Active Learning in Math as a Tool to Promote Equity

Kelly Spoon
Math Faculty
Mesa’s Online Success Team Member
San Diego Mesa College
What is active learning?

Type your definition of active learning in the chat.

You can reply and react to other posts! 👍🏻 💕
Students are actively engaging with the content through meaningful activities.
How does active learning promote equity?

Give your answers in the chat.

You can reply and react to other posts! 👍 💕
Okay I think I figured out the three phases of my career so far:

Kids, I want you to understand the brilliance of ...

1. MY ideas.
2. MATH ideas.
3. YOUR ideas.

How does this map onto your own teaching story?
Successful instruction starts with **student knowledge**, with whatever students know now.  – Dan Meyer
ACTIVE LEARNING FOR BELONGING
<table>
<thead>
<tr>
<th><strong>Include others as experts</strong></th>
<th>Create classroom environments that extend beyond the teacher as the sole authority to develop competence and confidence in others as experts, including the students themselves.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Be Critically Conscious</strong></td>
<td>Take the time to understand how negative stereotypes impact diverse learners and actively work to erase the effects of those negative stereotypes on the educational outcomes of marginalized students.</td>
</tr>
<tr>
<td><strong>Understand your students well</strong></td>
<td>Learn about your students, their families and their communities for the purpose of improving instruction (not making assumptions).</td>
</tr>
<tr>
<td><strong>Use Culturally relevant curricula</strong></td>
<td>Use instructional materials in ways that help students see themselves as doers of mathematics and help them overcome the negative stereotypes and messages regarding who is—and who isn’t—mathematically smart.</td>
</tr>
<tr>
<td><strong>Assess, Activate and build on prior knowledge</strong></td>
<td>Value the prior knowledge that students bring to the classroom, both personal and cultural, and leverage that knowledge as a resource for creating new knowledge.</td>
</tr>
<tr>
<td><strong>Release control</strong></td>
<td>Empower your students to take ownership of their learning by focusing on sensemaking and allow them to make choices about things that are important to them in the classroom.</td>
</tr>
<tr>
<td><strong>Expect more</strong></td>
<td>Hold high expectations for all students and avoid deficit views of diverse learners.</td>
</tr>
</tbody>
</table>
ACTIVE LEARNING FOR LEARNING
ACTIVE LEARNING FOR SOFT SKILLS
ACTIVE LEARNING FOR DIFFERENTIATION
Shared Notes + Q&A:

https://tinyurl.com/ActiveLearningMath
TODAY’S ROADMAP

**ON SITE**
Active learning options in a physical classroom

**SYNCHRONOUS**
Active learning options on Zoom

**ASYNCHRONOUS**
Active learning options on Canvas
BUILDING THINKING CLASSROOMS

Sketchnote by @wheeler_laura
VNPS

- Vertical Non-Permanent Surfaces
- Increased Knowledge Mobility
- Better Posture
- Improved Mood
- Increased Energy

Tips for VNPS Success

- Close not crowded
- One marker per group
- Thoughts written by someone else
- Hold members accountable to explain group’s thinking
- Different colour marker for the teacher
- Keep old/wrong thinking

Equity

- Increased reliance on each other instead of teacher
- Students do not feel anonymous when standing
- Opportunities for real-time differentiation
- New competencies emerge
- Skills developed: patience, communication, perseverance

Sketchnotes by A Klassen
Visibly Random Groups

Tips for VRG Success

- Needs to be visible
- Switch groups every hour/task
- No independent thinking time before collaborating
- Explicitly teach and give feedback on inclusive and effective collaboration

Equity

- Elimination of social barriers
- Willingness to collaborate
- More students do more thinking
- Knowledge comes from groups
- Puts students’ unbelievable capacity for empathy in motion

Sketchnotes by A Klassen
CARD SORTS
Hey, students!

Go to student.desmos.com and type in:

57N F7E
<table>
<thead>
<tr>
<th>TYPES OF CARD SORTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OPEN ENDED</strong></td>
</tr>
<tr>
<td>Free exploration highlighting what students notice.</td>
</tr>
<tr>
<td><strong>CATEGORIES</strong></td>
</tr>
<tr>
<td>Multiple representations, comparing &amp; contrasting.</td>
</tr>
<tr>
<td><strong>ORDERED</strong></td>
</tr>
<tr>
<td>Proofs and introducing difficult algorithms.</td>
</tr>
</tbody>
</table>
Do you have any other favorite active learning protocols for the physical classroom?
| THE ZOOM CLASSROOM |

ON SITE

Active learning options in a physical classroom

SYNCHRONOUS

Active learning options on Zoom

ASYNCHRONOUS

Active learning options on Canvas
Which one doesn’t belong?

A
- Joey
- white
- 5 kg
- no
- $9

B
- Classic
- silver
- 6.2 kg
- yes
- $13

C
- Molly
- black
- 3.3 kg
- no
- $25

D
- Elliot
- black
- 4.3 kg
- no
- $30
Which one doesn’t belong?

<table>
<thead>
<tr>
<th>$\frac{d}{dx}[e^{2x}]$</th>
<th>$\frac{d}{dx}[e^x \cdot e^x]$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{d}{dx}[e^x]$</td>
<td></td>
</tr>
<tr>
<td>$\frac{d}{dx}[\frac{e^x}{e^{-x}}]$</td>
<td>$\frac{d}{dx}[(e^2)^x]$</td>
</tr>
</tbody>
</table>

https://teacher.desmos.com/
Do you have any other favorite active learning protocols or tech tools for the Zoom classroom?
Taking It to Canvas

On Site

Active learning options in a physical classroom

Synchronous

Active learning options on Zoom

Asynchronous

Active learning options on Canvas
STRUCTURE

- Ignite
- Chunk
- Chew
- Review
Assumptions and Conditions

We can construct confidence intervals for $p$ if the following assumptions are satisfied:

1. The sampled values must be independent of one another.
2. If you have a survey, the sample should be a simple random sample. If the data comes from an experiment, subjects should have been randomly assigned to treatments.

Understanding Check

When constructing a confidence interval for a proportion or mean of a finite population, a condition is that the population size be at least 10 times the sample size. The reason for the condition is to ensure that

- the sampling method is not biased
- the degree of dependence among observations is negligible
- the sample standard deviation is a good approximation of the population standard deviation
- the sample size is large enough
- the central limit theorem is applicable

Check
Do you have any other favorite active learning protocols or tech tools for a Canvas classroom?
INSTRUCTIONAL MOVES

- Flipped classroom as a first step
- Explain motivation for activities
- Highlight student voice
THANK YOU

Kelly Spoon
kspoon@sdccd.edu
ADDITIONAL RESOURCES

- The Supportive Role of Active Learning in a Calculus Course on Low PreCalculus Proficiency Students
- Adventures in Corequisite Calculus Blog
- Which One Doesn't Belong