Department of Early Education and Care

Agenda for Morning

- Welcome & Introductions
- Hundred Acre School – A STEM Focused Preschool Program
- Licensing & QRIS in Massachusetts
- EEC and Why We Believe Promoting Early Childhood STEM is Good for Children
- List of STEM Preschool Resources
- Q&A Opportunity

Hundred Acre School

What is STEM?

www.bostonchildrensmuseum.org/sites/default/files/pdfs/STEMGuide.pdf

Science is a way of thinking.
Science is observing and experimenting, making predictions, sharing discoveries, asking questions, and wondering how things work.

Engineering is a way of doing.
Engineering is solving problems, using a variety of materials, designing and creating, and building things that work.

Technology is a way of doing.
Technology is using tools, being inventive, identifying problems, and making things work.

Math is a way of measuring.
Math is sequencing (1, 2, 3, 4...), patterning (1, 2, 1, 2, 1, 2...), and exploring shapes (triangle, square, circle), volume (holds more or less), and size (bigger, less than).

What are the benefits of teaching with a STEM focus?

- Creates connections with other learning domains.

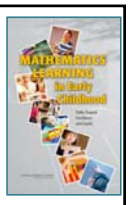
- Introduces sophisticated language and provides a context for using new vocabulary.
- Promotes children's curiosity and wonder provides and opportunities to ask questions, experiment, and make discoveries.

What the research says:

- "**ScienceStart!** offers research-based early childhood *Curriculum, Lesson Plans* and *Activities* that use children's curiosity to support learning **Language**, **Literacy**, **Mathematics** and **Science**!"
- "Research funded by grants awarded to the University of Rochester by the National Science Foundation and the US Department of Education shows that children in **ScienceStart!** classrooms make statistically significant gains on a variety of measures of language and literacy development, develop a rich knowledge-base, and develop discourse skills and science process skills that are important for school success."

- http://literasci.com (Formerly Science Start)

What the research says:



- "Improvements in early childhood mathematics education can provide young children with the foundational educational resources that are critical for school success. Furthermore, the increasing importance of science and technology in everyday life and for success in many careers highlights the need for a strong foundation in mathematics."
  - Mathematics Learning in Early Childhood: Paths Toward Excellence and Equity, National Academies Press

http://www.nap.edu/catalog.php?record_id=12519

What does intentional teaching and learning feel like? Why does it make an experience more powerful?

- HedBandz - Choose a card but **DO NOT** look!
- Find a partner
- Hold your card so your partner can see it – don't peek!
- You can each ask up to 5 questions to guess what's on your card.
- Once you've both asked 5 questions OR guessed what was on your card, have a seat.

Not all questions are created equal!

- **Ask Genuine Questions** –
  - What do you really want to know?
  - What do children want to talk about?
  - How can you help children make connections?
  - What will further your interaction and deepen your relationship?
- **Ask Reflective Questions**
  - Help children wonder, think deeper, consider multiple possibilities

Let's Play HedBanz AGAIN!!

- Select a new card – or continue with your previous one (remember don't look at it!)
- Ask your partner up to 5 questions!
- After you and your partner guess your cards, have a seat.

- Once you guess your cards, compare this round to the previous one.
  - What happened when you asked genuine questions?
  - What additional knowledge did you gain/share?

Research Shows Children Learn More When Teachers Wonder More & Instruct LESS

Bonawitz, E.B., Shafto, P.et al. (2011) The double-edged sword of pedagogy: Teaching limits children's spontaneous exploration and discovery. *Cognition, 120*(3), 322-330.

What do I want to try?

- "We don't learn from experience…we learn from reflecting on experience." – John Dewey

What does the environment look like?

- The materials and layout within the school as intentionally set up to welcome play and learning related to the early childhood standards.

Learning Center	Investigation Station
Circle	Hypothesis
Blocks	Engineering
Science	Ecology
Computers	Technology
Math	Mathematics
Puzzles & Manipulatives	Dissection
Dramatic Play	Demonstration
Library & Writing Center	Research
Cozy Area	Reflection
Art	Arts Laboratory
Sensory Table	Chemistry

Demonstration Station

- Allowing students to demonstrate skills or concepts in a authentic way.
- "Dramatic Play" in the bee hive.

Engineering Station

- A blocks area becomes an engineering station by allowing students to plan, build, and present their structures.

Let's explore perimeter too!

Remember outdoors is a fabulous place for STEM explorations!

Connections to QRIS and Licensing

Roles

- EEC Licensors
  - ❖ Regulations
- Program Quality Specialists
  - ❖ Assessment

Licensing

- Interactions:
- Educators must be responsive to children's individual needs and support the development of self-esteem, self-expression, autonomy, social competence, and school readiness.
- Educators must be nurturing and responsive to children
- Educators must support children in the development of self-esteem, independence, and self-regulation
- Educators must provide guidance to children in a positive and consistent way based on an understanding of the individual needs and development of children

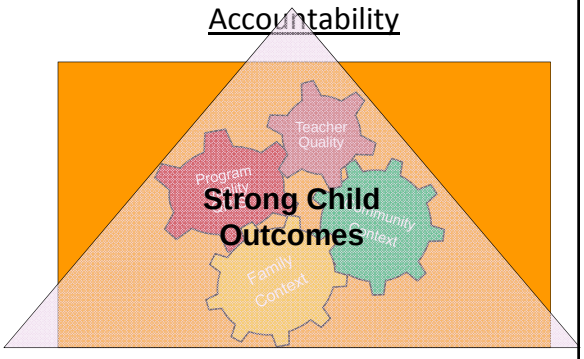
- Curriculum
- The licensee must provide a well-balanced curriculum of specific, planned learning experiences that support the social, emotional, physical, intellectual and language development of all children.
  - ✓ Include goals for the knowledge and skills to be acquired by children in the areas of English language arts, mathematics, science and technology/engineering, history and social science, comprehensive health, and the arts.
- The licensee must have evidence of a plan describing how program activities support and engage children through specific learning experiences
  - ✓ Opportunities for children to participate in a variety of creative activities, such as art, music, literature, dramatic play and science, encouraging exploration, experimentation and discovery
  - ✓ learning experiences that support problem solving, critical thinking, communication, language and literacy development, social skills and relationship building

Quantity Rating Improvement System

There are five standards in QRIS:

- **Standard 1: Curriculum and Learning**
- **Standard 2: Safe, Healthy Indoor and Outdoor Environments**
- **Standard 3: Workforce Qualifications and Professional Development**
- **Standard 4: Family and Community Engagement Standard**
- **Standard 5: Leadership, Management and Administration**

Standards, Assessment and Accountability



Over-arching Questions to Think About

What do "we" want children to know?

What do "we" want educators to know?

How do we build/encourage curiosity in children of all ages and stages of development?

What curriculum changes can occur? What resources are needed? What resources exist?

Infant and Toddler Guidelines Linkages to STEM

- Guideline: Cognitive Development
  - Develops memory skills; performs simple actions to make things happen and displays a beginning understanding of cause and effect
  - Develops problem solving skills
  - Explores materials and discovers mathematical concepts
  - Develops early scientific skills through exploration and discovery

Preschool Guidelines Linkages to STEM

- Guideline: Mathematics
  - Number Sense
  - Patterns & Relationships
  - Shapes & Spatial Sense
  - Measurement
  - Data Collection & Analysis
- Guideline: Science and Technology/Engineering
  - Inquiry Skills
  - Earth and Space Sciences
  - Life Sciences
  - Living Things & Their Environment
  - The Physical Sciences
  - Technology & Engineering
- Guideline: Health Education
  - Physical Development
  - Safety & Health Care

The MA Curriculum Frameworks and STEM

- Skills developed from birth to 5 through play and early language development are the foundation for success in STEM and in gaining meaning from curriculum.
- These skills are used in language arts and mathematics to varying degrees:
  - interpretation, analysis, evaluation,
  - explanation, description, organization,
  - comparison and contrast,
  - inquiry
  - symbolization and representation.

The MA Curriculum Frameworks and STEM

Offering intentional, systemic opportunities to develop and use these skills in peer and adult relationships provides the foundation for future growth

BUT

Most educators haven't had the opportunity to build systemic, intentional practice around these ideas.

STEM *provides engaging content for application of these skills and creates curiosity in children that can later develop into interest.*

Core Competency Linkages to STEM

- Area 4: Health, Safety and Nutrition
- Area 5: Learning Environments and Implementing Curriculum
- Area 6: Observation, Assessment, and Documentation
- Area 8: Professionalism and Leadership
- Area 1: Understanding the Growth and Development of Children and Youth
- Area 2: Guiding and Interacting with Children and Youth
- Area 3: Partnering with Families and Communities

QRIS Measurement Tools

Environment Rating Scale

- ECERS
- ITERS
- FCCERS
- SACERS

Teacher/Child Interactions:

- Arnett
- CLASS

EEC along with the ECE field and OST are Uniquely Positioned to Support STEM Education

- Children spend substantial time in ECE/OST settings
- Opportunities to offer extended STEM activities, such as project-based and experiential learning
- Educators are attuned to children's developmental needs and how to excite them about STEM learning
- Full year programs prevent 'summer learning loss' in all content areas

Program support

Children

- ✓ Materials and Tools
- ✓ Observation
- ✓ Communication

Staff

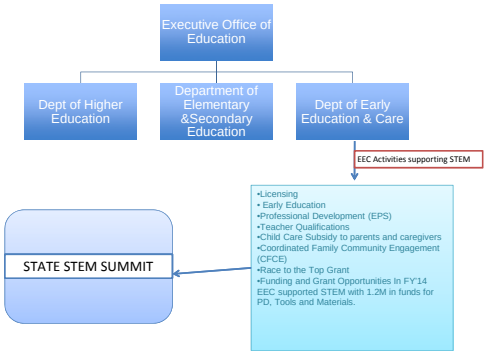
- ✓ Observation
- ✓ Evaluation
- ✓ Professional Development

EEC and STEM

Mass Audubon
Protecting the Nature of Massachusetts

SHED CHILDREN'S CAMPUS

All Under One Roof Supporting STEM



Brain Building In Progress

Build a STEM Foundation!
Curiosity
- Observation
- Interaction
- Language acquisition
- Problem solving

"a statewide, public-private partnership with the United Way to raise awareness of the importance of our youngest citizens' early development to their future success"
www.BrainBuildingInProgress.org

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http://www.youtube.com/watch?v=tZawNmpoXvI

Partnerships with Museums and State Library Associations and Community Natural Partners in Support of STEM

- Children's Librarians & Libraries
- Children's Museums
  - Discovery Museum
  - Worcester Eco-tarium
  - Boston Children's Museum
  - Boston Science Museum
- Mass Audubon Society
- Colleges and Universities
- Through CFCE Program 100 different communities across the state engaging with Families on STEM opportunities

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EEC Partnership with Museums and Libraries

- EEC is partnering with Boston Children's Museum to implement a statewide strategy to increase the capacity of museums and libraries to support the optimal development of all children through intentional family engagement activities and early learning opportunities.
- The partnership supports the development of a shared framework and set of resources focused on four areas: early literacy; school readiness, including preparation for Kindergarten; interest and awareness of STEM (Science, Technology, Engineering and Math)

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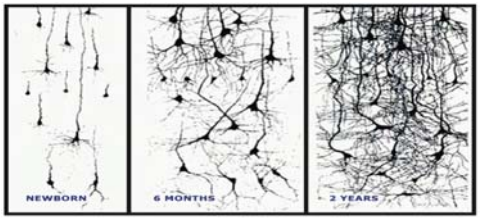
What the Science Tells Us About Child Development

- The brain's architecture is being built from the bottom up
- Early experiences literally shape the developing brain
- The early brain: building 700 neurons per second



Slide courtesy of Ready Nation *www.**readynation**.org*

Creating success, one step at a time

90% of brain growth occurs by age 5. Learning gaps appear as early as **9 months** of age. Disadvantaged children can come to school **18 months behind** and knowing **half** as many words.

One US study showed that if children start school ready to learn, they are **twice as likely** to read at grade level by age 8.

Another US study showed that if children read at grade level by age 8, they are **4 times** more likely to graduate from high school.

If US children graduate from high school, on average they will earn $500K more, live 9 years longer, and be 6 times less likely to be arrested.

Slide courtesy of Ready Nation *www.readynation.org*

EEC & DESE Develop STE Standards

- EEC adopts Pre-K Science, Technology and Engineering Standards in
- The Pre-K Science and Technology/Engineering Standards (STE) are based on the *Next Generation Science Standards.* The Pre-K (STE) standards for preschool children, ages 2 years and 9 months through 5 years old, are the highest quality early learning and development standards for young children that articulate multi-domain expectations for children's growth and support continuity in early education from birth through kindergarten.
- http://www.mass.gov/edu/docs/eec/2013/20131009-pk-sci-tech-standards.pdf

We Fund an Educator Provider SYSTEM which Supports STEM Learning Statewide for Early Educators

- EPS grantees support educators and programs through PD STEM based college and CEU course offerings;
- Engaging educators and programs in becoming STEM "ready" through coaching and mentoring opportunities;
- Assists programs and educators in upward progress in QRIS providing opportunities leading to acquiring new skills and knowledge in STEM related opportunities and teaching practice.

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EEC STEM Professional Development Opportunities Given by EEC EPS Grantees

- FY2012:
- 44 opportunities addressed STEM
- 42 opportunities addressed numeracy
- FY2013:
- 37 opportunities addressed STEM
- 28 opportunities addressed numeracy
- FY2014:
- 35 opportunities addressed STEM
- 25 opportunities addressed numeracy
- FY2015:
- 35 opportunities addressed STEM
- 25 opportunities addressed numeracy
- 29 opportunities aligned course content with PreK STE standards
- 450 educators representing 70 programs participated in a professional learning community around PreK STE standards (July 2014 - March 2015)

EEC Long Term STEM Goals

Quantitative Goals

1. Increase student interest in STEM
2. Increase STEM achievement among Prek-12
3. Increase students who are college STEM ready
4. Increase STEM degree attainment
5. Increase STEM classes led by effective educators
6. Align STEM education programs with the workforce needs

Qualitative Goals

1. Community Engagement
2. Academic Coherence
3. Educator Development
4. Better Student Outcomes
5. STEM Employers and STEM Professionals

Early Learning Plan: Qualitative Goals

Program Quality
- Intentional STEM integration in daily activities with students
- Increased STEM curiosity among students , staff, and parents
- Increased curriculum and instruction

Educator Development
- Increased teacher awareness and comfort level with STEM education
- Educators seeking STEM professional development opportunities

Screening & Assessment
- Increased comfort level with screening and assessment tools
- Increased comfort level with using data
- Enhanced instruction and curriculum adaptation to meet needs

Community Engagement
- Increased parent involvement related to STEM
- Increased exposure to STEM professionals and professions in the community
- Increased collaboration with larger community including public school

STEM Plan: Qualitative Goals

Community Engagement
- Parent STEM Education and Awareness
- Brain Building In Progress Campaign
- Connecting with public schools and the larger community
- Connecting with museums

Academic Coherence
- MA Curriculum Frameworks
- Preschool and Infant and Toddler Guidelines
- Science, Technology, Engineering Standards
- English Language Arts Standards
- Screening and Formal Assessment

Educator Development
- Curriculum and Instruction, development and interest
- Teacher comfort increase comfort level
- Teachers having the baseline knowledge to incorporate STEM into their practice

STEM Employers and STEM Professional
- Public/private partnerships and relationships
- Exposure to STEM professionals in your region or town

Links to interesting STEM related information

- EEC and WGBH TV STEM Resources- www.resourcesforearlylearning.org
- **http://www.mass.edu/stem/initiatives/otherstateearlycurricula.asp** (EEC STEM Curricular)
- Boston Public School Mathematics pilot
- http://bpsearlychildhood.weebly.com/index.html
- Hundred Acre School – www.100acreschool.org