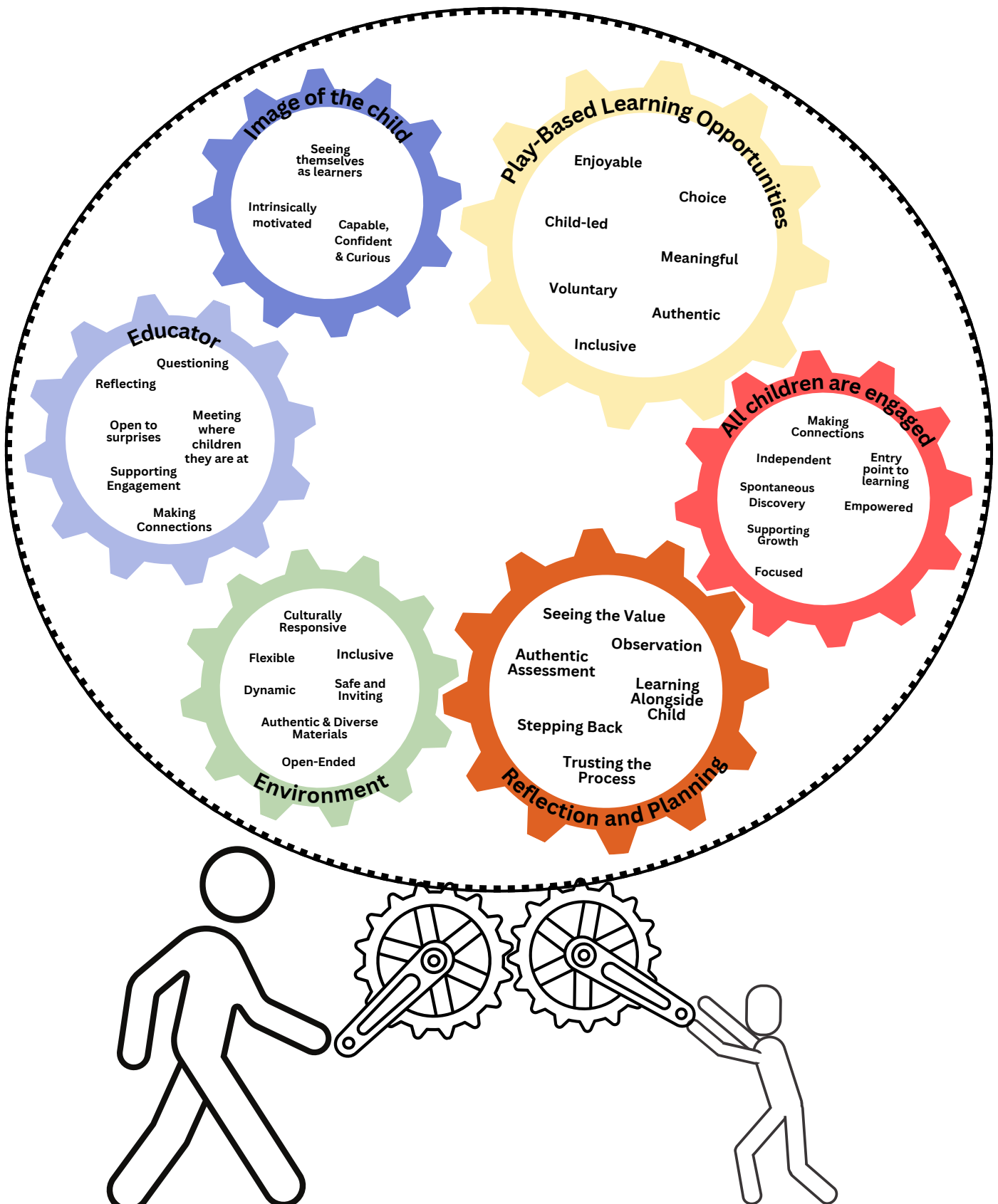
Healthy Environments



Francophone Final Visual

English Final Visual

Supporting Numeracy and Literacy Through Play



What have you learned from your Pre-primary and/or early elementary colleagues throughout this project?

“I think even though this was a small group [of educators], we can all take this [experience] back to our own school. I think it helps bridge the gap and build the relationship between Pre-primary and the early years up through the school system.”

-Pre-primary Educator



Sometimes during the day, something happens and I remember something that we talked about. It's just like an observation, but it's so interesting the discussions we have and the real life ideas that are exchanged. It's like an extra channel that tells me, 'Oh, it's like we had talked about as a group and [Pre-primary educator] had done such an activity.' And so it's just really fun to have that added to our toolbox too. So it's more like little thoughts like that, but I don't have one in particular.*

-Grade Primary Educator

I realize that we [early childhood educators] do a lot of observations to try and reach the interests of each student in the group. But I've realized that at the elementary level, it's just as important to make observations so that you're able to plan invitations that work and that will attract your students. It's like a little key word that stands out for me. That's something I've noticed [is important step for elementary educators] too.*

-Pre-primary Educator



*Please note this quote has been translated from French and is therefore not an exact quotation.

What have you learned from your Pre-primary/early elementary colleagues throughout the course of this project?

"I've gotten a lot of great ideas from everyone, and it's been really nice to hear how others have been collaborating with some of the early elementary (educators) with Pre-primary educators [in their school], which is what we'd love to see more of. We did some clay creations and we saw the grade one teacher who was also bringing clay into her classroom. So, we invited her to come in and see and she was just amazed at what Pre-primary had created in a play-based environment."

-Pre-primary Educator



I think it just helped us confirm our approaches, our pedagogical choices. I think it gave [myself and another grade primary educator in the group] a bit of a boost, it encouraged us to know that we're not the only ones who believe in these pedagogical approaches of really learning through play. We're not the only ones who have this vision, and think that it can be successful and meaningful. I think it's really encouraged us, and motivated us to keep going in that direction. But of course, I think there was an advantage of having someone in the same school. A chance to see, to exchange ideas, or to talk about what we'd been discussing in the group. So yes, it was a nice advantage.*

-Grade 1 Educator

"For me it was learning that play-based can still be given some kind of direction in the sense of the materials that you choose and the way that they are presented in a space. I think that really helped me figure out how play-based learning really does help the kids meet the outcomes that we're working towards and to demonstrate their learning that way. So, for me that was huge. Just seeing how everybody presented things and laid them out, and how it was okay for the kids to take them in different directions. But quite often they would show learning that you hadn't even anticipated."

-Grade 2 Educator



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Conclusions

- The monthly community of practice sessions provided an opportunity for Pre-primary educators and grade primary-two educators to come together and engage in discussion about their experiences in supporting play and learning.
- The photos acted as tools to not only show their practice but also to encourage reflection by both the participant sharing the photo and the other members of the group. The photos also encouraged idea sharing between participants.

Next Steps

- These materials are being created with the intention of highlighting and promoting how numeracy and literacy is supported in play-based early learning environments.
- Further dissemination information will be made available on our website (msvu.ca/eccrc).

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<https://tinyurl.com/ECCRCnl>

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