Ready to POP!
A Dynamic Approach to Spotting Mathematical Points of Promise in English Learners

Del Siegle, Susan Dulong Langley, & Talbot Hook
July 17, 2024
Confratute
Underrepresentation of gifted ELs

Little attention to EL mathematical thinking

(Coronado & Lewis, 2017; De Araujo et al., 2016; Gubbins et al., 2020; Mun et al., 2020; Siegle, 2020)
Goals

• Create dynamic ID approach
• Increase capacity for spotting EL/ML talent
• Increase EL/ML gifted referrals
Lessons to Elicit POP Behaviors

- Problem-based math tasks
- EL scaffolds
- Dynamic approach
  - Encourage
  - Elicit
Phase 1

Field Test Classrooms
EL Population
Phase 2

Starting 2025

State Partners

CO DOE
AZ DOE
TX TAGT
Research says...

• Linguistic and cultural considerations
• Measures
  • Multiple
  • Beyond standardized
  • Strength-based
  • Dynamic

NCRGE—Mun et al., 2020
Project EAGLE: Dynamic Approach

Feature
- Active
- Interactive
- Revealing
- Ongoing
- Culturally Responsive

Benefit
- Tasks not tests
- Teacher, student, and peers
- Student process and thinking
- Beyond the lesson
- Different approaches and ways of knowing

(Sternberg, 2002; Tzuriel, 2018)
Agenda

Introduction to Project EAGLE

Points of Promise

Behaviors that POP!
- Eliciting
- Spotting

Cultural and Linguistic Considerations
Why Points of Promise?

• Foster and spot mathematical talent
  • Research-based
  • Expert advisory board

• Utilize a checklist
  • Any indication of behavior is acknowledged
  • Behaviors “POP” out
<table>
<thead>
<tr>
<th>Teacher Language</th>
<th>Student Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is motivated and persists in solving difficult math problems.</td>
<td>1. I enjoy working on math and continuing to try to find the answer even when the problems are difficult.</td>
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<td>6. Makes inferences based on logical reasoning.</td>
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<td>9. Displays spatial abilities.</td>
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“I am thinking mathematically when...”

1. I enjoy working on math and continuing to try to find the answer even when the problems are difficult.

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4. I try many different strategies to solve math problems.

5. I think of unique ways to solve math problems and new problems to solve.

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### Activity

Sort the sub-behaviors according to each POP.

Each POP has 2-4 sub-behaviors.

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Additional notes:
- Mentally manipulates an object without physically touching it
- Uses mental computations easily
- Can think a few steps ahead
- Picks up concepts quickly
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- Mentally manipulates an object without physically touching it.
- Can think a few steps ahead.
- Picks up concepts quickly.
- Uses mental computations easily.
• Identifies situations where math might be useful
• Connects mathematical concepts to personally meaningful experiences
• Recognizes patterns in phenomena or experiences
3. Applies mathematical concepts to real-world situations

I relate the math we are learning to everyday life outside of math class.

• Identifies real-world problems where math might be useful
• Connects mathematical concepts to personally meaningful experiences
• Recognizes patterns in real-world phenomena or experiences
• Student moves on when making mistakes
• Makes meaningful, sustained progress on a challenging task
• Is curious, intrigued or interested by math
• Persistence of effort
• Student moves on when making mistakes
• Makes meaningful, sustained progress on a challenging task
• Is curious, intrigued or interested by math
• Persistence of effort

1. Is motivated and persists in solving complex math problems

I enjoy working on math and continuing to try to find the answer even when the problems are difficult.
• Changes strategies to a more efficient approach, as needed
• Restructures a problem to find a more workable form
• Changes strategies to a more efficient approach, as needed

• Restructures a problem to find a more workable form

I try many different strategies to solve math problems.
perimeter

the measure of the distance around the outside of an enclosed shape
- Draws inferences from recognizing patterns
- Recognizes and uses patterns to solve problems
- Groups multiple pieces of information together
7. Organizes information in a variety of ways to discover mathematical patterns

- Draws inferences from recognizing patterns
- Recognizes and uses patterns to solve problems
- Groups multiple pieces of information together

I recognize patterns in math and use them to organize information.
• Generates unique questions or problems to solve
• Devises a novel approach or strategy for solving a problem
5. Demonstrates original ways of approaching math problems

I think of unique ways to solve math problems and new problems to solve.

• Generates unique questions or problems to solve
• Devises a novel approach or strategy for solving a problem
• Demonstrates an understanding of and can represent place value
• Uses mental computations easily
• Uses appropriate numerical operations intuitively
• Compares and orders large numbers or fractions easily
• Demonstrates an understanding of and can represent place value
• Uses mental computations easily
• Uses appropriate numerical operations intuitively
• Compares and orders large numbers or fractions easily

8. Demonstrates a strong number sense

I understand and use relationships between numbers to order, compare, and estimate.
So because the rule changes, then you can get different numbers each time.
• Sees connections between new material and past material
• Connects ideas to other broader concepts
• Makes relationships between different mathematical ideas
• Picks up concept quickly
• Sees connections between new material and past material
• Connects ideas to other broader concepts
• Makes relationships between different mathematical ideas
• Picks up concept quickly

2. Learns new concepts easily by making connections

I connect what I am learning to what I have learned before in math.
Activity

- Draw the dining room on the grid. Name one side of the square. One side of the dining room is 2 m.
- Find the missing side of the square. Use the Pythagorean theorem.

Turn and talk.
What is the missing side of the square?
How did you find it?
• Mentally manipulates an object without physically touching it
• Solves problems using spatial representations
• Composes an object from component parts
9. Displays spatial abilities

- Mentally manipulates an object without physically touching it
- Solves problems using spatial representations
- Composes an object from component parts

I can figure out how shapes fit together in different ways.
• Draws logical conclusions from key ideas
• Generalizes based on specific examples
• Can think a few steps ahead
• Utilizes relational thinking
6. Makes inferences based on logical reasoning

I use logical reasoning to make sense of math problems and determine what to do next.

• Draws logical conclusions from key ideas
• Generalizes based on specific examples
• Can think a few steps ahead
• Utilizes relational thinking
Can I just, we know that that equals twelve.
1. Is motivated and persists in solving difficult math problems.

| Persistence of effort | Student continues on despite making mistakes | Makes meaningful, sustained progress on a challenging task | Is curious, intrigued by, or interested in math |

2. Learns new concepts in mathematics easily by making connections.

| Sees connections between new material and past material | Connects ideas to other concepts | Makes relationships between different mathematical ideas | Picks up concepts quickly |

3. Applies mathematical concepts to real-world situations.

| Identifies real-world problems where math might be useful | Connects mathematical concepts to personally meaningful experiences | Recognizes patterns in real world phenomena or experiences |

4. Shows flexibility in using a variety of thinking or problem-solving strategies.

| Changes strategies to a more efficient approach | Restructures a problem to find a more workable form |

5. Demonstrates original ways of approaching math problems.

| Generates unique questions or problems to solve | Devises a novel approach or strategy for solving a problem |


| Draws logical conclusions from key ideas | Generalizes based on specific examples | Can think a few steps ahead | Utilizes relational thinking |

7. Organizes information in a variety of ways to discover mathematical patterns.

| Draws inferences from recognizing patterns | Recognizes and uses patterns to solve problems | Groups multiple pieces of information together |

8. Demonstrates a strong number sense.

| Understands and can represent place value | Uses mental computations easily | Uses appropriate numerical operations intuitively | Compares and orders large numbers or fractions easily |


| Mentally manipulates an object without physically touching it | Solves problems using spatial representations | Composes an object from component parts |
## POP Checklist

<table>
<thead>
<tr>
<th>Points of Promise: Classroom Observation Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>identifygifted.education.uconn.edu</td>
</tr>
</tbody>
</table>

1. **Is motivated and persists in solving difficult math problems.**

2. **Leans new concepts in mathematics quickly by making connections.**

3. **Applies mathematical concepts to real-world situations.**

4. **Shows flexibility in using a variety of thinking or problem-solving strategies.**

5. **Demonstrates original ways of approaching math problems.**

6. **Makes inferences based on logical reasoning.**

7. **Organizes information in a variety of ways to discover mathematical patterns.**

8. **Demonstrates a strong number sense.**

9. **Displays spatial abilities.**

---

**Lesson:** | **Fraction Memory** | **Is It Worth It?** | **Keep Your Balance** | **Measuring Up** | **Date:** | **Time:**
---|---|---|---|---|---|---

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### Project EAGLE: POP Matrix

<table>
<thead>
<tr>
<th>Lesson</th>
<th>As a Rule</th>
<th>Fraction Memory</th>
<th>Is It Worth It?</th>
<th>Keep Your Balance</th>
<th>Measuring Up</th>
<th>Date</th>
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<tbody>
<tr>
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<td>2. New concepts in mathematics quickly by making connections: Connects to concepts or operations.</td>
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<td>3. Applies mathematical concepts to real-world situations: Applies math to own life or other situations.</td>
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<td>4. Shows flexibility in using a variety of thinking or problem-solving strategies: Changes conceptualization or strategies.</td>
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<td>7. Organizes information in a variety of ways to discover mathematical patterns: Strategic grouping, pattern spotting</td>
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<td>8. Demonstrates a strong number sense. Place value, operations, number fluency</td>
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Which POP do you think would be...

Easy to spot?

Challenging to spot?
Project EAGLE
Approach

Emphasis on encouraging participation and eliciting thinking to spot potential
Turn and Talk –
*Share a time from each column when you have had the chance to...*

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
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| • Encourage  
• Provide language supports  
• Model  
• Reassure  
• Teach in the moment  
• Provide a hint  
| • Determine understanding  
• Ask to justify  
• Ask to elaborate  
• Challenge to solve another way  
• Probe for deeper thinking  
• Seek connections in thinking  |
Project EAGLE’s Two-Step Dynamic Approach

IN

Encourage Participation

- Encourage
- Provide language supports
- Model
- Reassure
- Teach in the moment
- Provide a hint

OUT

Elicit Thinking

- Determine understanding
- Ask to justify
- Ask to elaborate
- Challenge to solve another way
- Probe for deeper thinking
- Seek connections in thinking

Student participation & thinking

(Adapted from Source: Lobato, 2015; Tzuriel, 2017)
Project EAGLE’s Two-Step Dynamic Approach

**GET THEM INVOLVED**

- Encourage Participation
  - Encourage
  - Provide language supports
  - Model
  - Reassure
  - Teach in the moment
  - Provide a hint

**FIND OUT THEIR THINKING**

- Elicit Thinking
  - Determine understanding
  - Ask to justify
  - Ask to elaborate
  - Challenge to solve another way
  - Probe for deeper thinking
  - Seek connections in thinking

(Student participation & thinking)
Project EAGLE’s Two-Step Dynamic Approach

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Elicit Thinking

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**Student participation & thinking**
From the teacher to the student

IN

Encourage Participation

• I – Inspire
  • emotional/affective supports
• N – Nudge
  • Task supports
IN: Continuum of Encouraging

Student is not yet engaging

- Language
- Directions
- Purpose
- Background

(Chaffey et al., 2013; Kazemi and Stipek, 2001; Lobato et al., 2005; Turner & Celedon-Pattichis, 2011)
IN: Continuum of Encouraging

Student is not yet engaging

- Language
- Directions
- Purpose
- Background

Inspire:
- Demonstrate significance of activity
- Build confidence
- Assure/reassure

Nudge:
- Clarify directions; purpose
- Model
- Remind them of similar info
- Make a connection
- Language supports
- Hint Cards
IN: Continuum of Encouraging

**Student is engaging**

- Communicating ideas in the current modality/choosing another
- Motivation to continue
- Support explaining thinking
**IN: Continuum of Encouraging**

*Inspire:*
- Errors as opportunities; part of the learning process
- Build confidence

*Nudge:*
- Provide other ways of showing thinking
- Sentence frames to support verbalization
- Encourage thinking extensions

**Student is engaging**
- Communicating ideas in the current modality/choosing another
- Motivation to continue
- Support explaining thinking
EL/ML supports

• Language
• Culture
# Language

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<th>How might this look in a lesson?</th>
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<td>Building background</td>
<td>Determine what information is needed and discuss</td>
<td>Show and discuss how lesson items work (e.g., balance scales).</td>
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<td>Student’s language level</td>
<td>Consult student records and EL/ML specialists</td>
<td>Simpler sentence structures when speaking; avoid/reduce figurative speech (metaphors, similes, idioms).</td>
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<td>Language support</td>
<td>Sentence starters or frames</td>
<td>I notice/wonder ______. The rule is ______. It is important because ______. An example is _____ because _____.</td>
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<td>Visuals and manipulatives</td>
<td>Provide pictures, videos, or actual items</td>
<td>Show pictures or videos of items referenced in lessons (e.g., show and discuss machines before demonstrating an input/output machine).</td>
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<td>Real-world examples</td>
<td>Connect or adapt the lesson to students’ lives</td>
<td>Ask students about machines they have seen and how they work.</td>
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<td>Vocabulary support</td>
<td>Word wall vocabulary with images</td>
<td>Introduce, discuss, and post word wall cards with definitions and images/examples of relevant terms (e.g., rule).</td>
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<td>Processing time</td>
<td>Build in wait time, allow peer-peer practice, let students draw/write before responding</td>
<td>Allow students to turn and talk with a partner to hear and practice responses.</td>
</tr>
<tr>
<td>Modalities of expression</td>
<td>Offer a range of options for answering questions</td>
<td>Include opportunities to speak, write, draw, or model with choices as often as possible.</td>
</tr>
<tr>
<td>What is needed?</td>
<td>What can I do?</td>
<td>How might this look in a lesson?</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Consider students’ cultures</td>
<td>Check lesson context that may/may not be ubiquitously known</td>
<td>Use soccer rather than basketball for math tasks.</td>
</tr>
<tr>
<td>Honor prior experience (Funds of Knowledge)</td>
<td>Tap into a student’s experiences</td>
<td>Relate a fraction task to recipes from students’ cuisine or calculate percentages from data relevant to students’ lived experiences.</td>
</tr>
<tr>
<td>Respect communication preferences</td>
<td>Check comfort with asking/answering questions.</td>
<td>Provide multiple pathways for individual versus collaborative work and answering to honor students’ preferences</td>
</tr>
<tr>
<td>Be mindful of body language and gestures</td>
<td>Check thumbs up, pointing, eye contact, etc.</td>
<td>Do not use thumbs up as a gesture of understanding/agreement if their culture finds it offensive.</td>
</tr>
</tbody>
</table>
Project EAGLE’s Two-Step Dynamic Approach

IN

Encourage Participation

Student processes & thinking

OUT

Elicit Thinking
Project EAGLE’s Two-Step Dynamic Approach

IN

Encourage Participation

Student processes & thinking

OUT

Elicit Thinking
Between Teacher and Student

OUT

Help students share **OUT** their thinking

- **O** – Orient – Where?
- **U** – Understand – Depth?
- **T** – Transfer – Breadth?

Adapted from Lobato et al., 2005
O-Orient
Finding where the student is in the process

• A sense of student thinking
• Start general and focus as needed

Eliciting in general: “Tell me about…”
For students who have a difficult time articulating, teacher might elicit more specifically:

“I notice you drew 4 circles. Tell me about that.”

(Franke, 2007; Hogan et al., 2000; Lobato et al., 2005; Turner and Celedon-Pattichis, 2011; Webb, 2009)
U-Understanding
Zooming in on student thinking

• Explain
• Justify
• Elaborate
• Decide
• Reflect

(Baroody, 2003; Franke, 2007; Hogan et al., 2000; Howe et al., 2020; Kazemi and Stipek (2001); Turner and Celedon-Pattichis, 2011; Webb, 2009)
T-Transfer
Delving for breadth

- Other mathematical concepts
- Other strategies
- Other situations

Baroody, 2003; Hogan et al., 2000; Lobato et al., 2005
Eliciting to draw out students’ thinking via...

• Images
• Ideas
• Strategies
• Conjectures
• Conceptions
• Ways of viewing mathematical situations

(Adapted from Lobato et al., 2005)
Eliciting thinking involves . . .

1. Allowing a student’s thinking to unfold.
2. Guiding a student’s use of tools.
3. Asking open-ended questions.

(Jacobs et al., 2014)
Project EAGLE’s Two-Step Dynamic Approach

IN

Encourage Participation

Student participation & thinking

OUT

Elicit Thinking
1. Alessia is at Level 1 EL. She is intently watching the lesson introduction but has written the word “Help” and a sad face on her white board to her turn-and-talk partner.

Is this an opportunity for the teacher to get them INvolved or find OUT their thinking?

Encourage Participation (IN)
- Inspire – Emotional/affective supports
- Nudge – Task supports

Elicit Thinking (OUT)
- Orient – Determine where a student is in the task.
- Understand – Zoom in on student thinking in the task.
- Transfer – Elicit for breadth of student thinking in the task.
1. Alessia is at Level 1 EL. She is intently watching the lesson introduction but has written the word “Help” and a sad face on her white board to her turn-and-talk partner.

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2. **Carlos** is working on the area and perimeter activity. He is getting the correct answers, but you do not see any work and are not sure how he got them.

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3. In *As a Rule*, **Anton** would not guess a rule in front of his group members. This was unusual for Anton who likes—and is good at—math. The teacher realized he was reluctant to guess as he could not be sure an accurate rule would be the “correct” rule.

Is this an opportunity for the teacher to get them **INvolved** or find **OUT** their thinking?

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3. In *As a Rule*, Anton would not guess a rule in front of his group members. This was unusual for Anton who likes—and is good at—math. The teacher could tell he had a guess, but he was reluctant to share as he could not be sure an accurate rule would be the “correct” rule.

**Encourage Participation (IN)**
- **Inspire** – Emotional/affective supports
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**Elicit Thinking (OUT)**
- **Orient** – Determine where a student is in the task.
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4. The teacher was not surprised to see Lucia excel at building the shapes in *Is It Worth It* but wondered how far her thinking could extend.

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Thank you!

projecteagle@uconn.edu
Project EAGLE Webpage
identifygifted.education.uconn.edu/

Contact
projecteagle@uconn.edu
Interested in sharing what your district does for subject-specific acceleration?

- The National Center for Research on Gifted Education is conducting a research study to document and disseminate information on how school districts implement subject acceleration. We would like to conduct online interviews (~ 1 hour) with knowledgeable administrators from school districts who have systematic procedures in place for subject acceleration. **Scan the QR code** or contact Catherine Little at catherine.little@uconn.edu to learn more.
Seeking schools interested in doing acceleration better?

NCRGE is seeking schools serving grades 2-5 interested in FREE PROFESSIONAL LEARNING OPPORTUNITIES and assistance in making acceleration decisions.

ncrge.uconn.edu/acceleration
You can assist in the creation of the new Renzulli Executive Functioning Scale

- Grade 4-8 students will assess their...
- ability to start tasks (e.g., I like starting new things),
- ability to stay on task (e.g., I finish what I start)
- organization (e.g., My desk is cleaned and organized)
- awareness of strengths and weaknesses (e.g., I know what I can do well)
- self-advocacy (e.g., I am not afraid to stand up for myself)
- ability to collaborate (e.g., I work well with others)
- awareness of ability to manage emotions (e.g., I can calm myself down when I am upset.)

Parents – s.uconn.edu/refs
Teachers – s.uconn.edu/renzulliscale
Links...

• This presentation https://identifygifted.education.uconn.edu/conference-presentations/ (coming soon)
• Project EAGLE https://identifygifted.education.uconn.edu/
• Renzulli Center for Creativity, Gifted Education, and Talent Development https://gifted.uconn.edu/
• Renzulli Center Events https://gifted.uconn.edu/events/
• Confratute https://confratute.uconn.edu/
• Renzulli Center Webinar Recordings https://gifted.uconn.edu/events-2021-22/
Project EAGLE

https://identifygifted.education.uconn.edu/

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