Unlocking STEM Futures

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Published by *K20 Center*

Time Frame 70 minutes

Essential Question(s)

How do we get students interested in STEM degree plans?

Summary

In this session, participants will consider the challenges that first-generation college students have with finding success in STEM programs. Participants will explore different types of interventions—representation, exposure, and coursework—and collaborate on ways to make a difference at their school for their students.

Learning Goals

Standards

InTASC Model Core Teaching Standards (K-12th)

2l: The teacher believes that all learners can achieve at high levels and persists in helping each learner reach his/her full potential.

Attachments

- Magnetic Statements—Unlocking STEM Futures.docx
- Magnetic Statements—Unlocking STEM Futures.pdf
- Making a Difference—Unlocking STEM Futures.docx
- Making a Difference—Unlocking STEM Futures.pdf
- Presentation Slides—Unlocking STEM Futures.pptx
- Spotlight STEM Success—Unlocking STEM Futures.docx
- Spotlight STEM Success—Unlocking STEM Futures.pdf

Materials

- Presentation Slides (attached)
- Magnetic Statements posters (attached; one set per session; print one-sided)
- Making a Difference handout (attached; one per participant; print one-sided)
- Spotlight STEM Success handout (attached; one per participant; print two-sided)
- Chart paper or giant sticky notes (three sheets)
- Markers (one per participant)

10 minutes

Engage

Use the attached **Presentation Slides** to guide the session. Display **slide 3** as participants enter the room. As the session begins, ask participants what comes to mind when they hear the term *first-generation*. Have participants discuss with others at their table for a few moments or ask volunteers to share their thoughts with the whole group.

Move to **slide 4** and share that the term "first-generation" can have different meanings, and for this session, you should be using first-generation to refer to students who do not have a parent or guardian who attended college.

Repeat this process again using **slides 5–6** for the term *STEM*. Help participants understand that this shared understanding of vocabulary is what should be used throughout the session.

Optional Digital Activity

If you would prefer a digital version of this activity, consider representing individual participants' responses with a word cloud using a tech tool like Slido or Mentimeter. This digital option is strongly recommended to add visual aid and engagement.

Transition through **slides 7–8** and introduce the essential question and learning objective.

20 minutes

Explore

Facilitator's Note: Activity Preparation

Hang the **Magnetic Statements** posters around the room before facilitating this portion of the activity.

Display **slide 9** and share the Magnetic Statements strategy with your participants. Read the statements around the room. Consider using the last page of the attached **Magnetic Statements** posters for quick reference. Instruct participants to choose the statement that most repels them.

After a couple of minutes or when participants have all gathered into groups, show **slide 10**. Tell participants they have five minutes to discuss within their groups the following prompts from the slide and select a spokesperson:

- Why did you choose this statement?
- What is one way it can be reversed, solved, or fixed?
- What is something we can do?

Start the 5-minute timer on the slide.

As time allows, ask volunteers to read their Magnetic Statement and share their group's response for one of the prompts.

- **Magnetic Statement 1:** "...First-generation college students were less likely to take the sort of rigorous math and science courses in high school that allow for a smoother transition into STEM majors." (Bettencourt et al., 2020, p. 768)
- **Magnetic Statement 2:** "...[First-generation college students] are less likely to know what careers are available to them, as well as what any particular job will include on a day-to-day basis..." (Coleman et al., 2025, p. 49)
- **Magnetic Statement 3:** "46% (13 of 28) of [first-generation college students] spoke of hidden expectations within STEM departments that shaped their perceptions of what students should know at the undergraduate level or how they should act as a STEM student." (Google et al., 2023, p. 13)
- **Magnetic Statement 4:** "Compared to continuing-generation students, first-generation students had significantly lower self-efficacy, emotional regulation, first-semester [college] GPA, and first-to-second year retention..." (Koh et al., 2022, p. 1078)
- **Magnetic Statement 5:** "...[First-generation college students] constitute 30% of undergraduate degrees..." (Marco-Bujosa et al., 2024, p. 906)

Time-Saving or Space-Saving Alternative

If you are presenting in a space that is limited on space, consider only printing the last page of the attached **Magnetic Statements** posters and distributing a copy to each participant instead of hanging the posters. This adjustment and modification to the activity during Explore would also decrease the amount of time needed to complete the activity.

20 minutes

Explain

Display **slide 11** and give each participant a copy of the attached **Making a Difference** handout. Explain the three ways educators can make a difference in their school(s): representation, exposure, and coursework.

Explain that representation makes a difference because when students can see people who look like them from similar backgrounds and circumstances thriving in STEM careers, they can envision more possibilities. Explain that representation sends the message to students that "this path is for me too."

Explain that exposure allows students to explore hands-on experiences like mentoring relationships, internships, and enrichment programs. These experiences give students a real taste of STEM in practice, building both skills and a sense of belonging that keeps them engaged. Lastly, when students have access to rigorous STEM coursework in high school, they arrive at postsecondary environments better prepared and more confident.

Move through **slides 12–14** and share the respective attributed information about representation, exposure, and coursework to share evidence that these interventions are transformative.

- **Slide 12:** When students completed assignments featuring a variety of scientists, first-generation students increased their ability to relate, which provided a stronger sense of belonging. (Metzger et al., 2023)
- **Slide 13:** Students with experiences in STEM during secondary school impact college STEM success. (Bettencourt et al., 2020)
- **Slide 14:** High school students who completed courses that were similar to the rigor of college-level courses were better prepared for STEM coursework. This preparation helped students finish challenging coursework despite obstacles. (Carver et al., 2017)

Move to **slide 15** and give each participant one copy of the attached **Spotlight STEM Success** handout. Explain the available resources for each intervention. Explain that the Spotlight STEM Success handout is a resource to support representation. Share that the handout offers ways that participants can showcase a variety of STEM professions throughout the school year.

Share that the STEM Challenge Curriculum collection and the College2Career Forum: How To Guide resource support exposure. Share that these resources engage students in hands-on, inquiry-based activities in the classroom with career professionals.

Share that the Power Up: Science ACT Prep and Power Up: Math ACT Prep resources support coursework; these are each 10-week lessons to integrate into existing science and math curriculum, respectively.

Facilitator's Note: Guiding the Activity

Direct participants' attention to the resources listed on their handout. If time allows, give participants time to explore those resources. If additional time is not available, encourage participants to later explore the resources in more detail.

15 minutes

Extend

Facilitator's Note: Activity Preparation

Hang the three sheets of chart paper labeled with “Representation,” “Exposure,” and “Coursework” around the room.

Display **slide 16** and introduce the Chalk Talk instructional strategy. Distribute a marker to each participant and preview the activity. Explain that they are to visit each of the three posters, labeled “Representation,” “Exposure,” and “Coursework.” At each poster, they should write ideas for actions they could take to support each intervention. When they are at a poster that already has ideas, they need to respond to others’ ideas, using words, drawings, etc., and add new ideas. As they visit the posters, they should remain silent, only representing their thoughts using their marker on the chart paper.

5 minutes

Evaluate

Display **slide 17** and share the What? So What? Now What? instructional strategy. Direct participants to write their responses to the following prompts on the back of their handout:

- What stood out to you regarding what you learned today?
- Why do you think first-generation college students need tailored supports?
- In what ways can you support first-generation college students interested in STEM degrees?

If time allows, invite volunteers to share their responses.

Research Rationale

Careers in science, technology, engineering, and mathematics (STEM) are increasing, and there is a need to develop and nurture STEM talents in the United States (Pearson et al., 2022). First-generation college students (FGCS) are significantly underrepresented in STEM fields; this disparity is driven by higher dropout rates and the burden of navigating unspoken departmental expectations that many are unprepared for without prior family guidance (Google et al., 2023; Marco-Bujosa et al., 2024; Peña et al., 2022; Riegle-Crumb et al., 2019). Prior to college, STEM experiences influence the selection of a major and can be a predictor of success in courses (Bettencourt et al., 2020). FGCS lack the social capital of their middle-to-upper-class peers and thus struggle in their college and career readiness experiences (Almeida et al., 2019). Research shows that representation of first-generation students helps to increase student achievement in coursework (Mowreader, 2023).

Resources

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