Postsecondary Teaching with Technology Collaborative

Beyond Engagement: Evidence-Based Strategies for Building Students' Learning Online

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Innovations Conference

Welcome!

Let’s see who is joining us today.

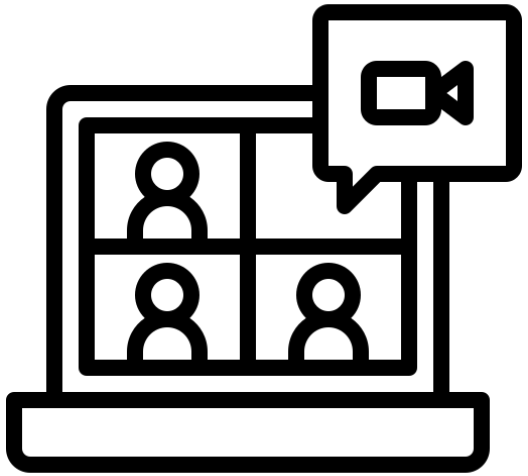
Slido.com Code: #1539707

In the poll, please share...

- What is your role?
- Do you have experience teaching online?
- What are you interested in learning about?

For today's session we will...

Provide an overview of the Collaborative



Discuss online STEM learning context and challenges

Share strategies to support self-directed learning skills & mindsets

Reflect and discuss as a group

Postsecondary Teaching with Technology Collaborative

An IES-funded research and capacity-building center that aims to study and improve how faculty **teach** and **use technology** to help students apply and strengthen **self-directed learning skills** to increase their success in online STEM courses.

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Teachers College, Columbia University

Achieving the Dream

Challenges in online learning

Research shows

Student outcomes are generally worse in online courses and degree programs than comparable face-to-face ones

In some cases, achievement gaps are wider in online environments

Key factors: Greater demands on students' self-directed learning capacities; need for belonging and community

(e.g., Jaggars & Xu, 2014; Xu & Xu, 2019)

Students face particular challenges in STEM learning

Environmental factors

Individual sink-or-swim culture

Content-heavy courses

Unclear personal relevance

Psychosocial factors

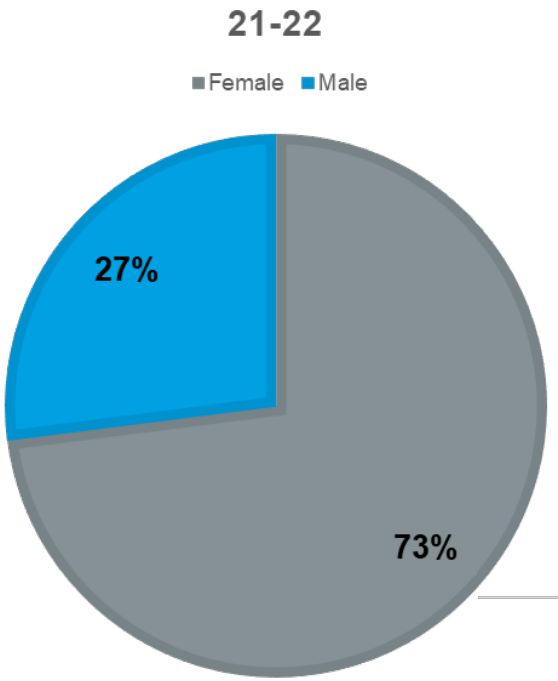
Belonging uncertainty

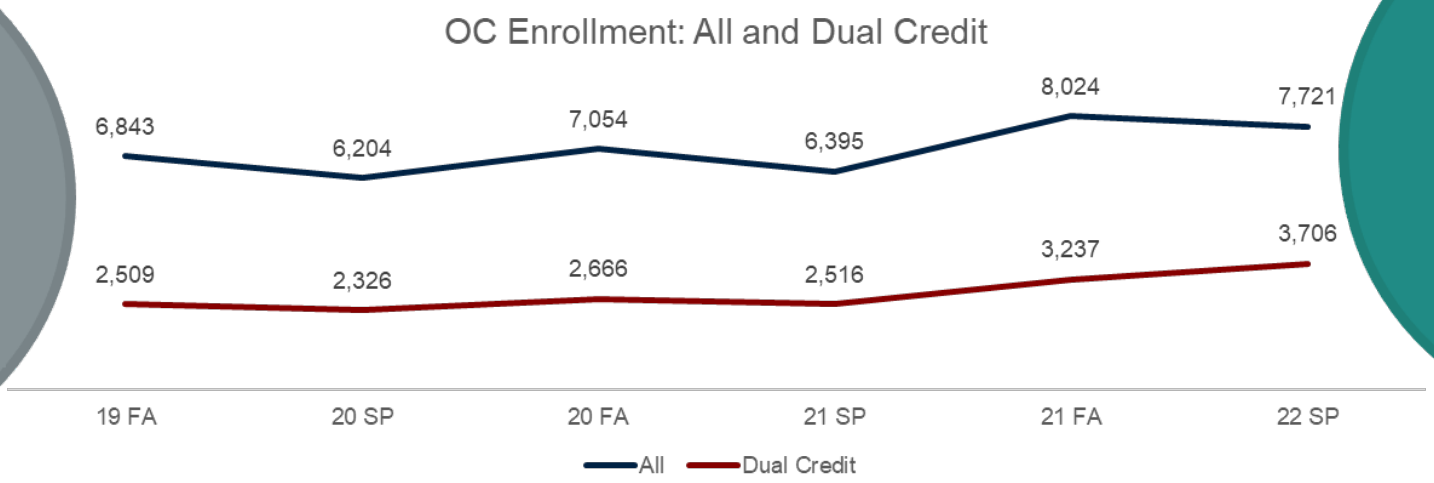
Stereotype threat

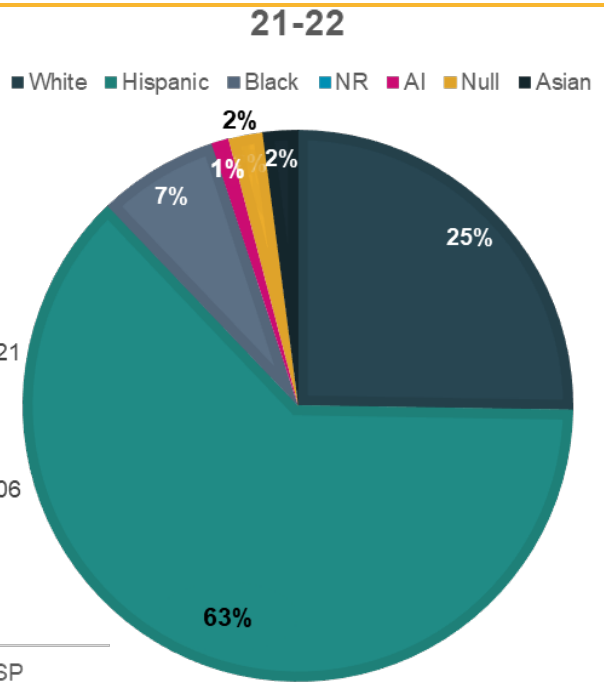
Feelings of isolation

(Hatfield et al., 2022; Murdock-Perriera, 2019; National Academies of Sciences, Engineering, and Medicine, 2023; Yarnall et al., 2023; Steele, 2010)

Challenges at Odessa





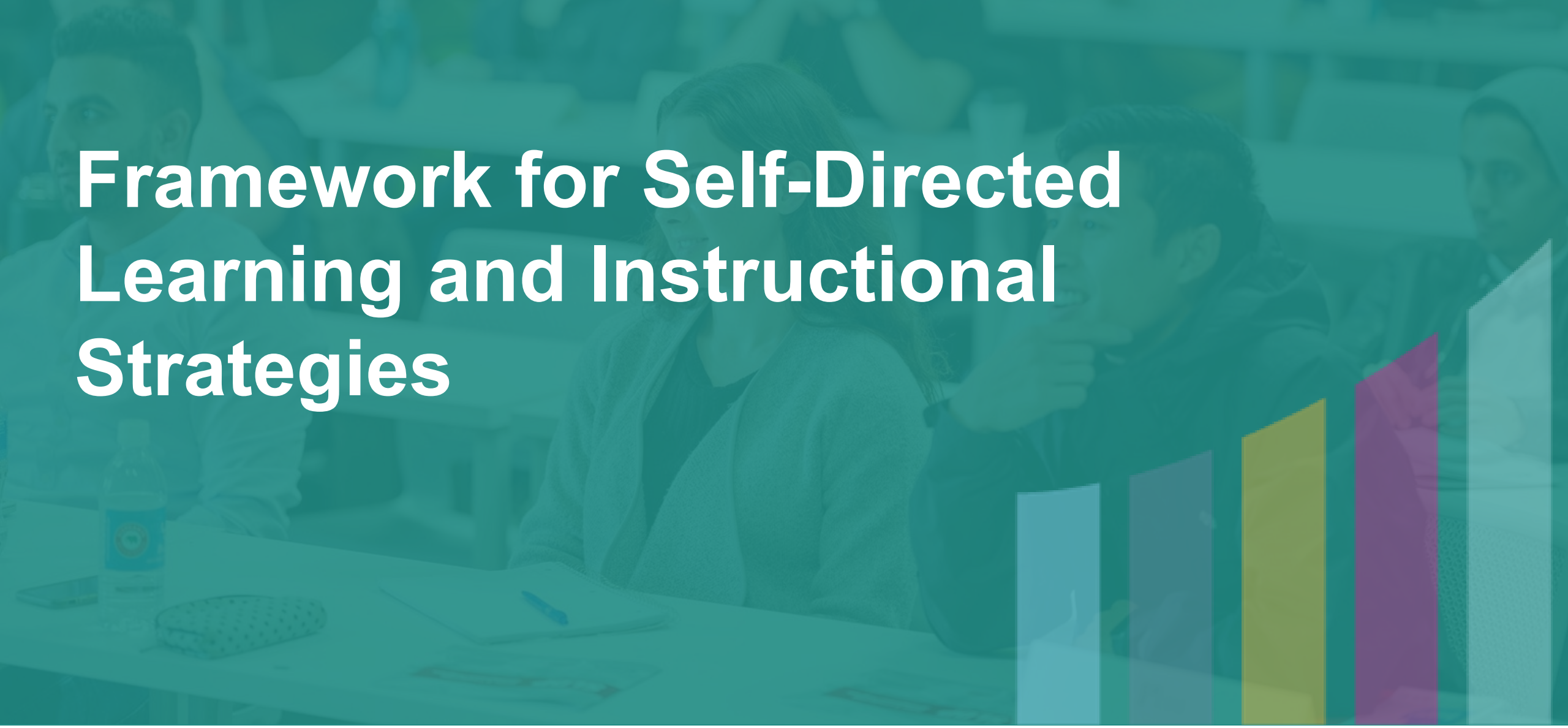


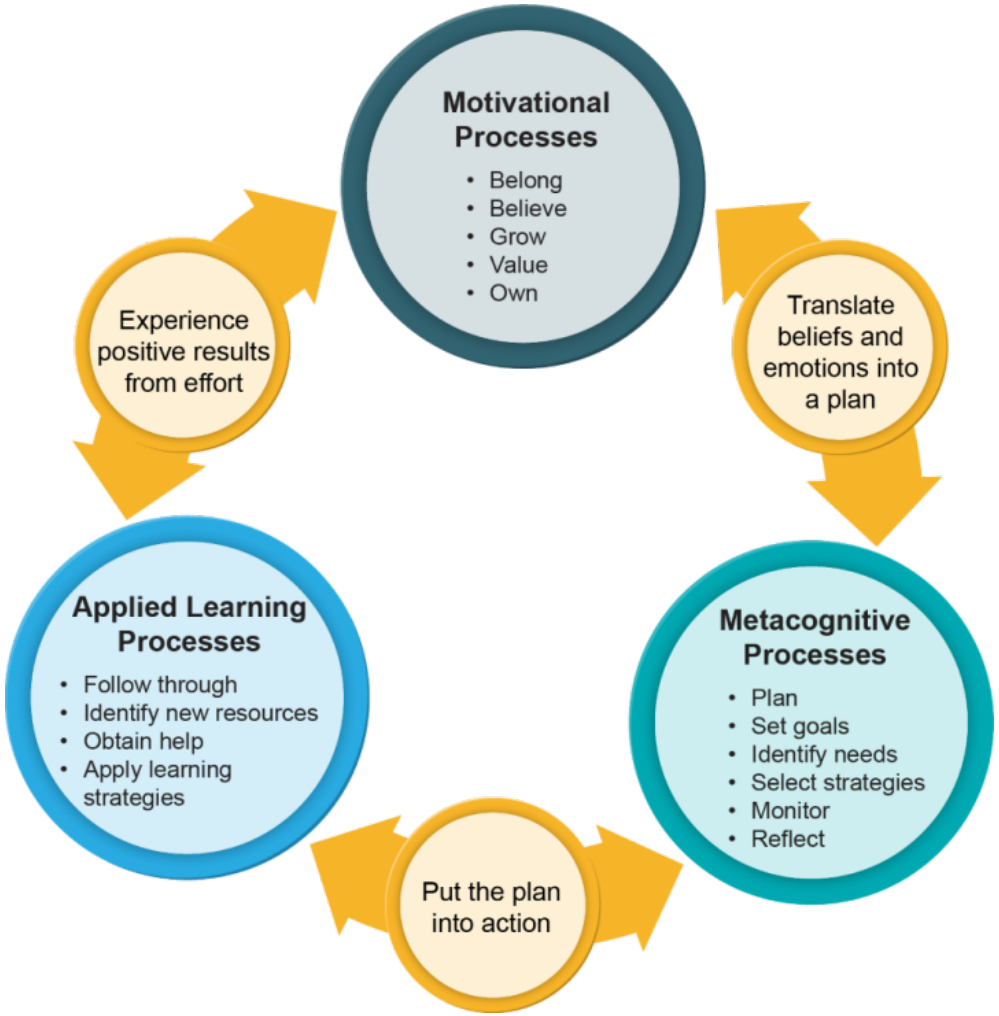
Supporting Student Learning in Online Courses

In your role, what kind of strategies or resources do you use to:

- Increase students' motivation?
- Help students reflect on their learning?
- Help students study more effectively / efficiently?

Framework for Self-Directed Learning and Instructional Strategies




Motivational Processes
• Belong
• Believe
• Grow
• Value
• Own
Translate beliefs and emotions into a plan
Metacognitive Processes
• Plan
• Set goals
• Identify needs
• Select strategies
• Monitor
• Reflect
Put the plan into action
Applied Learning Processes
• Follow through
• Identify new resources
• Obtain help
• Apply learning strategies
Experience positive results from effort

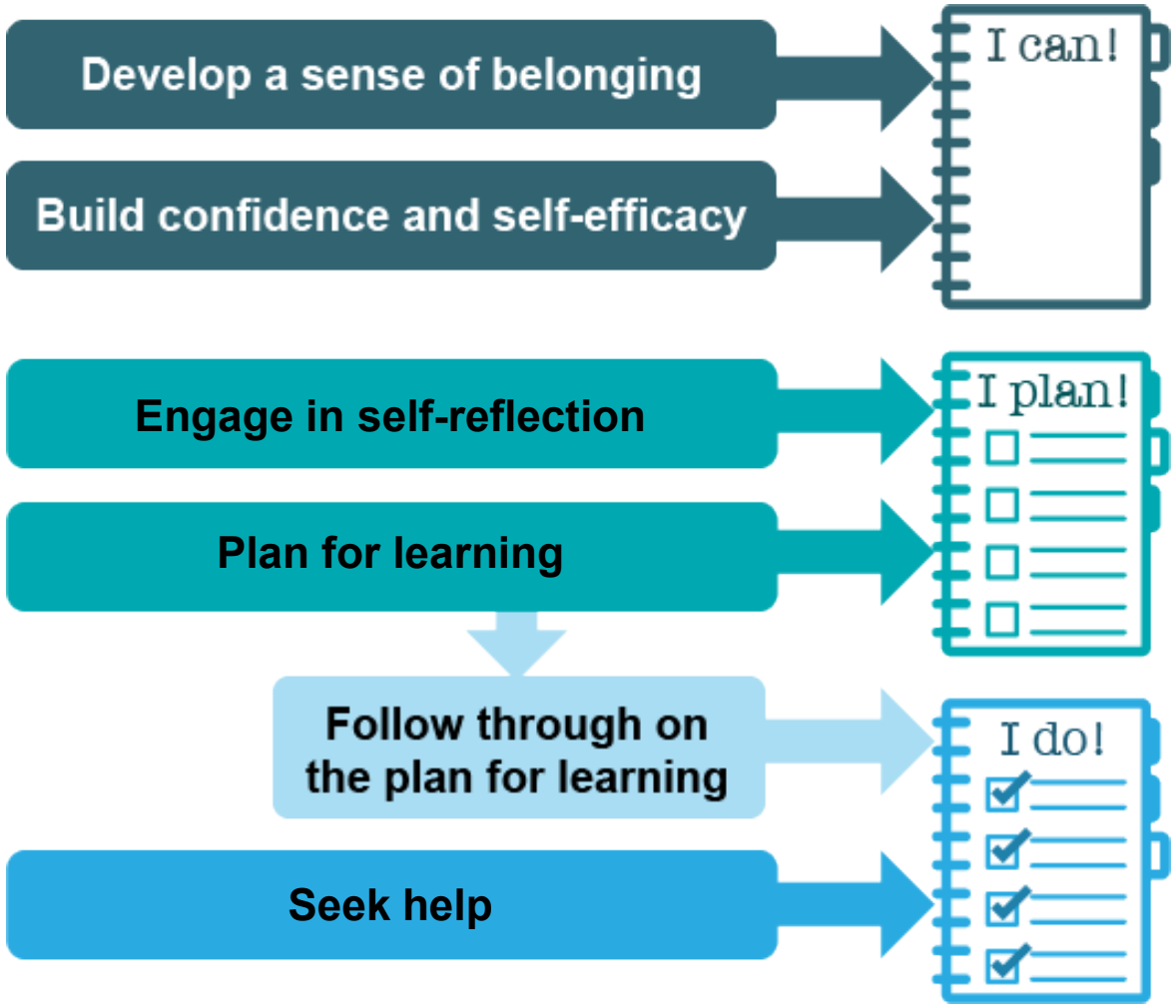
Three SDL processes

I can: Motivational processes provide the foundational emotions and beliefs that energize students' approach to learning. These are the emotions and beliefs around learning.

I plan: Metacognitive processes translate those emotions and beliefs into an action plan. This includes understanding how to manage learning and actively adjust to the demands of any learning task.

I do: Applied learning processes put that plan into action and adjust it as needed. These are learning techniques and self-discipline strategies that help students take greater ownership of achieving specific learning goals.

Targets 5 student skills



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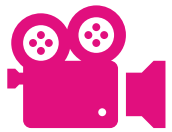
Strategies co-developed and tested

Strategies were identified via literature review and systematic database review,[1] and co-developed/adapted for online courses with instructors at four partner institutions.



Assign **videos** to support sense of belonging, planning for learning, confidence, and self-efficacy through a growth mindset

Set up automated **prompts** focused on help seeking, task-planning, and reflection

Use technology to support student-peer interaction and networking (**SPIN**) and promote help seeking

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[1] To learn more about the Collaborative's research on instructional strategies, read our white paper at https://postseccollab.org/teaching-and-designing-online-stem-courses-to-support-sdl-skills/.

Video series

Sense of belonging

Time management

Growth mindset

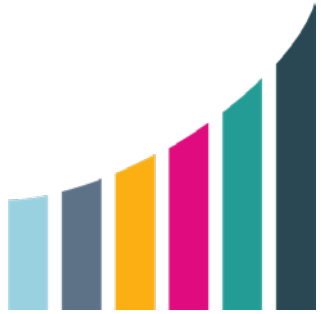
Each video follows a consistent structure:

- Overview of what students will learn
- Introduction to the SDL skill/mindset
- 2–3 strategies to develop the SDL skill/mindset
- Where to find additional resources

Each video includes a reflection activity:

- Self-rating on the SDL skill/mindset
- Self-reflection on the strategies presented in the video
- Planning for how to apply the strategies

Prompts: Metacognitive supports

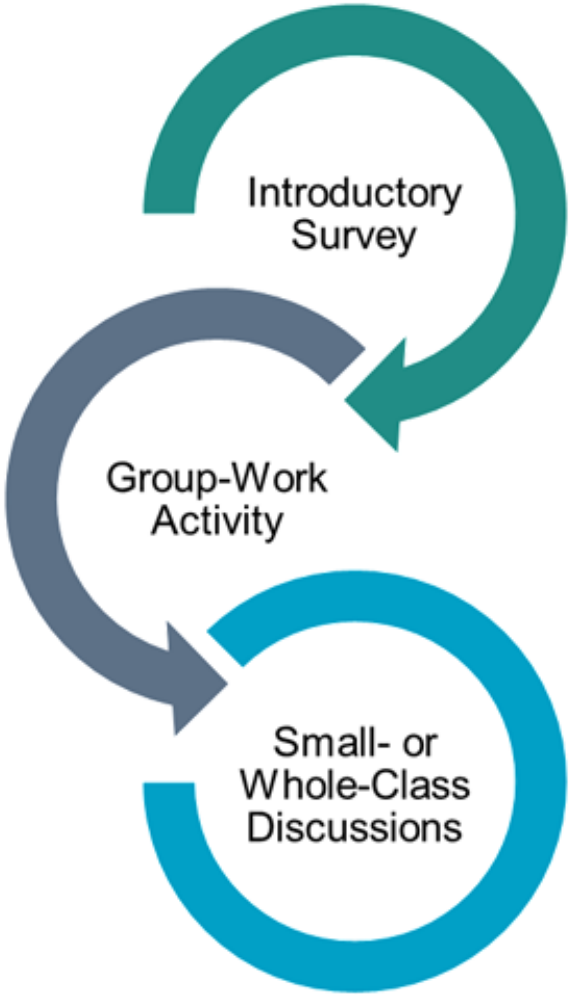


	Reflective prompts	Timing
Academic behaviors	• What assignments and other coursework do you need to complete this week for this class? What information, resources, or help do you need to complete this week's coursework?	Starting at 1x/week
	• Have you scheduled a specific time to complete this week's work for this class? [If no] When will you complete this week's work for this class?	Starting at 1x/week
Checking gaps in understanding	• What questions from your last [assessment] did you not understand? What resources and strategies do you need to improve your understanding? – *[Includes customized list of resources for each institution]*	Starting with each major assessment
	• Which concepts from this class do you feel you mastered this week? Which concepts are you still struggling with?	Starting at 1x/week

Prompt strategy: Metacognitive supports (cont.)

	Exam wrappers & letter to a future student	Timing
Academic behaviors	• Pre-exam survey administered before the test, designed to ask students about their planning for exam. • Post-exam self-evaluation after students have received graded assignment, designed to ask students to self reflect about exam.	Before and after major exam
Consolidating lessons learned	• The letter to a future student prompts students to describe all that they did to manage their learning and maintain their sense of belonging and self-efficacy.	End of course

Student-peer interaction and networking (SPIN)



Introductory survey that instructors use to create an activity around students' shared nonacademic interests

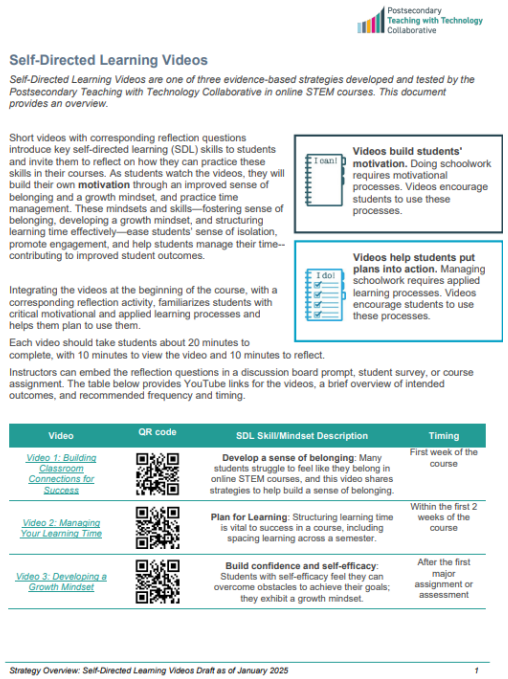
Group-work activity facilitated by instructors

Class discussions for students to share concepts they understood or struggled with and resources

Resources and guidance

Visit the event page for today's webinar at https://postseccollab.org/events/ to access draft versions of the instructional strategies and implementation guidance.

Videos



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Self-Directed Learning Videos

Self-Directed Learning Videos are one of three evidence-based strategies developed and tested by the Postsecondary Teaching with Technology Collaborative in online STEM courses. This document provides an overview.

Short videos with corresponding reflection questions introduce key self-directed learning (SDL) skills to students and invite them to reflect on how they can practice these skills in their courses. As students watch the videos, they will build their own **motivation** through an improved sense of belonging and a growth mindset, and practice time management. These mindsets and skills—fostering sense of belonging, developing a growth mindset, and structuring learning time effectively—ease students' sense of isolation, promote engagement, and help students manage their time--contributing to improved student outcomes.

Videos build students' motivation. Doing schoolwork requires motivational processes. Videos encourage students to use these processes.

Videos help students put plans into action. Managing schoolwork requires applied learning processes. Videos encourage students to use these processes.

Integrating the videos at the beginning of the course, with a corresponding reflection activity, familiarizes students with critical motivational and applied learning processes and helps them plan to use them.

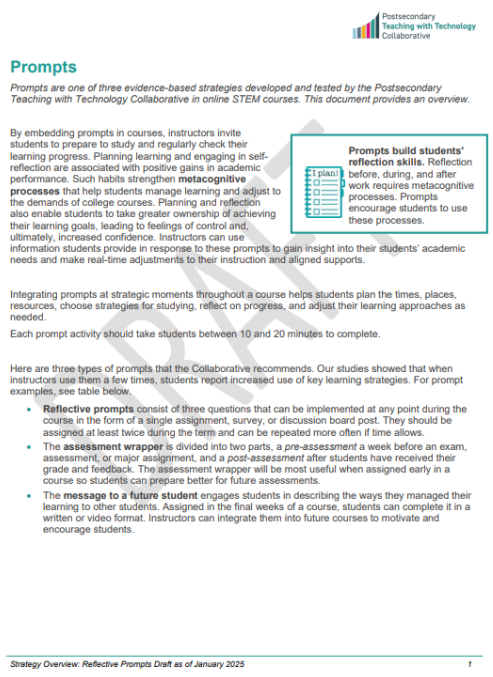
Each video should take students about 20 minutes to complete, with 10 minutes to view the video and 10 minutes to reflect.

Instructors can embed the reflection questions in a discussion board prompt, student survey, or course assignment. The table below provides YouTube links for the videos, a brief overview of intended outcomes, and recommended frequency and timing.

Video	QR code	SDL Skill/Mindset Description	Timing
Video 1: Building Classroom Connections for Success		**Develop a sense of belonging**: Many students struggle to feel like they belong in online STEM courses, and this video shares strategies to help build a sense of belonging.	First week of the course
Video 2: Managing Your Learning Time		**Plan for Learning**: Structuring learning time is vital to success in a course, including spacing learning across a semester.	Within the first 2 weeks of the course
Video 3: Developing a Growth Mindset		**Build confidence and self-efficacy**: Students with self-efficacy feel they can overcome obstacles to achieve their goals; they exhibit a growth mindset.	After the first major assignment or assessment

Strategy Overview: Self-Directed Learning Videos Draft as of January 2025 1

Prompts



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Prompts

Prompts are one of three evidence-based strategies developed and tested by the Postsecondary Teaching with Technology Collaborative in online STEM courses. This document provides an overview.

By embedding prompts in courses, instructors invite students to prepare to study and regularly check their learning progress. Planning learning and engaging in self-reflection are associated with positive gains in academic performance. Such habits strengthen **metacognitive processes** that help students manage learning and adjust to the demands of college courses. Planning and reflection also enable students to take greater ownership of achieving their learning goals, leading to feelings of control and, ultimately, increased confidence. Instructors can use information students provide in response to these prompts to gain insight into their students' academic needs and make real-time adjustments to their instruction and aligned supports.

Prompts build students' reflection skills. Reflection before, during, and after work requires metacognitive processes. Prompts encourage students to use these processes.

Integrating prompts at strategic moments throughout a course helps students plan the times, places, resources, choose strategies for studying, reflect on progress, and adjust their learning approaches as needed.

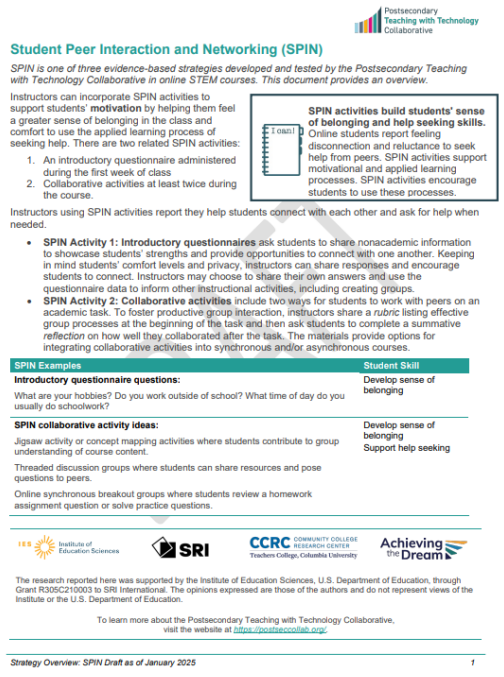
Each prompt activity should take students between 10 and 20 minutes to complete.

Here are three types of prompts that the Collaborative recommends. Our studies showed that when instructors use them a few times, students report increased use of key learning strategies. For prompt examples, see table below.

- **Reflective prompts** consist of three questions that can be implemented at any point during the course in the form of a single assignment, survey, or discussion board post. They should be assigned at least twice during the term and can be repeated more often if time allows.
- The **assessment wrapper** is divided into two parts, a *pre-assessment* a week before an exam, assessment, or major assignment, and a *post-assessment* after students have received their grade and feedback. The assessment wrapper will be most useful when assigned early in a course so students can prepare better for future assessments.
- The **message to a future student** engages students in describing the ways they managed their learning to other students. Assigned in the final weeks of a course, students can complete it in a written or video format. Instructors can integrate them into future courses to motivate and encourage students.

Strategy Overview: Reflective Prompts Draft as of January 2025 1

SPIN



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Student Peer Interaction and Networking (SPIN)

SPIN is one of three evidence-based strategies developed and tested by the Postsecondary Teaching with Technology Collaborative in online STEM courses. This document provides an overview.

Instructors can incorporate SPIN activities to support students' **motivation** by helping them feel a greater sense of belonging in the class and comfort to use the applied learning process of seeking help. There are two related SPIN activities:

1. An introductory questionnaire administered during the first week of class
2. Collaborative activities at least twice during the course.

SPIN activities build students' sense of belonging and help seeking skills. Online students report feeling disconnection and reluctance to seek help from peers. SPIN activities support motivational and applied learning processes. SPIN activities encourage students to use these processes.

Instructors using SPIN activities report they help students connect with each other and ask for help when needed.

- **SPIN Activity 1: Introductory questionnaires** ask students to share nonacademic information to showcase students' strengths and provide opportunities to connect with one another. Keeping in mind students' comfort levels and privacy, instructors can share responses and encourage students to connect. Instructors may choose to share their own answers and use the questionnaire data to inform other instructional activities, including creating groups.
- **SPIN Activity 2: Collaborative activities** include two ways for students to work with peers on an academic task. To foster productive group interaction, instructors share a *rubric* listing effective group processes at the beginning of the task and then ask students to complete a summative *reflection* on how well they collaborated after the task. The materials provide options for integrating collaborative activities into synchronous and/or asynchronous courses.

SPIN Examples	Student Skill
Introductory questionnaire questions: What are your hobbies? Do you work outside of school? What time of day do you usually do schoolwork?	Develop sense of belonging
SPIN collaborative activity ideas: Jigsaw activity or concept mapping activities where students contribute to group understanding of course content. Threaded discussion groups where students can share resources and pose questions to peers. Online synchronous breakout groups where students review a homework assignment question or solve practice questions.	Develop sense of belonging Support help seeking

The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R305C210003 to SRI International. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education.

To learn more about the Postsecondary Teaching with Technology Collaborative, visit the website at https://postseccollab.org/.

Strategy Overview: SPIN Draft as of January 2025 1

Questions

Faculty Experience with SDL Supports

What Would Show “More Engagement”?

- 2 sections of the same course (Bio 1408 W**72C** & W**71C**)
- Same 4.5 Week Format
- Same Assignments with W**72C** having the SDL strategy additions
  - Prompts
  - Videos
  - SPIN

Section with SDL Strategies

- Higher # of replies and length of replies to prompts:
  - Is science a belief system? Or Should designer babies be legal?
- More assignments turned in on time
- More assignments completed
- Reasoning scores before and after - No significant different between the two courses

What We've Learned

Postsecondary Teaching with Technology Collaborative

Collaborative's research activities

Qualitative research to shed light on **institutional policies and practices (IPP)** and instructional environments needed

2021–2022

Rapid cycle experiments (RCEs) to test and refine technology-enabled instructional strategies

2022–2023

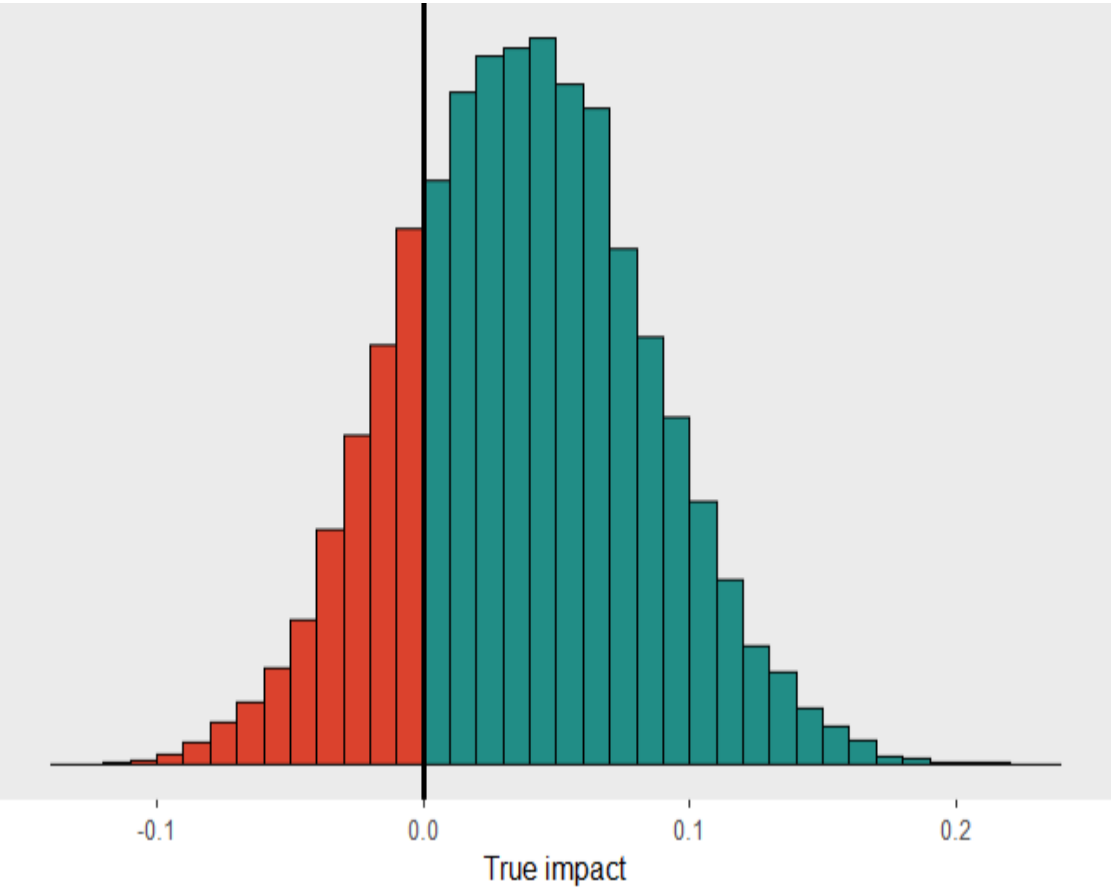
Develop and pilot-test **an "instructional model"** that uses tech features to deliver SDL instruction

2023–2025

Probability of positive impact on end-of-course grades

To account for smaller sample sizes, the study team conducted a Bayesian analysis, which incorporates prior evidence on other postsecondary strategies.

There is a 78% probability that our strategies had a positive effect on student achievement, specifically end-of-course grades.



(Deke et al., 2022; Burkander et al. 2024)

Findings from survey

Being in a class implementing 1+ strategies positively impacted:

- Students' use of more **learning strategies** (drawing diagrams, revising lecture notes, and revisiting practice problems)
- Whether students **evaluated** their learning strategies

This study found the effectiveness of the strategies was consistent across student populations and across different courses

Outcome Domains	Outcome (* = Admin. Data)	Impact Estimate (*SD*)	*p* Value	Prob Positive Impact
Achievement	End-of-course grade*	0.05	0.450	78
Applied learning strategy outcomes	Learning strategies inventory	0.16	0.019	83
	Help seeking	0.08	0.314	72
	Time management	0.01	0.916	65
Metacognitive outcomes	Comprehension monitoring	0.08	0.283	81
	Debugging strategies	0.06	0.528	81
	Evaluation	0.21	0.006	98
	Goal-setting	-0.02	0.762	65
Motivational outcomes	Self-efficacy	-0.10	0.188	19
	Sense of belonging	-0.15	0.121	15
	Growth mindset	-0.07	0.341	34

(Burkander et al. 2024)

SDL interventions: Student experiences

Motivation

"Learning about other people and what they experience, and like finding myself in that same boat."

– Prompts + video

Metacognition

"That actually helped me think back on what I learned."

"What didn't you understand so well this week? … When I got asked that question I realized, 'Oh, I really need to study this, because I didn't really understand it, that well this week.'"

– Prompts

Applied Learning

"I started a WhatsApp group for the class, only I think [with] 8 or so people. I was inspired by one of the videos to start the group."

– Video

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General insights from instructors

Instructors found:

- The strategies to be worth their time and inform their insight of student content-related understanding
- Creative ways to encourage student engagement, including offering extra credit or other incentives to participation
- They made some adjustments to the implementation of the strategies, most often changes to pacing and focus of reflection questions
- The strategies were attuned to course grades, rates of withdrawal and completion

Group discussion

- **Topic 1 – Student experiences in online courses**
  - What is one strategy—that you have used or have heard others use—to learn about students (and their experiences) in your online courses?
- **Topic 2 – Strengthening instructional strategies in online courses**
  - What kinds of strategies do you use in online courses to support students' noncognitive learning about how to learn? In what ways do you think specific or different strategies are needed for online STEM courses?
- **Topic 3 – Institutional supports for faculty teaching online courses**
  - How does your institution support instructors in their efforts to address noncognitive skill development such as SDL skills and mindsets?

Next steps for the Collaborative

- Refining the instructional strategies and integrating them into a comprehensive set of resources, in collaboration with our institution partners
- Piloting the set of instructional strategies in spring 2025 to test their usability, feasibility, and promise for improving student outcomes

Thank you!

Learn more about what we mean by self-directed learning

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