

Inspirations from Reggio Emilia for a STEM Infused Environment



Presented by Vicki Bartolini

Creating a Reggio-Inspired STEM Environment for Young Children



Vicki Carper Bartolini

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Three Parts to My Talk:

1. A quick look at the Big Picture of Early Care and Education and STEM

2. Lessons Learned From Reggio



3. Six Elements from Reggio to consider in setting up the STEM environment

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Part 1 -The BIG PICTURE

This is your moment!

You have the leverage!

Society views your work as essential!

Breaking Down the Early Childhood Crisis — and What Might Be Done About It



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Early Care and Education professionals have the **power** if, as Carlina Rinaldi encourages, we find the **courage** to act to ensure:

- Accessibility
- Affordability
- High Quality
- Joyful and wondrous learning opportunities



FOR ALL CHILDREN

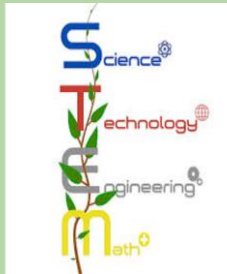
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STEM LITERACY is more important than ever in the 21st Century

For example:

- Using data to make informed decisions
- Understanding the impact of our cyber connectedness
- Taking care of our planet

Society needs STEM literate citizens and professionals for the public good.



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Political Hot Button

January 2022: *Evaluating the Effectiveness of Tennessee's Voluntary Pre-K Program*

By the end of sixth grade, the state pre-K cohort fared worse than the non-pre-K group, both academically and behaviorally. (2900 children)

Farran's hypothesis: "These programs steer toward an academic framework that focuses on basic skills like knowing letters and numbers instead of on child development strategies such as *exploring learning through interaction* and lots of outdoor play. There's too much focus on group instruction and rigid behavioral controls, according to Farran. Even discussion during "story time" is generally limited to questions with a single "right" answer, *instead of engaging children to think more deeply.*"

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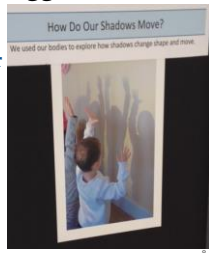
Classic Reggio studies involve STEM

- Carnival for the Birds
- How to Make a Rainbow
- The Theater Curtain Study
- The Portrait of the Lion

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Part 2: Lessons Learned from Reggio

1. The Environment as the Third Teacher
2. The Teacher as Co-Researcher
3. Teachers Promote the 6 Cs
4. Teachers Lead by Example



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Lesson 1: The Environment as the Third Teacher

The intentional design:

- fosters encounters, relationships, the 6Cs
- spurs surprise, wonder, curiosity, discussion and further study
- provokes questions that evolve into investigations
- allows studies to unfold over time
- attends to the careful selection of materials



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Lesson 2: Teachers as Co Researchers

Together they make observations, gather information, analyze the data, propose solutions and reflect on their new learning.

Viewing the children as competent and capable the teachers trust that children can sustain their engagement with complex, child generated topics over a period of time.

Practicing the pedagogy of listening, Reggio educators support inquiry based learning or research - or project based learning.

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Lesson 3: Teachers Promote the 6 Cs

Communication

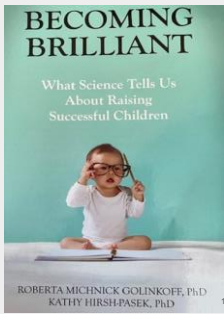
Collaboration

Cooperation

Creativity

Critical Thinking

Confidence Building



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Lesson 4: Teachers Lead by Example

And our expectations of the child must be very flexible and varied. We must be able to be amazed and to enjoy, like the children often do. We must be able to catch the ball that the children throw us, and toss it back to them in a way that makes the children want to continue the game with us, developing, perhaps, other games as we go along.

Tiziana Filippini, pedagoga and former director of The Documentation and Research Centre, Reggio Emilia, quoted in *The Hundred Languages of Children*, 3rd ed.

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Part 3:

Six Elements to consider to promote a wondrous, joyful, and playful inquiry-based STEM learning environment

3 Case studies - a glimpse into their journeys

Elizabeth Amen Nursery School, Wheaton College, MA (private)

Local Self-Help Head Start program (federally funded- income criteria)

Anchorage Park Kindergarten Program, NZ (public funding)

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but first, What is STEM in the early childhood setting?

- **exploring** water and sand
- **comparing and contrasting** natural materials (rocks/ soil)
- **experimenting with rolling** balls down the ramp
- **observing** insect legs through a magnifying glass
- **computing** with a friend
- **tinkering** with simple machines, gears, wheels, pulleys
- **designing and testing** structures, systems, solutions

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STEM is also

- **using senses** to determine attributes
- **describing** using content rich vocabulary
- **making patterns, constructing & deconstructing** with "loose parts"
- **estimating and measuring** while cooking or building
- **sorting and categorizing** shapes and natural materials
- **problem solving**
- **recording and analyzing data**

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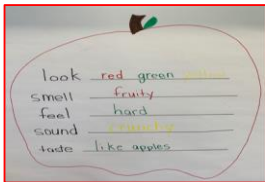
Element 1:
Messages and Values
in the
STEM Environment

What is your philosophy?



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TASTING APPLES		NEW	OLD
NICK	☺	☺	☺
ELLA	☺	☺	☺
BROGAN	☺	☺	☺
KELSEY	☺	☺	☺
HAZEL	☺	☺	☺
ROBY	☺	☺	☺
CHARLOTTE	☺	☺	☺
MILLIE	☺	☺	☺

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Charts and graphs support, capture, reflect and celebrate the children's learning during their investigations. Encouraged to analyze their data, comparing and contrasting, drawing conclusions - children develop their competence in critical thinking.

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Outdoor investigations message **respect** for the natural world.

Children take **responsibility** for planning, preparing, planting, observing growth, tending, harvesting, composting and recording observations - all while engaged in the **6Cs**.



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Quiet intimate spaces, both indoors and out, message that children are **welcomed** to imagine, collaborate, reflect, and relax while playing with ideas, together or alone.

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STEM is not limited to a science center, table, windowsill, or shelf. Opportunities and materials are integrated throughout the setting. *Provocation and Inquiry are at the center of the curriculum.*



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Element 2

The Use of Time
In the
STEM Environment

“An environment is a living changing system. More than the physical space, it includes the way time is structured.”

Lella Gandini in *The Hundred Languages of Children*, 3rd. ed.

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Amen teachers start the day by **carving out time** for their study of the “**magical woods.**”

Children use their senses to make observations (light & shadows), collect data (bark, leaves, acorns, moss, feathers), record (drawings, photos, videos) and analyze data.

While investigating the life cycles of plants, animals and insects, they also enjoy their read-aloud sitting in the shade under the trees.



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Head Start teachers carve out flexible time for playful explorations during a required curriculum study on trees, wood, lumber and constructions.

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The Director states that "It's essential to have time to connect with the child. . . . if a child wants your time, they are entitled to that time - for help, support, advice or celebration. *What's more important?*"

An essential aspect of time is "recognizing, responding and capturing the moments to celebrate the wonder, excitement and learning of the children."

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Element 3

The Use of Space

In the

STEM Environment

"... educators in Reggio Emilia speak of space as a 'container' that favors social interaction, exploration, and learning, but they also see space as having educational 'content'"

(Gandini cites Filippini's observations in The Third Edition The Hundred Languages of Children, 2012, pg.320)

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Self Assess - How might you or your staff:

- Vary the levels of challenge and complexity (Pisha and Spencer)
- Declutter and reorganize
- Assure accessibility
- Identify creative and flexible space options
- Bring the outdoors in
- Bring the indoors out
- Collaborate with colleagues to achieve your goals

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The Head Start Director notes that "Space is a challengeBut after 2 years of study, "STEM is no longer marginalized - it is all around - even in dramatic play. Children have the opportunity to explore the physical properties of liquids at the water table with funnels, tubes, gutters and measuring cups, or they engage with engineering design challenges with nearby magnetic tiles.

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With the help of local Eagle Scouts, Head Start converted a tight outdoor space to a more inviting setting by adding raised beds, a bench, and a greenhouse for their study of plants. The children conducted life cycle studies - planting their own seeds, tending their seedlings, and observing the growth of their plants.

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“Who owns the space?”

The APK director notes that decisions are made by “*looking at space from a child’s eye*”—considering the competencies of children, how children learn, recognizing what children need, asking what makes sense and what will support children in learning”



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Some outdoor spaces are relatively big and open, allowing for STEM investigations with large loose parts including tires, lumber, and old tractor parts.



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Former Amen “Playground”



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Transformed Amen "Outdoor Classroom"



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Element 4

Aesthetics In the STEM Environment

Reggio educators in recent years have been communicating in ever stronger ways their commitment to the aesthetic values of beauty, harmony, and order, as a way of knowing for children.

Carolyn Edwards, Lella Gandini, and George Forman, "Final Reflections and Guiding Strategies for Teaching" in *The Hundred Languages of Children*, 3rd ed

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Amen teachers acknowledge that attention to aesthetics is primarily reflected in the beauty of nature as can be seen in their new outdoor classroom, pond studies, visits to the apple orchard, and investigations into the "magical woods."

But they are beginning to question the aesthetics of their indoor classrooms.

- Are we stereotyping with our color choices?
- How can we include more natural items such as baskets, wooden trays, pebbles, feathers, shells, etc.?
- How can we store our materials in a more enticing way and for easier access by all of the children?

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At each turn at the APK, children stumble across *arrays of beautiful natural items*. Observing them closely, picking them up, turning them over, viewing them from different perspectives, using their senses raises lots of comments and questions.

- Where do these come from?
- Are they alive?
- Why are they smooth?
- What made the lines?

From these questions, the children and teachers agree on a line of investigation.

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These shallow wooden trays, aesthetically appealing to the eye, feature sections to order materials for counting, sorting, patterning, constructing, and inventing.

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Element 5

Materials and Themes

In the

STEM Environment

"The materials should be rich and varied. They should create a multi-sensory setting . . . which changes over a period of time (wood, stone, flowers, fabrics) or remain unchanged (glass, steel)." Italian architect Michele Zini

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Carefully chosen materials invite children's...

curiosity...

wonder and delight...

bewilderment...

manipulation, careful

observation & conversation...

and...

promote investigations.



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Giving children opportunities to play with inexpensive, everyday objects encourages them to use these processes to make discoveries about their physical world. In fact, many twenty-first-century companies look for employees who can similarly play with new ideas, use their imaginations, think outside the box, take risks, and make mistakes - employees who exhibit the 6Cs, playfully confident as they grapple with others over a design challenge. In this same playful manner, children study mirrors, reflections, shadows and light.

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Head Start documentation captures the joyful investigations children made as they studied clothing, fabrics, sewing, body mechanics and exercise. 43

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STEM Investigations

Everyday materials

Cotton, wool, silk, polyester, tie-dye

Button, zippers, hooks, velcro

Counting, sorting, matching, patterning

Design and function

How sewing machines work

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Architectural Study



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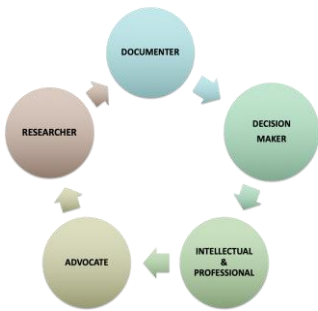
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Element 6

Teacher's Role
In the
STEM Environment

"As Malguzzi stated, 'Your image of the child: Where teaching begins'"
Edwards in The Hundred Languages of Children, Third Ed

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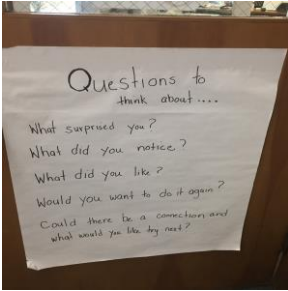


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As the STEM environment evolves, teachers consider:

- The pedagogy of listening
- Documentation
- Their own background knowledge
- Early reading and writing opportunities through STEM investigations
- The importance of their modeling of curiosity, surprise, confusion, wonder
- Advocating on behalf of children's right to a wondrous inquiry based, playful STEM learning environment where the 6Cs abound

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Open-ended questions promote children's critical thinking.

They also spur further investigation.

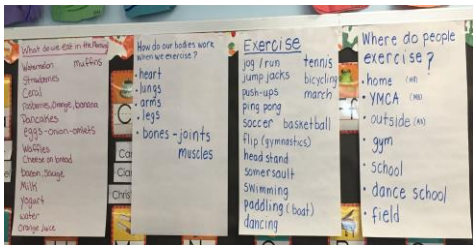
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Amen director notes that collaboration about documentation, although challenging at first, encourages *teachers'* *critical thinking* about children's learning.

She also notes that their professional discussions *reflect the 6Cs* as teachers communicate, collaborate, think critically about rich STEM content

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Endless opportunities abound for children's acquisition of vocabulary associated with STEM studies.

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The importance of teachers modeling wonder



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The metaphor is that of a *journey into unknown territory* where a compass is the most useful instrument.

The feelings belong to the children: curiosity, wonder, enthusiasm for the unknown. The courage necessary for this journey lies in the courage to choose, to make mistakes, and to be uncertain.

Carolina Rinaldi, "Staff Reflections in Reggio Emilia," in *Reflections on the Reggio Emilia Approach*



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Websites and Apps

- Reggio Children: www.reggiochildren.it/en
- North American Reggio Emilia Alliance: www.reggioalliance.org/narea
- Alliance for Childhood: <https://allianceforchildhood.org>
- **TRUCE (Teachers Resisting Unhealthy Children's Development): www.truceteachers.org
- Videative Series: <https://videatives.com/company>
- EIE (Engineering Is Elementary): www.eie.org/stem-curricula/engineering-grades-prek-8/wee-engineer
- Education Development Center (EDC): www.edc.org
- KinderLab Robotics: <https://kinderlabrobotics.com>
- Engaging Children in STEM: <http://resourcesforearlylearning.org/educators/module/20/16>
- GOLD Documentation by Teaching Strategies: <https://teachingstrategies.com/solutions/assess/gold>
- Preschool STEAM: <https://preschoolsteam.com/science-activities-preschoolers>

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Thank You!

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