

Low Floor, High Ceiling Experiences - Group Share

2024

What are your go-to sources for tasks for your classes?

- JIBLM (<https://www.jiblm.org/>)
- Art of Problem Solving (<https://artofproblemsolving.com/online>)
- Textbook
- jrmf.org
- MAA CRM/Textbooks
- Talks at MAA Mathfest
- MAA Connect
- Friends, PRIMUS
- Illustrative Mathematics curriculum
- Exeter secondary curriculum
- “Building Thinking Classrooms”
- NE COMMIT workshops and sessions
- “Math circle activities as a gateway into mathematics” journal or sigma.maa.org/mcst/JMM2023CIRCLES.htm
- Journal of Math Circles
- digitalcommons.cwu.edu/mathcirclesjournal/
- Social Media
 - Twitter, Bsky, facebook groups
- <https://ebme.zulipchat.com>
- Project Euler
- ... And many more!

Guiding Questions to Ask Self

Questions to consider as you decide to implement or adapt a task/experience may fall into these 5 dimensions.

Learning Goals	Audience	Entry Points	Scaffolds	Extensions/Ceiling

Learning Goals

- What are the learning goals of the activity/task/experience as it is written?
- If students don't *finish* the activity, what learning goals are possible for them to meet along the way?
- If students do *finish* the activity,
 - What learning goals are on the horizon that they could work toward, possibly with additional support?
 - How can I incentivize their further exploration of these horizon goals?
- If I adapt the activity/task (in X way), does it add further learning goals, or change my original goals?

Entry Points

- What are the entry points for the task? (or, How are students invited to begin to engage with the task?)
- Are there enough entry points for all students?
- Are the entry points all mathematical, or are there some other (experiential) entry points?
- Do I believe the entry points will promote the student experience I envision for the task?
- Will the entry points help lead to the mathematical learning objectives of the task?

Scaffolds

- What sort of scaffolding is built into the task?
- Will the scaffolds build to the anticipated mathematics, or just to continued engagement?
- Will the scaffolds help lead to the mathematical learning objectives of the task?
- What happens if we remove the scaffolds? Do the learning goals or expectations shift? (or, What is the role of each of the scaffolds?)
- What effect would further scaffolding provide - is it likely to promote the students' mathematical experience, or does it remove too much of the exploration?

Audience

- Will the entry points and scaffolds support all students, and support the student experience I have in mind?
- Is the task appropriate for my population? (i.e. the mathematical focus, the context, the learning goals, the entry points, the perceived ceiling)
- How do I believe my audience will experience this task?
 - What is the vision for how students will interact with the task, and how does the task, as written, support this vision?
 - What should I be doing while the students work to support the students' experience?

Extensions / Ceiling

- In what ways does the perceived ceiling of the task match my learning goals / my desired student experience?
- Are there extensions that should be added to the task, or are these “back pocket” extensions to use if needed?
- Do I believe the entry points and scaffolds will lead to my perceived ceiling? Is there a means for students to exceed that perceived ceiling, with continued exploration?
- As students experience the task, will I need to provide support to allow students to reach the perceived ceiling? Is this even desirable?

Task Prompt

Consider a circle, triangle, and square: In what order should you “inscribe” them so that you create the “best fit”?

Lauren, Julie, Joe

Copy this slide, replace the title of the slide with your group members' names, and discuss / record your ideas with your team in small groups; add slides as needed –

Audience – give definition of “inscribe”, options of what we mean by “best fit,” what kind of class are we looking at: elementary or middle school?

Prerequisite knowledge – basic geometric defs of regular polyhedra

Our adaptation – give tangible examples and

Jane Cushman, Helena Davenport, Mel Henriksen

Audience: First day of classes for Calculus
(or other mathematics class)

Use Geogebra; set a clear definition together
of what is “best fit”

Have quick intros of each other; then let
them start

Scaffold when needed

Goals: Establish a standard of active
learning and inquiry in the class

Bob, Lauren, Peter

Audience - Geometry

Prerequisite knowledge - definition of inscribe?

Our adaptation -

Learning Goals - properties of the shapes, understanding inscriptions / when they are possible, defining “best fit”?

Notes about student experience - Think we need to start with just two shapes: equilateral triangle and circle or square and triangle (and tell them what it means for square to be inscribed in a triangle).

Andrew, Andrew, Anne

Consider a circle, triangle, and square: In what order should you “inscribe” them so that you create the “best fit”?

- Audience - Geometry? Calculus II? Warm Up for any level class.
- Prerequisite knowledge - None! Just need to define “inscribe”
- **Our adaptation** - What does best fit mean? How wacky can the triangle be? Come up with a visual/tangible model (desmos, physical). After solving the problem, come up with a DIFFERENT definition of “best fit” and solve that problem.
- Learning Goals - Attend to definitions, Modeling (what is best fit), Jailbreaking the notion of area
- Notes about student experience -

Circle, Square, Triangle task adaptations

Copy this slide, replace the title of the slide with your group members' names, and discuss / record your ideas with your team in small groups; add slides as needed -

Audience - future HS teachers, geometry

Prerequisite knowledge - intuitive idea of tangency or inscribe

Our adaptation - provide circles

Learning Goals - stepping stone toward estimation of circle

Notes about student experience - nonequilateral triangles may or may not come up

Dana & Cathy

Audience - Students in geometry or education majors course, or participants in an outreach program

Prerequisite knowledge - what “inscribe” means, and some idea how to make sense of “best fit”?

Our adaptation - Giving a few pairs of one shape inscribed in the other and perhaps asking for computation of the area of one minus the area of the inscribed shape. Possibly scaffold by asking which is a better fit, the triangle in a circle, or square in a circle?

Learning Goals - How to approximate circles with polygons(?)

Notes about student experience -