

GREATER ESSEX COUNTY DISTRICT SCHOOL BOARD

Supporting All Mathematics Learners through Responsive Learning Environments

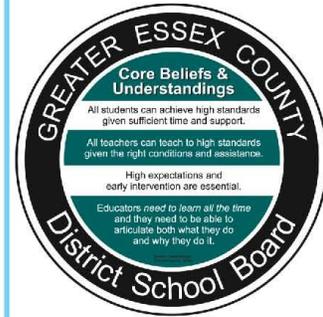
The GECD SB has high expectations for all learners. We understand that learners come with diverse strengths, needs and interests. It is critical that we close the achievement gaps and meet the needs of all learners. Through a responsive mathematics learning environment, we can create equitable learning contexts and significantly impact student achievement. The GECD SB believes that we can design learning environments that are supportive, enriching and responsive to the uniqueness of our students.

The Greater Essex County District School Board provides mathematics education that engages and empowers students through collaboration, communication, inquiry, critical thinking, and problem-solving, to support each student's learning and nurture a positive attitude towards mathematics.

GECD SB, A Vision for Mathematics, 2016

The purpose of these learning briefs is to share the research, discussion and insight garnered from the intensive work of the Greater Essex County District School Board's Math Task Force. These papers are rooted in the GECD SB core beliefs, the Full-Day Early Learning—Kindergarten program and the Ontario Mathematics Curricula for grades 1-8, 9-10, and 11 & 12. The briefs are meant to elevate, enrich and extend the discourse of mathematics education with the intention of encouraging a positive and productive disposition toward mathematics for all learners.

Each paper provides a list of sources to extend the professional conversation and enhance the learning. In addition, live links appear at the end of the papers with connections to various resources.





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SUPPORTING ALL MATHEMATICS LEARNERS THROUGH RESPONSIVE LEARNING ENVIRONMENTS

The core beliefs of the Greater Essex County District School Board express the heart of teaching and learning. Our beliefs define our action, set our direction and determine our success. The GECDSB believes that “all children can achieve high standards given sufficient time and support.” When we carefully examine the dimensions of “time and support” we are led to an understanding of the critical role that mathematics learning environments play in supporting all learners.

Understanding Achievement Gaps

Achievement gap is a widely used term which refers to the discrepancy in academic achievement of identifiable groups of students. *Learning for All: A Guide to Effective Assessment and Instruction for All Students (2013)* is an Ontario Ministry of Education publication which guides and supports school and system planning by addressing effective means of reaching all learners. It states:

Gaps in achievement can be measured in terms of various factors, such as gender, ethnocultural background, socio-economic status, special education needs, language proficiency, or number of credits accumulated by the end of a particular grade. Achievement gaps can also be defined according to combinations of these factors, such as gender and special education needs, or gender and socio-economic status, or ethnocultural background and credit accumulation by year and grade. (p. 11)

Research suggests that background influences, specifically socio-economic status and parental involvement, play an important role in student achievement (Learning for All, 2013). These factors influence student *readiness to learn* and these levels of readiness are genuine realities of every classroom. Research also suggests that learning environments which are safe, supportive and meet the needs of students are a means of creating equitable

contexts and have a significant impact on student achievement (Jensen, 1998; Marzano, 2003).

Certainly there are conditions over which educators have limited control. Our efforts are best applied, however, to those factors over which we do have significant influence. We can explicitly and methodically design learning environments that are supportive, enriching and responsive to the uniqueness of our students.

Effective mathematics teaching supports learning according to the differentiated needs of the student. In order to support *all* learners, researchers insist that the learning environment must match the needs, strengths and readiness of each student. In order to overcome the disparities in achievement, we must address *learning gaps*, which is a term “often used to refer to the gap between a student’s actual achievement and his or her potential for achievement” (Learning for All, 2013). Our responsibility is to address these learning gaps with precision and intentionality.

Building Responsive Learning Environments

A learning environment includes the physical and social contexts in which students learn. These settings have a profound impact on the experiences of the learner. The Literacy and Numeracy Secretariat (2012) states that a responsive learning environment encompasses the physical and social-emotional environment which include such elements as student voice, collaborations, focus on solutions, real-world problem solving, and self-efficacy. The Department for Education and Skills in the UK explains that the learning environment is made up of three factors that overlap and impact each other: ethos, behaviours and routines, and the physical environment. Hannah (2013) identifies that the learning environment is affected by physical elements, emotional elements, and intangible elements such as the energy of the classroom, rules and sounds. Fraser (2012) defines the learning environment as

"the social, psychological, and pedagogical contexts in which learning occurs and which affects student achievement and attitudes."

Based on the literature, it can be surmised that a responsive learning environment includes three realms: the Physical Realm, the Social and Emotional Realm, and the Choice and Voice Realm (Figure 1).

When considering the Physical Realm, educators look at the space of the classroom that promotes collaboration through group work as well as the space that permits quiet thinking and exploring of math. Active areas for inquiry, investigation and wonder are also considered to be part of the Physical Realm. When students are involved in the process of creating their own learning environment they can develop a sense of community and increased motivation.

When educators work to foster the Social and Emotional Realm, students feel safer to take risks in math class so that they can make mistakes while trying new ideas and strategies. Students also feel safer to revise their ideas and develop new mathematical understandings. When students feel supported by educators, they develop a more positive attitude towards math. Students feel they learn better in a "togetherness" learning environment that provides them with a sense of community. Furthermore, when students have more opportunities to independently explore and inquire, they feel more connected to the classroom community. In these classrooms, students not only hold more positive attitudes toward math, but they demonstrate higher achievement in math (Yang, 2015).

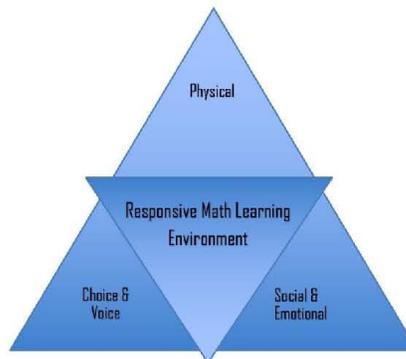
Students need to feel they have a "choice and voice" in their learning. The Choice and Voice Realm is key in creating a responsive math learning environment that encourages diverse thinking perspectives and ideas that are valued as ways to deepen mathematical understanding. Students have choice in exploring mathematics by choosing tasks, tools, methods, and partners. Students need to engage in tasks that challenge their

current understandings and therefore have multiple entry points to meet the needs (Suurtamm, Quigly, & Lazarus, 201; Boaler, 2015).

An effective mathematics learning environment is determined by many factors and is influenced by all levels of educational organizations. Thus, decisions at all levels and by all stakeholders must take heed of the impact of these on the learning environment.

Each and every school day our classrooms are filled with students who bring the uniqueness of their individual stories to their learning. Each and every day we work together to write the pages of these stories. Planning these settings with purpose and intentionality is one way in which we can constructively shape the success of the stories our students will tell.

Figure 1



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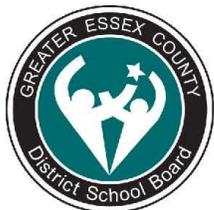
Students have choice in exploring mathematics by choosing tasks, tools, methods, and partners.





Greater Essex County District
School Board
451 Park Street West
P.O. Box 210
Windsor, ON
N9A 6K1

Phone: 519-255-3200
www.publicboard.ca



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LINKS

Guides to Effective Instruction
http://www.edugains.ca/newsite/math/guides_effective_instruction.html

The Third Teacher
http://www.edugains.ca/resources/LNS/Monographs/CapacityBuildingSeries/CBS_ThirdTeacher.pdf

Describing an Effective Learning Environment
<http://www.edugains.ca/newsite/math/learningenvironments.html>