Full STEAM Ahead: Exploring MDE's K–5 STEAM Framework

Sarah Carter | Education Consultant

DEPARTMENT OF EDUCATION

Minnesota Department of Education | education.mn.gov

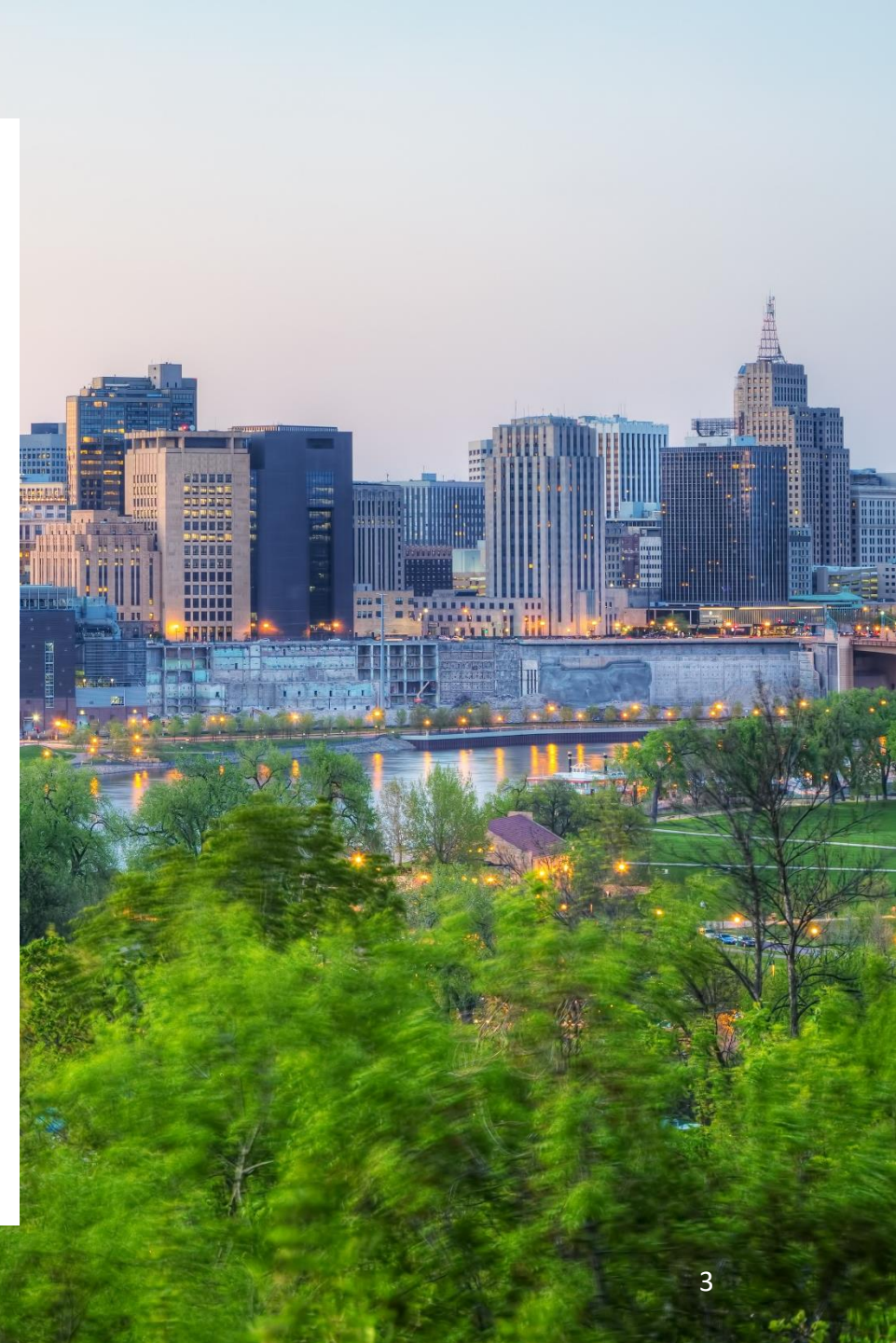# Ten Minnesota Commitments to Equity

1. Prioritize equity.

2. Start from within.

3. Measure what matters.

4. **Go local.**

5. Follow the money.

6. Start early.

7. Monitor implementation of standards.

8. Value people.

9. **Improve conditions for learning.**

10. **Give students options.**

Items 4, 9, and 10 are emphasized.
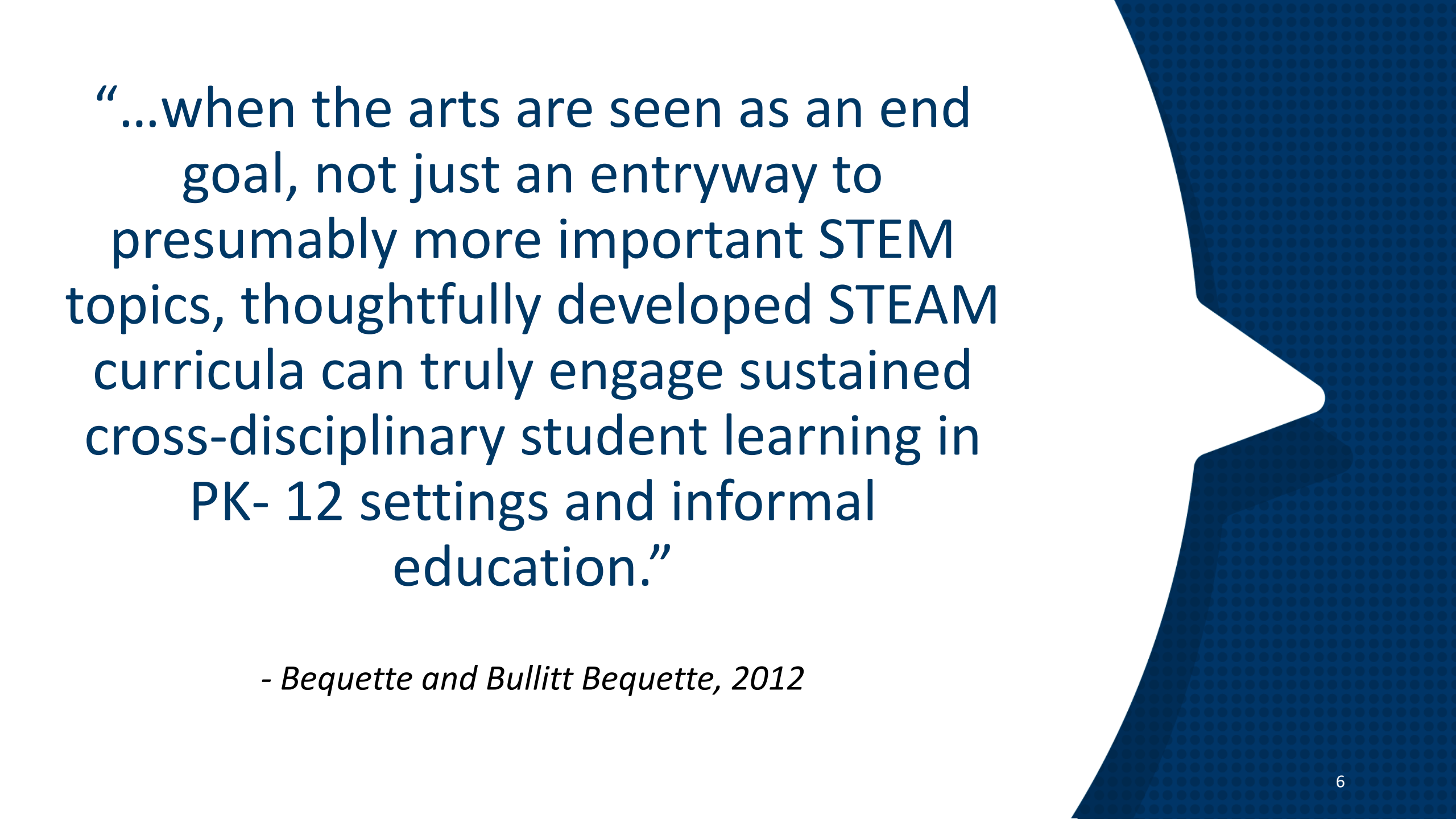
Objectives for the session

- Identify the benefits of integrating the arts into STEM education.

- Understand the structure and purpose of MDE's K–5 STEAM Framework.

- Experience a sample interdisciplinary STEAM activity.

When you hear STEAM what comes to mind?

- In integrated STEAM experiences, the arts emphasize **creativity, emotion, empathy, communication, critical thinking, and personal or cultural expression**.

- "Perspective, pattern, and perception and the attempt to understand, describe, and communicate reality..." guide all the content areas.

- Integrating the arts into STEM is more than just using visual art to communicate it is **intentionally integrating** foundational arts—whether it's visual arts, music, dance, theater, or media arts— concepts and processes.

"…when the arts are seen as an end goal, not just an entryway to presumably more important STEM topics, thoughtfully developed STEAM curricula can truly engage sustained cross-disciplinary student learning in PK- 12 settings and informal education."

- Bequette and Bullitt Bequette, 2012

" "Real" scientists, like "real" mathematicians have been moved and enlightened by the beauty and abstract nature of their explorations and discoveries in the natural universe in ways similar to those of probing artists."

- *Irene Plonczak and Susan Goetz Zwirn, 2015*

- Students might just be asked to color the bridge they build in a STEM lesson without talking about the choices they made or might talk about Leonardo da Vinci in an art lesson without considering his scientific work.

- STEAM lessons will take the place of arts instructional time.

- No collaboration with available arts teachers.

Purpose of K-5 STEAM Guidance

- A need expressed by teachers, school leaders, and parents.

- Serve as a model of what good STEAM integration could look like.

- Help address the limited time in K-5 classrooms for science and the arts.

- While no two STEAM programs will look the same, there are some fundamental aspects and components that quality K–5 STEAM programs share.

- Considerations

  - Complexity and Frequency of Integration

  - Building Blocks of STEAM Programs

- Features of High-Quality STEAM Instruction

- Features of High-Quality STEAM Programs

Complexity and Frequency of Integration

- Activities – Simple additions of content with a primary focus on increasing student engagement.

- Instructional Tool – Explicit instruction in the content area.

- Full Integration – Addressing and assessing standards in all involved content areas.

- Individual educators creating STEAM experiences

- STEAM specialists

- Community engagement

- Afterschool STEAM programming

Features of High-Quality STEAM Instruction

- Students are engaged in rich open-ended tasks or problems.

- Student voice and choice are prioritized in the planning and selection of STEAM experiences.

- Students explore connections between at least two STEAM content areas to gain greater understanding in both.

- Learning experiences are aligned to the Minnesota Academic Standards.

- Building-wide collaboration is prioritized.

- Students develop 21st century skills.

- STEAM experiences are developed in partnership with the community.

- Instructional strategies that support interdisciplinary learning for every student are used.

- Measures are taken to ensure safety.

- Learning experiences are connected to future career paths.

Hologram Art

- Observe the phenomenon

  - What do you notice?

  - What do you wonder?

- Draw a model that shows how the light is being reflected to create the "hologram."

Create your own hologram

- Think of an issue in your school or community you want other people to know about.

  - What is a symbol you could use to represent the issue?

- Open https://scratch.mit.edu/projects/1200124524

  - See inside.

  - Select a Scratch "sprite" that represents your issue

  - Copy the code into the new sprites

  - Test out your creation!

- How would you like your audience to interact with your art?

Science

- Model of the phenomenon – How well does the model illustrate the reflection that is happening?

  - 3P.1.2.1.1 Plan and conduct a controlled investigation to determine the effect of placing objects made with different materials in the path of a beam of light. (P: 3, CC: 2, CI: PS4)

Arts

- Hologram – How well does the hologram communicate the issue the student chose to address using media arts foundations (image, sound, space, motion, time and/or sequence)?

  - 2.3.2.3.1 Construct media arts content to communicate a purpose or idea, using elements of artistic foundations.

What elements of STEAM did you experience?

Turn and talk

Think about the content areas and/or the Features from the guidance.

Discussion

- How could you adapt STEAM in your school or classroom? If you already do STEAM are there areas you're working on improving?

- What opportunities or challenges might you face doing STEAM experiences in the classroom or school?

- What other resources do you need?

- Bequette, J. & Bullitt Bequette, M. (March 2012). *A place for art and design education in the STEM conversation.* Art Education. Vol. 65 (2).

- Plonczak, I. & Goetz Zwirn, S. (March 2015). *Understanding the art in science and the science in art through crosscutting concepts.* Science Scope. Vol 38 (7).

- [MDE's K-5 STEAM Guidance](#) (coming soon!)

References and Resources for Hologram Lesson

- [Institute for Arts Integration and STEAM lessons](#)

- [NySci Pepper's Ghost Illusion](#)

- [Handheld Hologram](#) from Mind Trekkers

- [Scratch Hologram Model Project](#)

- [Hologram video](#)

Thank You!

Sarah Carter

sarah.carter@state.mn.us