Math in Action

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Essential Question(s)

How can math concepts be supported in all content areas?

Summary

Participants will use provided data to construct a viable argument using mathematical reasoning. Participants will also explore ways to incorporate math strategies in other content areas to support math achievement.

Learning Goals

- Identify parallels between problem solving and logical reasoning in math and in other content areas.
- Examine math strategies that can reinforce math objectives in other subject areas.

Attachments

- Authentic Learning and Teaching—Math in Action.pdf
- Everyday Math—Math in Action.docx
- Everyday Math—Math in Action.pdf
- Football Statistics—Math in Action.docx
- Football Statistics—Math in Action.pdf
- Instructional Strategy Note Sheet—Math in Action.docx
- Instructional Strategy Note Sheet—Math in Action.pdf
- Presentation Slides—Math in Action.pptx

Materials

- Blank paper
- Pens or pencils
- Presentation Slides (attachment)
- Authentic Learning and Teaching (attached; 1 per participant)
- Football Statistics (attached; optional; 1 per participant)
- Everyday Math (attached; 1 per participant)
- Instructional Strategy Note Sheet (attached; 1 per participant)

Engage

Presenter's Note

Prepare copies of the Authentic Learning and Teaching rubric, one per participant. Make sure there is enough room in the meeting space for all participants to form a circle.

Use the attached **Presentation Slides** to facilitate the presentation.

Share the Agreement Circles instructional strategy with participants. Let them know you will be using this strategy to help assess their prior knowledge and how they feel about the topic to be addressed—something they can take back to their own classrooms if they so choose.

1. Begin by having participants form a circle.
2. Display **slide 4** then give participants 5-10 seconds of think time.
3. Ask participants to move to the center of the circle if they agree with the statement and stay on the outside if they disagree.
4. Match participants up 1:2, 1:3, 1:4, 1:5, or whatever the proportion of agree/disagree indicates; or allow the group in the middle and the group on the outside to take turns convincing each other. Give them a few minutes to defend their ideas in small groups.
5. Use the discussion to transition to the Learning Objectives on **slide 5**.

Presenter's Note

If no one moves to the middle of the circle, tell participants you hope that this session changes their minds about the feasibility of supporting math in other content areas. If everyone moves to the middle of the circle congratulate participants and tell them you hope to offer even more ways and strategies that add to their repertoire of supporting math.

Inform participants that the session will offer even more strategies to help them reinforce math content in other subject areas. Pass out copies of the **Authentic Learning and Teaching** rubric. Move to **slide 6** and introduce the two components of authenticity that this session will highlight. All components are featured to varying degrees, however, the two you will focus and reflect on are "value beyond school" and "student-centered learning."

Explore

Presenter's Note

Prepare copies of the football statistics for participants. You may choose to distribute the **Football Statistics** handout, which is a printer-friendly version of slide 9, or you can print out copies of slides 9 and 10 for participants.

Display **slide 7** and ask participants to use the prepared **Football Statistics** handout for this next activity.

Have participants partner up to answer the question "Who is the better team?" based on the data they have been given, their own prior knowledge, or the way in which they can manipulate said data. This activity reinforces logical thinking and construction of a reasoned argument, which are skills that can be easily transferred to other content areas.

- Have participants find Elbow Partners.
- Invite participants to construct viable arguments to address the essential questions.
- Ask participants to utilize the football statistics provided to support their arguments.

Move to **slide 8**. Have participants use the football statistics information for the two teams featured. For the OU vs. OSU football statistics provided (**slide 9**), you may find it helpful to include who each team played on the weeks that are listed (**slide 10**).

Differentiation

Optionally, to differentiate this activity, allow groups or participants to include other statistics, if they so choose. Both the handout and the slides are editable, so if you wish, you can compare different stats in your session that may be more relevant to your participants (e.g., comparing players, different teams). All session activities should still have the same format. Groups can also be encouraged to represent their conclusions in the way they think is most helpful to support their arguments.

Once groups have had ample time to pick a team with supporting evidence, change to **slide 11.** Have each group share out their conclusion and the reasoning to support their decision.

Explain

Change to **slide 12**. Review the content standards for math, science, social studies, and ELA. Then move forward to **slide 13** to ask the questions on the Reflection slide. Facilitate a discussion to point out that the activity just completed was based on logical thinking, reasoning, and supporting a claim, and that when educators are doing these types of skill building in their content areas, they are supporting the formation of that skill in math as well.

Change to **slide 14** and ask participants to use the **Authentic Learning and Teaching** rubric to decide which components of authenticity they saw demonstrated in the mini lesson.

Extend

Presenter's Note

Before beginning the following activity, print out copies of the attached **Everyday Math** handout for participants. Cut these handouts in half to create one card per participant.

Share **slide 15** and discuss with participants the things they might already do in their classes (either featured on the slide or additional activities) that support math in other content areas. Pass out the **Everyday Math** card and encourage them to write down any additional ideas that were discussed in the session. For instance, regarding the last idea listed on the slide (students do a basic mathematical calculation to find out what page number to turn to in their textbooks): Highlight the power of building number sense if everyone was using this technique in every class, every day.

Now that you have discussed general, everyday ideas to support math in other content areas, move the discussion to **slide 16**. Give specific content examples of how other content areas can incorporate math concepts in their own material. Ask for other examples that participants have done, seen, or heard.

Evaluate

To close the session, invite participants to reflect on what they learned using I Used to Think...But Now I Know. This strategy allows participants to apply the strategies discussed during the session to their own content areas and allows the session facilitators to check for understanding. It is used after instruction and asks participants to compare their ideas or thoughts from the beginning of a lesson to the ideas they have after completing the lesson.

Display **slide 17**. Ask participants to use blank pieces of paper or the backs of their Everyday Math cards to draw two columns. Have participants use this table to complete the I Used to Think . . . But Now I Know closing activity to answer the question: “How have your ideas about supporting math in all content areas changed (or become more detailed)?” Have them label the left column “I Used to Think” and the right column “Now I Know." Give participants 1-2 minutes to complete the charts, then ask for share outs.

Next, show them **slide 18** with the URLs for the K20 LEARN website homepage and instructional strategies search page. Make sure they are aware that there are many lessons on this site that support authentic instruction and that utilize some of the instructional strategies used in the session today, and also that they can access any of the K20 instructional strategies they experienced today, and many more, at the URL found on the slide.

Hand out the **Instructional Strategy Note Sheet** to aid participants in organizing their thoughts. Display **slide 19** and ask participants to reflect on the two instructional strategies covered in the session.

Follow-up Activities

Research Rationale

Not all teachers teach math, but all teachers can incorporate mathematical concepts (such as number sense) into their content areas. Doing so can greatly affect student understanding and skill (Höfer & Beckmann, 2009). Another important opportunity that can have a profound effect on student learning is the use of authentic instruction. Algebraic reasoning encourages students to reflect on their thinking and to share their experiences, and assists them in developing different ways of thinking about problems (Windsor, 2010). By allowing students to wrestle with complex problems while encouraging group participation and relating content to the real world, teachers can improve not only the mathematical achievement of their students but also their overall ability to think critically in other areas (Bell 2010).

Resources

- Bell, S. (2010). Project-based learning for the 21st century: Skills for the future. *The Clearing House*, 83(2), 39-43.
- Höfer, T., & Beckmann, A. (2009). Supporting mathematical literacy: Examples from a cross-curricular project. *ZDM*, 41(1-2), 223-230.
- K20 Center. (n.d.). Agreement circles. Strategies. https://learn.k20center.ou.edu/strategy/157
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- Windsor, W. (2010). *Algebraic thinking: A problem solving approach* [Paper presentation]. Mathematics Education Research Group of Australasia 33rd Annual Meeting, Fremantle, Western Australia.