Title of proposal: Bringing Math to life. Example of Visual Art integration in Mathematics in intermediate grades

Name and affiliation: David Hung, Laurentian University

Email address: dhung@laurentian.ca

Presentation style: Remote

Clear description of the proposal objective and how it connects to one of the MACAS Conference topics: (Mathematical modelling and interdisciplinary for studying and learning mathematics)

In this presentation, I will share several examples of how mathematical modelling is used in real life. I will use one example to discuss how I have integrated Visual Arts into the teaching of Probability to grades 7 and 8 through the use a high-quality task. Pre-service teachers were introduced to this process of curriculum integration. This had a positive impact on their perception of math and of teaching it.

Connection with the Symposium 2025 theme: Circles of Resonance in Mathematics

This presentation aligns with the symposium's theme by demonstrating how the integration of one or more disciplines with the teaching and learning of mathematics can be refined and expanded over time. Each iteration of the task allows the math instructor to adapt and improve it, thereby engaging in a spiralling approach that builds on previous versions.

For example, a math instructor may begin with a task that integrates Visual Arts. After administering the task, they can revise it by incorporating additional Visual Arts concepts or by integrating another subject area. The task can also be adjusted to better align with the evolving goals of the lesson or the specific needs of the students.

Type of communication: Practical examples of interdisciplinary teaching and learning

Proposal:

Many students often say they dislike mathematics. Some find it difficult or boring, while others struggle to see its relevance or usefulness. This sentiment is not limited to students - many adults openly, and sometimes proudly, declare that, “I am not a math person,” “I was never good at math,” or “I am just like my parents - they never liked math either.” Yet mathematics remains a compulsory subject in most, if not all, school curricula worldwide.

In their Principles and Standards for School Mathematics (PSSM) (2000), the National Council of Teachers of Mathematics (NCTM) notes that students should engage with mathematics that is relevant and meaningful to them. Similarly, the Ontario Ministry of Education encourages educators to implement high-impact instructional strategies in their classrooms. Students are more engaged and perform better when math is taught through real-world and using meaningful tasks (Boaler, 2015; Liljedahl, 2016, 2019).

In Ontario, around 82% of elementary teachers completed post-secondary education in areas unrelated to mathematics (EQAO, 2017), whereas in the US, this figure is around 78% (Forgione, 1999). Many teachers teaching elementary grades have insufficient mathematical knowledge to teach all children (Ball, 1990; Blomeke, Suhk, & Kaiser, 2011; Hill, Ball, & Schilling, 2008; Ma, 1999; Marshall & Sorto, 2012) and they often find it challenging to assist students when they need help (Hill, Rowan, & Ball, 2005; Marshall & Sorto, 2012).

An effective approach to teaching math is to integrate it with other subjects. While it is not uncommon to see math integrated with science or physical education, it can also be integrated with the Arts. Even though the two subjects may seem quite different with Math being more scientific and logical, and the Arts being more open to different interpretations, the two subjects can, nonetheless, be successfully integrated. Stemming from a socio-constructivist perspective where the teacher is the crafter of learning activities and a facilitator rather than ‘a sage on the stage’, the teacher plays a significant role in student learning and achievement (NMAP, 2008).

In this presentation, I will discuss how I integrated the arts in my math classroom as a former teacher. I will present an example of a high quality task (Doyle, 1988) that integrated visual arts with probability in grades 7 and 8 (ages 13-15). Through this task, students learn probability alongside visual arts, thereby increasing the possibility of a higher level of engagement as some students may like math while

other may like art better. Pre-service teachers were introduced to the notion of high-quality tasks, curriculum integration, making math relevant and meaningful, and using real-life examples. Then, they had the opportunity to apply what they learned by designing such task during their math course. The pre-service teachers kept a math portfolio in which they documented their learning. They also wrote an overall reflection about their math journey at the end of the course. I will share their attitude towards math before and after the course, and referencing the effect of what they learned about curriculum integration, and high quality tasks that are meaningful and real life on them.

References:

- Boaler, J. (2015). Mathematical mindsets: Unleashing students' potential through creative math, inspiring messages and innovative teaching. John Wiley & Sons.

- Forgione, P. (1999). Teacher quality in the United States: Data on preparation and qualifications.

- Liljedahl, P. (2016). Building thinking classrooms: Conditions for problem solving. In P. Felmer, J. Kilpatrick, & E. Pekhonen (eds.), Posing and Solving Mathematical Problems: Advances and New Perspectives. New York, NY: Springer.

- Liljedahl, P. (2019). Conditions for supporting problem solving: Vertical non-permanent surfaces. In Mathematical problem solving (pp. 289-310). Springer, Cham.

- National Council of Teachers of Mathematics (NCTM) (2000). Principles and Standards for School Mathematics. Reston, VA: NCTM.

- National Mathematics Advisory Panel (2008). Foundations for Success: The final report of the National Mathematics Advisory Panel. Washington, DC: USDOE