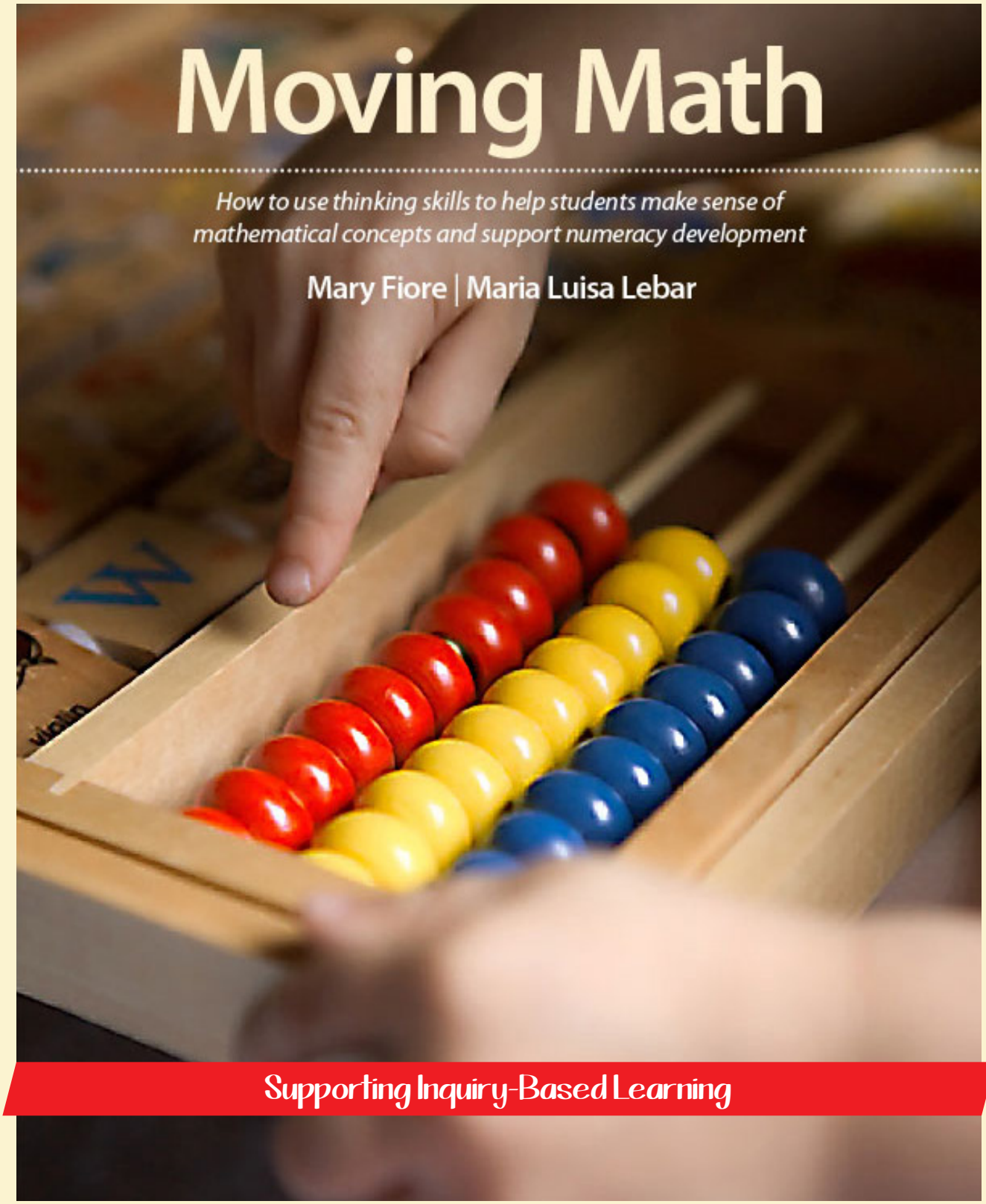
FRIDAY FREEBIE



Supporting Inquiry-Based Learning

"Inquiry . . . requires more than simply answering questions or getting a right answer. It espouses investigation, exploration, search, quest, research, pursuit, and study. It is enhanced by involvement with a community of learners, each learning from the other in social interaction."
— Kuhlthau, Maniotes, and Caspari (2007, 2)

Although we touched upon inquiry-based learning when we addressed the attributes of learning experiences to support sense making, we feel the need to elaborate further. We think it is worthwhile to explore inquiry-based learning as a process used to *collaborate*, *communicate*, *critically think*, *create*, and develop *character* attributes. Watt and Colyer state, "learning through inquiry is both a teaching method and a skill for students that harnesses natural curiosity and wonder" (2014, 2). Using inquiry as a mindset empowers students to ask questions about their wonderings; think about solutions to problems; use a variety of learning materials; construct knowledge through multi-modalities, including visual, auditory, kinesthetic, or tactile; create products for a particular audience and purpose; and represent learning and thinking in multiple ways. Students have opportunities to navigate and evaluate information from a variety of sources presented through two- and three-dimensional landscapes. They can also engage in different types of inquiries depending on the purpose. Daniels and Ahmed (2015) refer to mini-inquiries, curricular inquiries, literature circle inquiries, and open inquiries. Watt and Colyer (2014) talk about inquiry variations, including open, guided, and blended.

Regardless of the type of inquiry, developing any inquiry with students incorporates a repertoire of skills and strategies. There is, however, a predominant emphasis on promoting the universal elements of thought (Watt and Colyer 2014). Students need to learn to think for different purposes and from diverse perspectives which, through questioning, becomes the driving force of powerful inquiry and the catalyst of inquiry-based learning. As students become effective questioners, they develop as critical and creative thinkers while engaging in the inquiry process: exploring, investigating, discovering, solving problems, and making interpretations. They learn to analyze and assess the validity and credibility of information and draw conclusions about the data "based on concepts and theories" (Watt and Colyer 2014, 55).

To nurture curiosity in our students, we need to harness their potential to ask thought-provoking questions. We can do so by creating learning spaces that invite discovery, engagement, exploration, and investigation.

> Feeding students endless content to remember is akin to repeatedly stepping on the brakes in a vehicle that is, unfortunately, already at rest. Instead, students need questions to turn on their intellectual engines and they need to generate questions from our questions to get their thinking to go somewhere. Thinking is of no use unless it goes somewhere, and again, the questions we ask determine where our thinking goes. (Watt and Colyer 2014, 41)

"Inquiry-based learning requires considerable amounts of analytical thinking, which may pose challenges for many students. We can't just ask students to 'think harder' — we need to describe explicitly what good thinking involves, and encourage students to think about their own thinking even when we are not there."
— Watt and Colyer (2014, 54)

Inquiry-based learning fosters the mindset needed for today's collaborative learning spaces. The conditions required to develop and engage in inquiries are flexible, fluid, adaptive, and shaped by the students. As consumers and creators of information, students use integrated skills — reading, writing, listening, talking, viewing, and representing among them — to think, express, and reflect while developing competencies to take active part in society. As they make deci-

sions about how to learn in environments influenced by their needs, strengths, learning styles, and wonderings, they are developing identities as learners and building a sense of self-efficacy.

Ready to Go Deeper with Thinking Skills

Now that we have set the context, we will get ready to go deeper with the cross-disciplinary thinking skills in an effort to describe explicitly what the process of thinking involves. We will present learning experiences that allow for sense making of mathematical concepts and skills, with clearly outlined learning intentions and success criteria linked to the Bigger ideas. The learning intentions will make clear to teachers what we want students to learn for that learning experience, so that students understand the learning intentions and what the process of thinking looks like (Hattie 2012). The success criteria will help teachers identify successful attainment of the learning intentions and allow students to engage in the learning confidently.

"We must not make the mistake of making success criteria related merely to completing the activity or a lesson having been engaging and enjoyable; instead, the major role is to get students engaged in and enjoying the challenge of learning. It is challenge that keeps us investing in pursuing goals and committed to achieving goals."
— John Hattie (2012, 51)

The featured meaningful learning experiences to be presented have the following characteristics. They invoke appropriate challenges that engage the students' commitment to invest in learning; they are designed to build students' confidence to attain the learning intentions; they are based on appropriately high expectations of outcomes for students; they lead to students having goals to support further wonderings; and they have learning intentions and success criteria intended to be explicitly known by the students (Hattie 2012). Authentic student solutions are incorporated, and evidence of successful learning is highlighted.

Overview of Thinking Skills and Bigger Ideas

Thinking Skills	Bigger Ideas
Inferring and interpreting	• To make meaning and reach an interpretation involves identifying stated and implied information and ideas. • To draw meaning from explicit and implicit information requires use of prior knowledge and experiences. • Interpreting information and drawing a conclusion about it involves the use of reasoning to think about evidence, both stated and implied.
Making connections	• Understanding of texts, information, concepts, procedures, and skills is deepened through the use of prior knowledge, experiences, and opinions. • Deeper meaning of concepts and skills is gained when relationships are identified and how they support understanding can be explained. • Understanding is extended by comparing and contrasting information and ideas to one's own knowledge and experiences.
Analyzing	• Information can be broken down by identifying the parts of elements, and describing their purpose and function and how they contribute to meaning. • Determining how the parts or elements are connected to one another can be achieved by classifying, comparing, and contrasting information and ideas. • Inferring the relationship between the parts relies on using evidence to support generalizations, conclusions, and assumptions.
Evaluating	• Forming and defending opinions requires making judgments about information and ideas. • Reasons for an informed decision can be justified through the use of established criteria that help determine the validity and quality of information and ideas. • Assessing something's effectiveness involves using a set of criteria to draw conclusions about information, evidence, and ideas.
Synthesizing	• Combining and integrating ideas will lead to the creation of a new understanding. • Current understanding evolves and changes as more information and experiences are acquired. • Identifying when an understanding shifts and changes supports reasoning and proving.

Reasoning and proving	• Conclusions for a justification are drawn from inferring hypotheses and making conjectures. • Justifying one's thinking requires providing evidence that is reasonable and valid — that is, effective. • Being able to explain why conclusions and arguments are logical depends on evaluating the validity of proof.
Reflecting	• Thinking about one's own thought processes to acquire a deeper understanding of concepts allows monitoring of one's learning. • Analyzing and evaluating strategies used to improve learning enable assessment of one's understanding. • Thinking about how to expand knowledge or extend ability to make connections and gain understanding allows one to transfer learning to new contexts.