

Leveraging Existing Tasks into Low-Floor, High-Ceiling Experiences

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Example (class for future teachers) – Learning Goal

Students will be able to ...

Use prime factorizations to determine how many factors a number has.

Example Task 1

Task: How many factors does a given integer have?

Entry Point: Brute force with familiar numbers, or prior knowledge about factors

Scaffolds: None built in, would have to be provided by the instructor in real time

(Possible) Ceiling: Finding the relationship to prime factorizations.

Example Task 2

Task: How many factors does 302400 have? Can you generalize to other numbers?

Entry Points: Brute force with familiar numbers, start factoring 302400, use divisibility rules

Scaffolds: The focus on a specific number, others would need to be provided by instructor in real time

Ceiling: The number of factors of 302400 or finding the relationship to prime factorizations.

Example Task 3

Task: I asked Chat GPT and it told me numbers written as $(\text{prime}_1)^2 \times (\text{prime}_2)^2$ have exactly 6 factors. I am skeptical, is it right? Can you generalize to other prime factorizations?

Entry Points: Checking numbers of the given form through example, finding numbers with 6 factors and their prime factorization.

Scaffolds: Starting with example of prime factorization.

Ceiling: The number of factors of $(\text{prime}_1)^2 \times (\text{prime}_2)^2$ or finding the general relationship to prime factorizations.

Example Task 4

Task: Place the numbers 1 through 25 in the table below based on their number of factors.

1 factor	2 factors	3 factors	4 factors	5 factors	6 factors	7 factors	8 factors
1	2 3	4					

Find the next number in each column and determine how a number gets into each column.

Determine the number of factors of each of the following:

(a) $2^3 \times 7^4 \times 11^2 \times 23$

(b) 1900

(c) 304200

Let's briefly discuss ...

- What circumstances might lead you to choose one version of the task over another?
- Are there any that are “close, but not quite right” for your audience? Why?
- How might students' experiences with one version of the task differ from another version?
- Do you perceive any of these to be low-floor, high-ceiling tasks? Why or why not?

Low Floor, High Ceiling ...

- Some tasks we may like to use (if they suit the day's goals) are **low-floor, high-ceiling**
- This is not necessarily synonymous with “open-ended” or other types of tasks that state a problem to be solved, with little other structure
- We can talk about taking any task (or the bones of a good task) and transforming it to have a **low-floor** and/or **high-ceiling**
- The task, as written, is not enough - we have to think more holistically about the whole **experience**

Here are some types of tasks we might start with

- What are some of your favorite sources to find new tasks?
Paste them in the chat! We will [start to compile a list here](#) in slide 2.
- We can source our tasks from these and other places, and get some great starts ... but ... the tasks may not suit the kind of **experience** we want our students to have, or the **learning goals** we have for our particular **population**

Ways that adapting tasks can happen

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Adapt a Textbook/Boring/Too Specific Task to be a low-floor, high-ceiling experience:

[Dan Meyer: Math class needs a makeover | TED Talk](#)

- Take out given information and make it a question where unknowns are not given or defined
 - Remove some scaffolding and let students come up with that on their own
 - Moving from pointing out specific observations to more general observations—allows more ownership by the students, shift focus from what does the instructor want to student ownership
- Could be adapting a non-rich task to be a rich task or shifting focus in the moment while working on a task
 - Could start with an existing task as it is, but expand the parameters or change the context so that you “raise the ceiling”

Ways that adapting tasks can happen

Transform a Provocative image or data into a task that aligns with specific learning goals.

Take a “homework-type” task, on paper, and adapt it to become a more meaningful experience for a team or group setting.

Ways that adapting tasks can happen

Adapt a too open ended task

- To meet specific learning goals
- To add scaffolding towards a learning goal
- To add an entry (low floor) for all students or raise the ceiling

Anecdotally new IBL practitioners may choose tasks that are too open ended and the outcomes could make them question their decision to use IBL

This form of task adaptation has gotten less mainstream attention and since this audience has an IBL background we decided to focus on this less considered form of task adaptation.

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?

All types of tasks have a place in our classrooms!

These Guiding Questions are not meant to imply that some types of tasks are “better”; the questions support us to make decisions about whatever type of task we want for a particular day or content! We make these decisions every day with different constraints and goals in mind

There’s a time and place for **all types of task**, and varied types of tasks will help support students in building the skills they need to be able to approach unfamiliar tasks.

If we focus on Learning Goals, Entry Points, Scaffolds, Audience, Extensions/Ceiling, we can take even a completely open-ended task and make it suit our population’s needs.

Your turn to think about adapting a task

We are going to give you a task that you **may** find too open-ended ...

In breakout rooms we would like you to consider the following as you adapt the task

- What are the learning goals of your adaptation?
- Who is the audience for your task?
- What prerequisite knowledge does the audience bring to your task?
- How will your audience interact with the task?

Task Prompt

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

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 -

Prerequisite knowledge -

Our adaptation -

Learning Goals -

Notes about student experience -

Share and Discuss

[Slides for teams](#)