



CULTURALLY RESPONSIVE PEDAGOGY: CO-CREATING RICH MATH TASKS THROUGH THE LENS OF SOCIAL JUSTICE

The following article outlines the key learnings emerging from a co-terminus collaborative inquiry into Culturally Responsive Pedagogy, Math and the Brain. Through a number of inquiries, educators, parents and students explored the big ideas in math and pedagogy, including growth mindset, rich math conversations and culturally responsive pedagogy and math. These experiences extended the learning by reaching out to local and global communities. By responding to student voice and wonderings, educators and students co-created rich, cross-curricular math tasks that empowered student learning and improved student engagement and achievement in mathematics.

Keywords: Mathematics, Equity, Culturally Responsive Pedagogy, Inquiry, Growth Mindset

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Culturally Responsive Pedagogy: Educator Mindset, Advocacy and Action

In the 2013 Ontario Ministry of Education Capacity Building Series – Culturally Responsive Pedagogy: Towards Equity and Inclusivity in Ontario Schools, the mindset of the culturally responsive educator is described through the following six characteristics:

Characteristic #1 Socio-cultural consciousness

Socio-cultural consciousness includes an awareness of privilege and what and how we teach based on our own identity and the identities of our students.

“Self-reflection is foundational to the examination and identification of one’s own biases. This critical process includes understanding the issues related to the distribution of power and privilege and the relationship of power dynamics to one’s own social experience” (CRP. p.4). As co-learners, we question our own bias and we invite students to question their biases.

Characteristic #2 High expectations

The perceptions we have of our students’ abilities to learn significantly impact their achievement and well-being.

“Culturally responsive educators hold positive and affirming views of their students and their ability to learn and achieve academic success. They demonstrate genuine respect for students and their families as well as a strong belief in their potential. They consider the social identities of students as assets rather than deficits or limitations” (CRP. p.4).

Characteristic #3 Desire to make a difference

Teachers that allow students to be agents of change invite their students to critically assess local and global issues of inequity and to respond empathetically.

“Culturally responsive educators are committed to being agents of social change, ultimately working to remove barriers and creating conditions for learning that are beneficial for all” (CRP. p.5).

Characteristic #4 Constructivist approach

Students are invited to ask questions and to use their natural curiosity and their own experiences to create new knowledge.

“Constructivist approaches promote inquiry-based learning- they support students asking questions and creating new knowledge based on their natural curiosity about their own experiences” (CRP. p.5).

Characteristic #5 Deep knowledge of their students

This characteristic is about understanding and building strong relationships with your students and their families. This allows the teacher to embrace a collaborative and responsive approach to teaching and learning.

“Drawing on students’ experiences provides teachers with opportunities to represent their knowledge in the curriculum so it is meaningful and students see themselves reflected in the learning that take place in the classroom”.

Characteristic #6 Culturally Responsive Teaching Practices

Teachers understand their students and their community and listen deeply to student concerns and interests. Teachers hold high expectations for their students and honour their strengths and voice.

“At the core of these strategies is a) holding high expectations for learning while b) recognizing and honouring the strengths that a student’s lived experiences and /or home culture bring to see themselves in the daily learning of the classrooms...Learning experiences are designed to be relevant and authentic” (CRP. p.6).

The monograph, **Culturally Responsive Pedagogy: Towards Equity and Inclusivity in Ontario Schools**, invites educators to reflect on bias, and understand issues related to the distribution of power and privilege. By recognizing the assets that each child brings to the classroom and by having high expectations for student achievement, we can empower each child to be a critical thinker and an agent of change.

An important characteristic of Culturally Responsive Pedagogy and Math is the co-development of rich mathematic tasks based on the students lived experience. In her analysis of educators’ collaborative inquiry into Culturally Responsive Pedagogy, Math and the Brain (2015-2016), Nancy Steinhauer noted the following benefits of the teacher inquiry:

- Enthusiastic engagement in exploring powerful pedagogy by teachers
- Opportunities to explore both mathematics content and mathematics for teaching content
- Spread of exciting and effective practices among classrooms and schools
- The development of students’ understanding of themselves as changemakers
- Parent and community engagement in student learning

- Motivation for teachers to dig deeper into mathematics teaching and learning (Steinhauer, 2016).

As educators, mindset is critical to the students' learning environment. If educators believe in student voice and the impact of student learning, this belief will resonate with their students. Michael Fullan writes that "our main goal in education is to provide immediate opportunities for students to help humanity.. students have a role as change agents" (Fullan, 2014). Students need to believe that their learning is important, that it can change their classrooms, their school, their local and global communities. Students need to believe in the impact of their learning. If students believe that they can change the world through their learning, they will know that their learning is important. As culturally responsive educators who believe in high expectations for students and the power of student voice, we are called to co-create rich cross-curricular learning opportunities based on students' wonderings and lived experience. Responding to student voice empowers students and improves student engagement and achievement in mathematics.

Social Justice and Math: Student Mindset, Advocacy and Action

Social Justice and Math extends Culturally Responsive Pedagogy, in that it invites students to respond to their learning through advocacy and action. While Culturally Responsive Pedagogy is about teacher mindset, advocacy and action, Social Justice is about student mindset, advocacy and action. Rich tasks are co-created with students. They elicit an emotional response from students because the tasks are a response to the concerns and wonderings of the students. If the task is relevant to students' lives and elicits an emotional response, the learning is deeper. In order to persevere through a rich task, students also need a growth mindset and a deep understanding of productive struggle.

The following three excerpts by teachers, describe the lived experiences of educators who participated in the collaborative inquiry on Culturally Responsive Pedagogy, Math and the Brain. Each teacher describes how their Mindset, Advocacy and Action led to a transformational change in student learning.

Student Inquiry and its Impact by Irena Albinowski, Grade 8 Teacher

As educators, we strive to instill a lifelong enthusiasm for Mathematics in all our students. Significantly, I have come to recognize that the facilitation of meaningful student Math inquiries which are based on the students' lived experiences and the explicit teaching of a growth mindset (Dweck, 2006) in a safe learning environment have a most positive impact on various aspects of student learning.

Indeed, a student inquiry was launched as a response to student wonderings and concerns regarding a very long line of people the class had observed as we returned from a field trip. The building which the people were in line to enter was the site of a daily free meal program for people in need. After tapping into students' previous knowledge about wage inequity and poverty during the next school day, I provided them with statistics about the increasing reliance on food banks and meal programs being

experienced by Toronto residents. Inevitably, the question asked was, *Why are food banks and meal programs on the rise in Toronto?* After a very engaging and passionate discussion, which included students communicating their own money concerns, the class was challenged to use math to answer the posed question. In other words, in making a convincing argument regarding the reason for the increased use of food banks and meal programs, not only were students encouraged to seek out, collect and organize data to justify their point of view, they were to also read, interpret, reevaluate and draw conclusions from such data so as to effectively communicate their findings to their peers.

After reviewing previously established group norms as well as co-creating learning goals and success criteria, students were placed into groups of four with various resources such as laptops, chart paper, markers and calculators. Moreover, the growth mindset was recalled through reminders about the possibility of numerous answers, mistakes being opportunities to learn, risk taking and perseverance as key to success. With groups enthusiastically collaborating to formulate their hypotheses, the student inquiry was launched. Within one week's time, accountable talk by way of a class gallery walk of the groups' efforts, reflection about successful strategies and a consolidation of learning, especially with regard to data management skills and social justice issues, successfully took place.

Without question, I have learned that the impact on student learning as a result of student inquiries such as the one just described is quite immense and exceeds expectation. Indeed, the heightened student engagement and metacognition elicited from meaningful class inquiries which are directly relevant to the students' experience have occasioned rich Math conversations, greater confidence in the students' own abilities and improved achievement scores in Mathematics. Indeed, in regard to the inquiry regarding heightened food bank and meal program use, content and skills linked to graphing and interpreting trends were augmented. Moreover, these Math concepts and skills were retained and more flexibly used in future learning, as observed when students were asked to interpret various patterns and trends related to human settlement and global inequalities in Geography. As well, the students' collaboration and oral communication skills are fostered with the implementation of Math inquiries since students must persevere in communicating with one another, especially in resolving differences within their groups to arrive at solutions and communicating their outcomes to others.

Importantly, I have also observed students demonstrate a more consistent reflection about Mathematics and its implications regarding daily life when inquiry is utilized as a teaching approach. The students' math journal entries testify to this tendency. In fact, these entries, as well as class discussions, have also demonstrated in students a heightened response to their own learning since they independently propose various forms of action to address the injustices their inquiries reveal. As such, student inquiries empower or enable students to realize their ability to be agents of change in their communities.

In summary, I can state that the inclusion of meaningful student inquiries as a key component of any Math program honours student voice and can contribute significantly to the development of enthusiastic, self-directed, responsible and reflective lifelong learners who are propelled to make a difference in their communities.

Goat Math by Katharine Piotrowski, Special Education Teacher -Junior Division

Having access to high quality education is key to all students. Maintain high expectations that challenge students creates opportunities for Special Education students to build self-esteem and showcase their knowledge. When appropriately supported, students who need small group intensive support are capable of pushing their learning beyond even their own expectations.

Team 218, a Language Impaired (LI) closed classroom at St. Sebastian Elementary Catholic School in Toronto, works to make a difference in the world. At the beginning of last year, the Team took on the organization of September's pizza lunch for the whole school, with the promise that the Team could decide what to do with the profits. Organizing the pizza lunch provided an opportunity to begin the year with real life mathematics connections (collecting, grouping, counting money, calculating how many pizzas need to be ordered) and a chance to decide what to do with the profits. We made \$231 in profits and decided to use the money to 1) buy a sponge soccer ball for each classroom (we are a big soccer school!), 2) go on a fieldtrip together, and 3) help a small farmer family in Kenya by buying them a goat through We Charity, an international charity that works with communities to lift themselves out of poverty. The idea of buying a goat naturally brought up questions which lead to a very engaging Numerations math unit during which the Team explored how much milk a goat produced during the year, how this compared to how much milk we drank, what the small farmer could do with the milk and how it could help his family. We documented our journey through Storify (<https://storify.com/KPiotrowski/team-218-social-justice>).

This project produced a high degree of student engagement through ownership of the mathematics, which naturally evolved through structured inquiry. Furthermore, Team 218 students felt empowered through their ability to contribute to the school community as well as make a contribution to the life of a small farmer family in another part of the world. Through experience, they understood that they can be change agents and make a difference.

Bridge Inquiry by Kathleen Keenan, Primary Teacher

In my grade 2 class last year, the opening task for our measurement turned into a cross-curricular problem solving social justice action created with a focus on the growth mindset and culturally responsible and relevant pedagogy (CRRP).

Our measurement unit began with the engaging tasks of mapping our local community in order for students see the function of measurement in their everyday life. We asked questions like: Who's house is closer to the school? Further away? How does that affect your day?

Students immediately noted the location of the commuter train tracks and commented on the distance between the tracks and their homes/school. The province has plans to convert the train track into a bridge in order to improve frequency of train service. When the students learned this information, they had a real desire to learn more. We turned to our math skills.

Students set out to measure the proposed height of the bridge. They wanted to know how the bridge height would affect their community - their parks, their roads, their houses. We created measuring tools (ribbons) which were 8.5 metres long - the height of the bridge. Walking to the nearby park, balloons in hand, students discussed the impacts of this project on their life: pollution, noise, safety. In the park, we

estimated the heights of other objects (trees, houses, basketball nets) and returned back to the school to consolidate our learning.

The students voiced real concerns about the situation. Would they cut down the trees to build the bridge? Could they build a tunnel instead? Will the train fall on our houses? They were thinking critically about a real world problem that would affect their community. The motivation and engagement was palpable.

When students are made aware of a social justice issue, they should also be given tools to affect real change. So we wrote letters to our mayor, describing our math tasks and our critical thinking, and asking him to stop the bridge from being build. We found out days later that city council (and the mayor) voted against the bridge and in favour of a tunnel. What better motivation for student voice than the experience of having yourself heard by the mayor of your city.

From there, students explored many avenues of civic engagement. They polled their school and used the results to prove that their community was not in favour of the bridge. They hosted a presentation for Metrolinx staff in order to convince them to build a tunnel. They wrote persuasive speeches and convinced hundreds of people to sign a petition. They shared their learning with local community groups who were advocating against the bridge. It was a powerful way for students to see that their work mattered - not just to their peers and their family, but to their neighbourhood, their city, and their province.

The stories above as well as the learning from the Collaborative Teacher Inquiry on Culturally Responsive Pedagogy, Math and the Brain are documented in the video series by the Ontario Ministry of Education Student Achievement Division, Culturally Responsive Pedagogy: Educator Mindset and Action (2016) and Math Lives Here: Helping Social Justice Take Flight (2016).

References

Albinowski, Irena and Helling, Gianna (2016). Culturally Responsive Pedagogy, Math and the Brain: Building Rich Math Tasks Through The Lens of Social Justice. A TCDSB Resource Package For Intermediate Educators.

Dweck, Carol. (2006). Mindset The New Psychology of Success: How We Can Learn to Fulfill Our Potential. New York: Ballantine Books.

Fullan, Michael and Langworthy, Maria (2014) A Rich Seam: How New Pedagogies Find Deep Learning. michaelfullan.ca/wp-content/uploads/2014/01/3897.Rich_Seam_web.pdf

Ontario Ministry of Education (2013): Capacity Building Series. Culturally Responsive Pedagogy: Towards Equity and Inclusivity in Ontario Schools. www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/CBS_ResponsivePedagogy.pdf

Ontario Ministry of Education (2016): Student Achievement Division. Culturally Responsive Pedagogy: Educator Mindset and Action.

Ontario Ministry of Education (2016): Student Achievement Division. Math Lives Here: Helping Social Justice Take Flight.

Steinhauer, Nancy (2016). **Practicum Summary Report**

CRRP, the Brain and Math: A (Co-terminus) Collaborative Inquiry for Principals and Teachers.