# How Meta-Major Development Led to the Design of a New Natural Science Degree

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## Rachel Garcia

Associate Vice Chancellor, Teaching and Learning

San Jacinto College

- Curriculum and Catalog Management for all course-work for the College

- Transfer Agreements for the College with Universities

  - Co-founder of Take Flight transfer program with Rice U

- Faculty professional development

  - PI on NSF faculty prof. dev. Grant
  - Co-PI on Title III DOE grant

- Faculty Excellence Recognition Program

- External Partnerships (Aspen, AtD, TPI, etc.,)

- Degree Pathways and Mapping

**Chris Duke**

Institutional Research & Data Science | Institutional Effectiveness | Assessment | Accreditation (SACSCOC Liaison) | THECB Liaison | Community Colleges | Higher Education

Pasadena, Texas, United States

2K followers · 500+ connections

## Meet the presenter

# Chris Duke

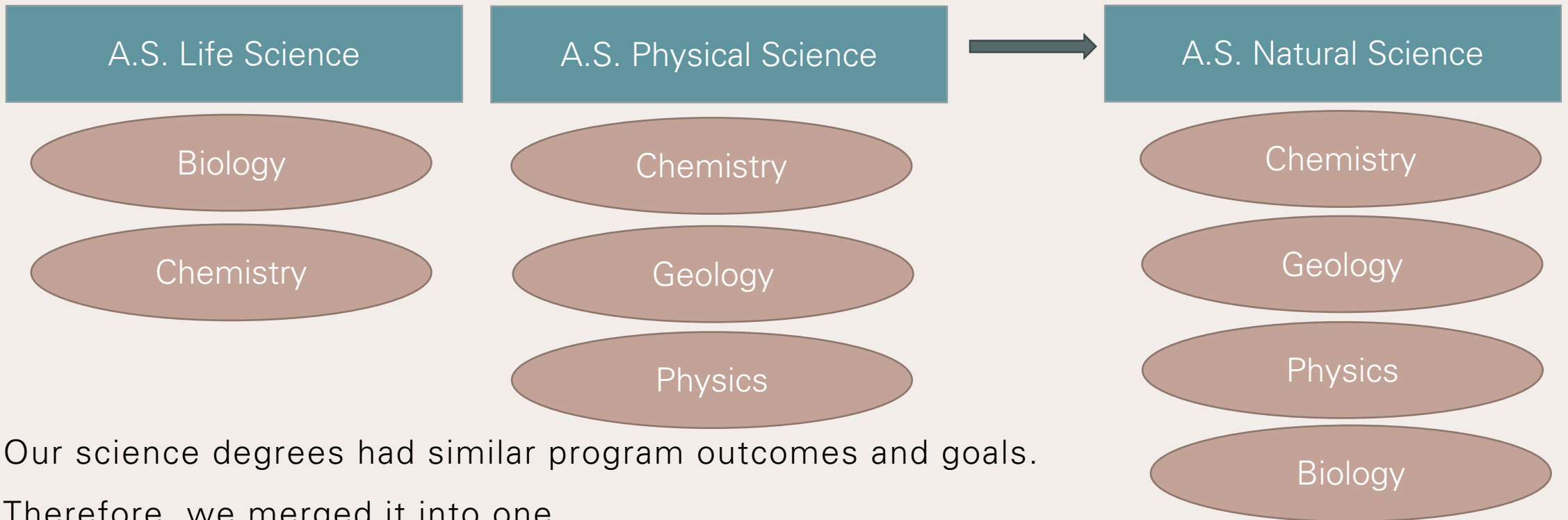**Associate Vice Chancellor,** Accreditation, Institutional Research, Institutional Effectiveness

**San Jacinto College**

Program effectiveness, assessment, and continuous improvement – all instructional and support service programs, college-wide

- Program Learning Outcomes

- Assessment Methodology

- Instructional Assessment Systems

- Continuous Improvement (ImprovE)

## Background

Degrees and certificates of various programs need to have meaningful outcomes. Program outcomes are the goals of a program for students.

| A.S. Life Science | A.S. Physical Science | → | A.S. Natural Science |
|---|---|---|---|
| Biology | Chemistry | | Chemistry |
| Chemistry | Geology | | Geology |
| | Physics | | Physics |
| | | | Biology |

Our science degrees had similar program outcomes and goals. Therefore, we merged it into one.

# Pause and Reflect Questions (5-7 min)

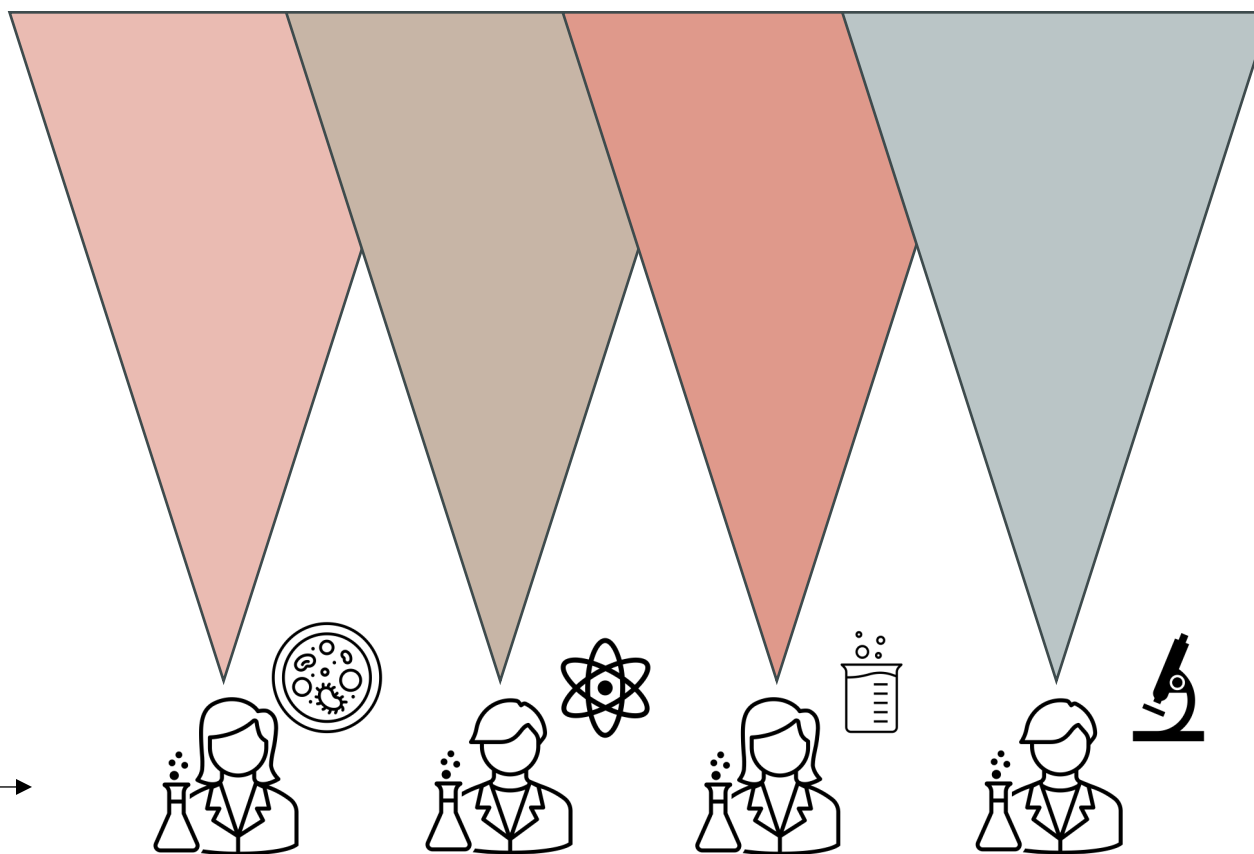How do you define program outcomes in your area?

Are there any barriers that block the successful development of program outcomes?

Share your answers with each other.

# How do you define (and assess) broad content that is meaningful to both students and faculty?

Program Outcome content level (broad)

Need for them to all agree on a common denominator they are all connected to.

SME content level (detailed)

Lab coats and beakers = all are scientists! Science skills are important to all SMEs

## Development

Program Outcomes should increase the student's ability to get a job.

Need to evaluate what are the most needed soft skills as well as hard skills. Soft skills are no longer a given.

## Pause and Reflect activity:

Verification of skills, knowledge and abilities with job search engines: Go to indeed.com



Write down three skills, knowledge or ability a person needs to have for a job that requires an Associates degree. Feel free to pick the area of concentration.

All of our associates degrees should lead to a career. If they do not, we should evaluate offering them.





SAN JACINTO COLLEGE

8

**Education and Experience**

- High School Diploma or GED (Required)
- Associates Degree in a science discipline (Preferred)
- 1-year experience working in a laboratory setting (Preferred)

**Knowledge, Skills and Abilities**

- Good organization skills, detailed oriented and completes tasks in a timely manner. (Required)
- Able to work in a routine repetitive fast paced work environment (Required)
- Able to stand on feet for long periods of time (Required)
- Ability to interpret a variety of instructions as may be furnished in oral, written, diagram, electronic or schedule form. (Required)
- Must be able to work with all chemicals, petrochemicals and petroleum products. (Required)

Job Type: Full-time

Pay: $50,000.00 - $80,000.00 per year

Benefits:

- Dental insurance
- Health insurance

# A.S. N.S. Program Outcomes:
## Address both hard and soft skills, collectively marketable skills

**1. Critical Thinking:**
Collect, organize, and evaluate relevant data from credible sources to draw logical conclusions.

**2. Communication Skills:**
Communicate scientific principles, experiments, or investigations in written, oral and/or visual formats.

**3. Empirical and Quantitative Skills:**
Utilize quantitative and empirical skills to analyze and explain natural science phenomena.

**4. Teamwork:**
Interdependently consider scientific evidence and points of view to achieve a shared goal.

**5. Personal Responsibility:**
Develop investigative skills based on scientific evidence to make ethical decisions.

**6. Social Responsibility:**
Apply scientific reasoning and principles to real world situations to make informed decisions.

**7. Content Program Outcome:**
Explain, describe, or identify scientific knowledge and content.

# A.S. N.S. Program Outcomes: One way to assess is using a rubric

| Criteria | Level 4 | Level 3 | Level 2 | Level 1 | 0 |
|---|---|---|---|---|---|
| Critical Thinking | Collected relevant data from credible sources; organized and interpreted the overall findings to develop a coherent analysis or synthesis; and discussed implications for further study or application. | Collected and organized relevant data from credible sources and interpreted the data to develop a coherent analysis or synthesis. | Collected relevant data that was organized and interpreted but not enough to develop a coherent analysis or synthesis. | Collected data that was taken from sources without organizing, interpreting, or evaluating data. | Does not meet Level 1 standards |

AAC&U

Value Rubrics

Needed resources and support for faculty:
Rubric training on how to use them for assessment
Rubric Development and how to import in Blackboard

# Pause and Reflect Questions (5-7 min)

Are there any struggles with faculty buy-in in implementing assessments in their courses?

Are program and general education outcomes harder to assess in an online class?

Do you think technology has helped or hindered student's ability to meet the outcomes?

Share your answers with each other.

## Assessment

Program Outcomes should be assessed in a timeline where faculty can see progress and feel they are making a difference on an individual level.

Faculty need to develop the assessment questions with intentional and clear guidance.

Assessment 1   Assessment 2   Assessment 3

A.S. NS
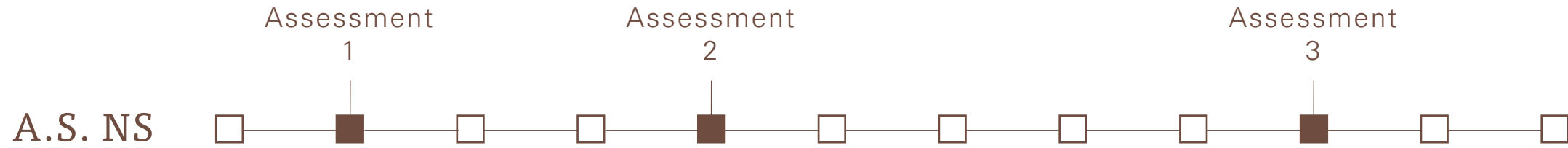
Ideal assessment timeline (from STEM faculty)

Assessment via student surveys

FALL 2022

Core and Pre-requisites, ~ 40 hrs          Transfer Path Courses, ~18 hrs

Baseline vs. Summative:
BIOL 1306/07, GEOL 1303/04,
CHEM 1311/12, PHYS 2326/26

**Spring 2022 U.S. Drought Outlook**

AK and HI not to scale
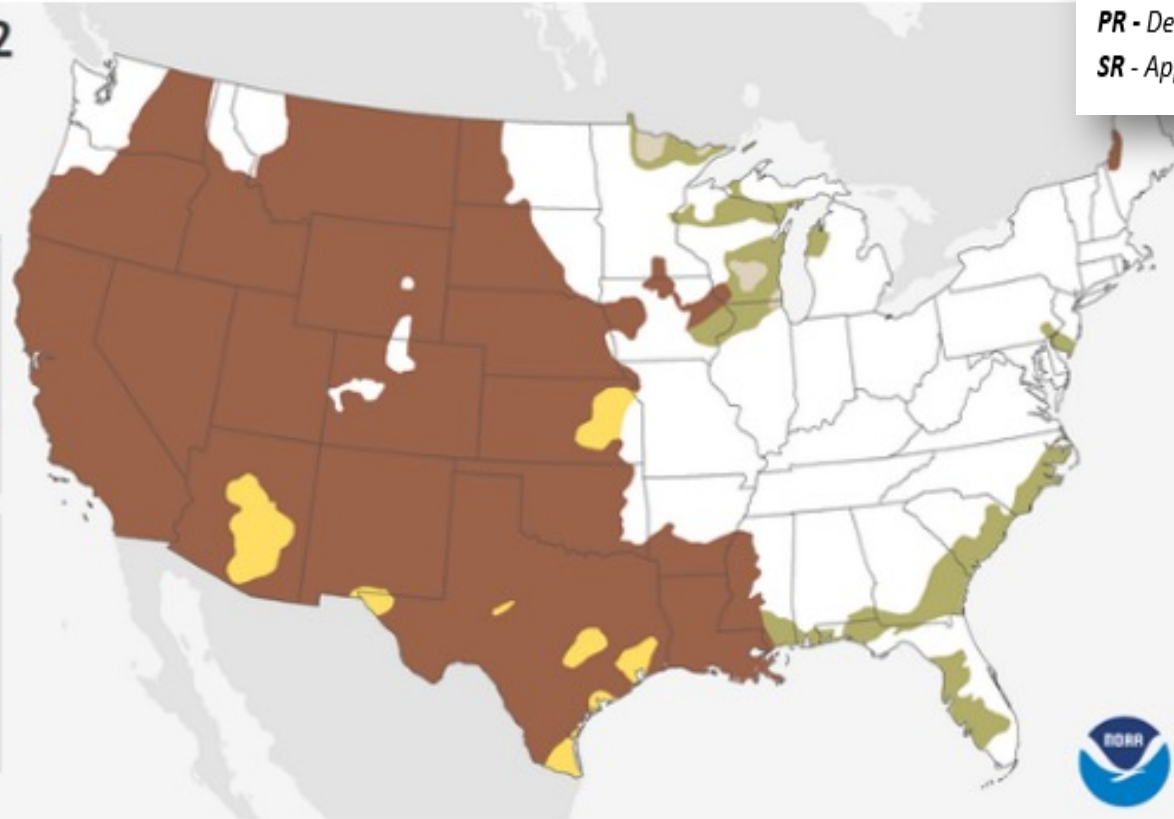
Drought Outlook
valid through June 2022
Issued 17 Mar 2022

**Drought Tendency**

None    Develop    Continue or    Improve    End
                    Worsen

Climate.gov
Data: CPC

**A.** Based on this map, do you, a resident of the Houston area, think it was a smart idea to conserve water in Spring 2022? Please explain.

**B.** What are some signs you would look for that would suggest that your community/city is in the middle of a drought? After noticing that your community/city is in a drought, please explain what you could do in your personal life that could help reduce your water usage.
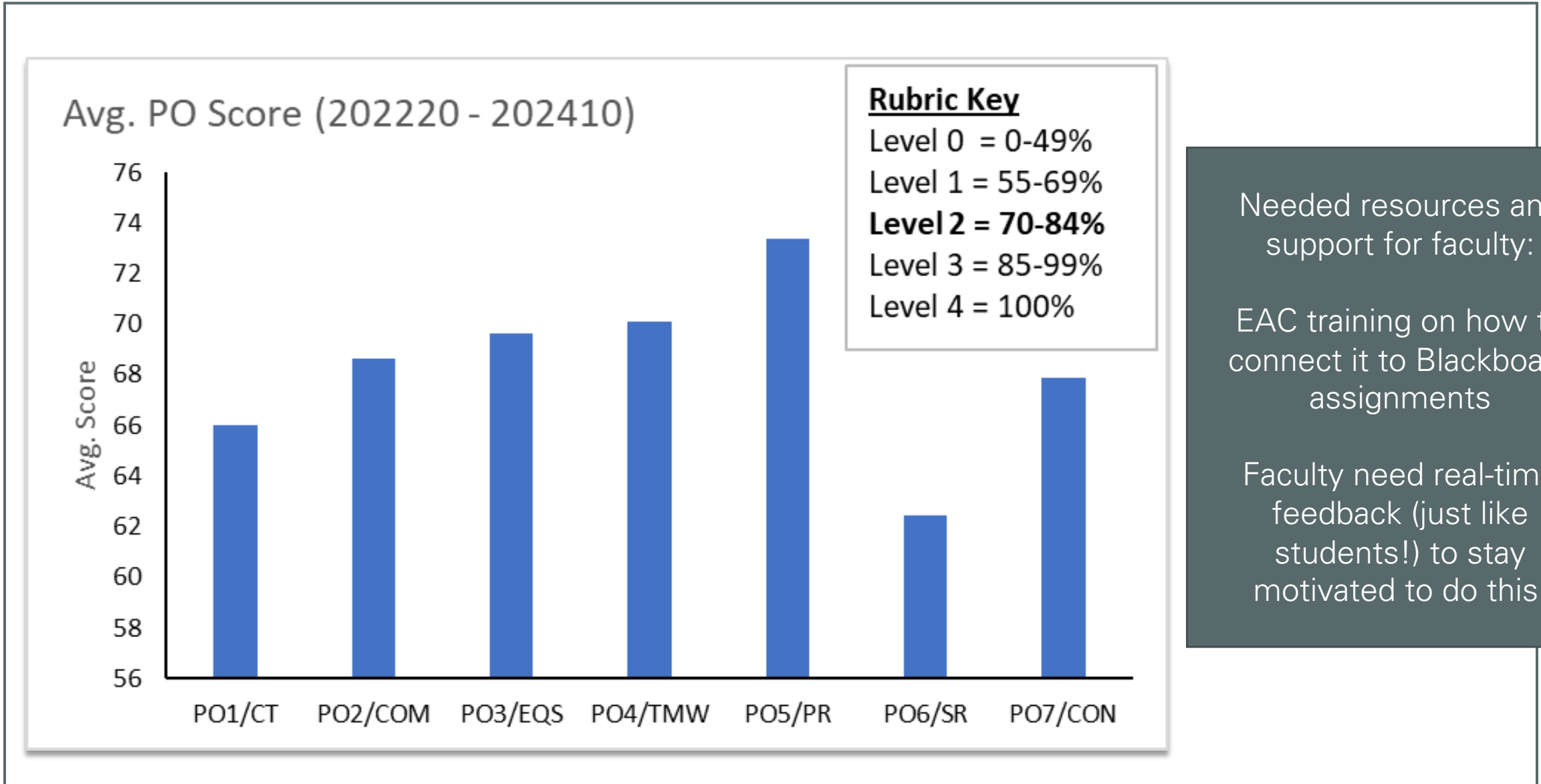
Needed resources and support for faculty:

A place where selected faculty can develop and house questions (example Teams folders)

Faculty opted for a pool of questions that will be randomly selected during the assessment. Faculty need to know how to develop this in Blackboard and tie the rubric the question.

# EAC: To look at the results:



Avg. PO Score (202220 - 202410)

**Rubric Key**
Level 0 = 0-49%
Level 1 = 55-69%
**Level 2 = 70-84%**
Level 3 = 85-99%
Level 4 = 100%

Needed resources and support for faculty:

EAC training on how to connect it to Blackboard assignments

Faculty need real-time feedback (just like students!) to stay motivated to do this.

# Pause and Reflect Questions (5-7 min)

How do faculty feel regarding their course as helping students become career-ready?

How are faculty inspired by the current industry trends and workforce demands?

# Plant tours: One professional development approach for increased faculty engagement with industry



Evaluate the associate degree in terms of job placement by asking industry. Do not assume all students will transfer in the future; embrace what an associate's degree can do for students now.

Look for ways to incorporate real-world applications into courses to show partners you are serious about their feedback. Science courses have labs which are prime for this action. This content should drive program outcomes.

Distillation Lab
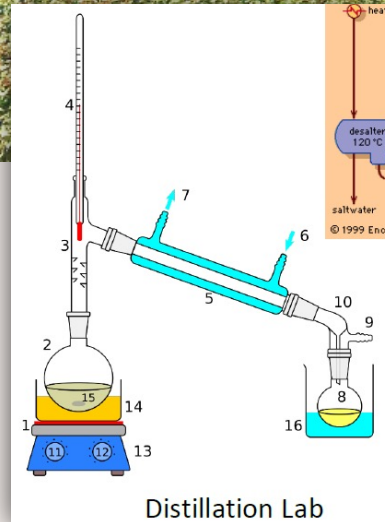
# Transfer partner example for honors STEM students: Take Flight

Had an existing partnership in place that supported Rice University: STEM REUs

Listened to Rice faculty on what skills STEM students need: hosted a faculty convening

Piloted Take Flight with a few students: Had a one-year MOU with Rice with defined metrics.

Show leaders the potential of the program to continue to support it.

RICE UNIVERSITY
Office of the Provost
*Take Flight STEM Pathway*

## Staying in STEM
INSPIRING GROWTH AND DEVELOPMENT

## Transfer Ready
BECOMING A RICE OWL

Take Flight students have a 16% chance of admittance into Rice U vs. 8% of transfer students.

# Key takeaways

Program Outcomes should be career-focused more so than transfer. We should consider the academic associate's degree as more of a terminal degree and find ways to involve faculty in workforce and industry needs.

For the work to be faculty-driven, the leaders must take the initiative (chairs in this case) to provide clear guidance and resources to support the work.

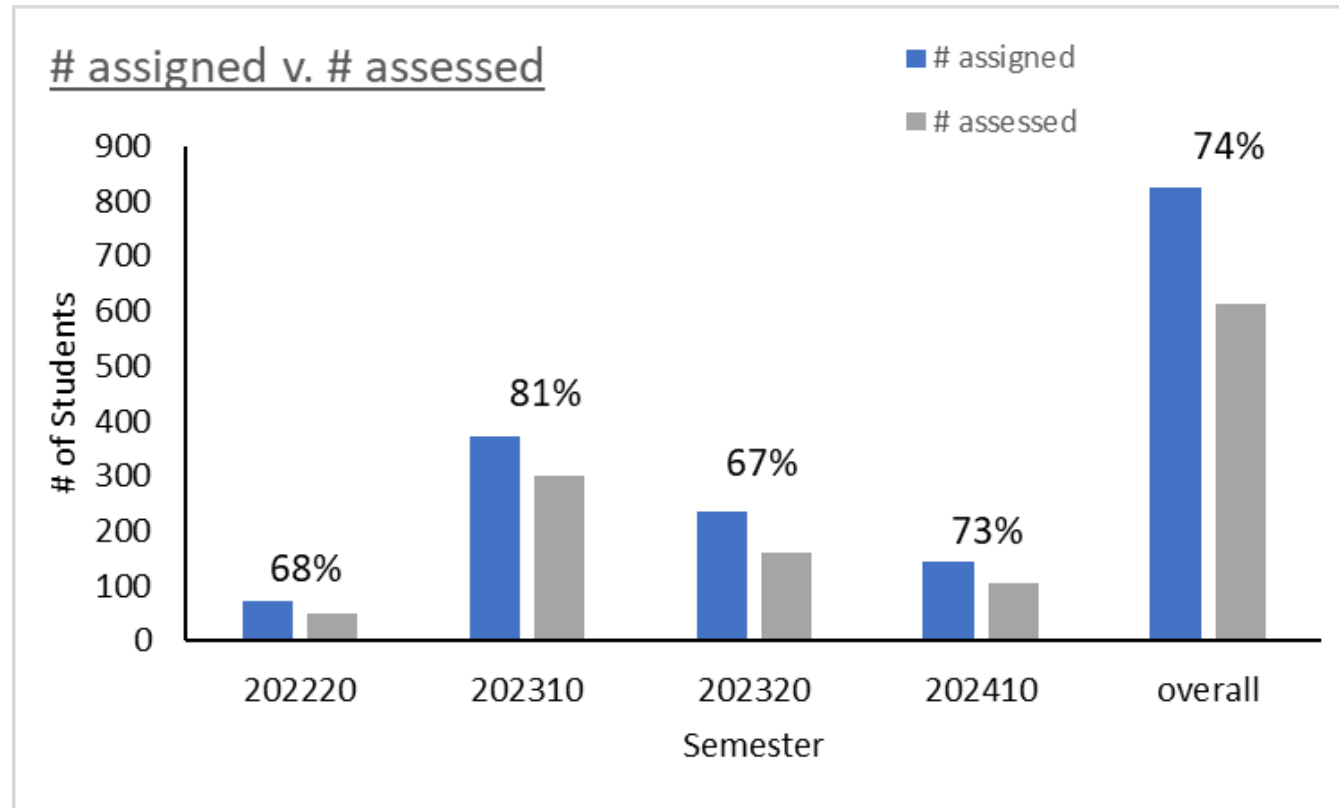# Thank you!

- Chris.Duke@sjcd.edu
- Rachel.Garcia@sjcd.edu

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# APPENDIX

| Criteria | Level 4 | Level 3 | Level 2 | Level 1 | 0 |
|---|---|---|---|---|---|
| Critical Thinking | Collected relevant data from credible sources; organized and interpreted the overall findings to develop a coherent analysis or synthesis; and discussed implications for further study or application. | Collected and organized relevant data from credible sources and interpreted the data to develop a coherent analysis or synthesis. | Collected relevant data that was organized and interpreted but not enough to develop a coherent analysis or synthesis. | Collected data that was taken from sources without organizing, interpreting, or evaluating data. | Does not meet Level 1 standards |
| Communication Skills | Communicated scientific principles, experiments, or investigations with a detailed and sequential narrative and a visual or oral format that facilitated analysis or clarified understanding. | Communicated scientific principles, experiments, or investigations with a detailed and sequential narrative and a visual or oral format. | Communicated scientific principles, experiments, or investigations with a detailed and sequential narrative. | Communicated scientific principles, experiments, or investigations but did not do so clearly or adequately. | Does not meet Level 1 standards |
| Empirical and Quantitative Skills | Demonstrated knowledge of technical aspects (controlled variables, sources of error, repeatability, sample size, etc.) when gathering quantitative or empirical data to analyze or explain natural science topics. | Gathered quantitative or empirical data and used the data to analyze or explain natural science topics. | Gathered quantitative or empirical data but did not use that data to analyze or explain natural science topics. | Gathered information that was not empirical or quantitative. | Does not meet Level 1 standards |
| Teamwork | Interdependently consider scientific evidence and points of view to achieve a shared goal. | Considers scientific evidence and points of view collectively to complete a shared goal. | Considers scientific evidence and points of view collectively but does not achieve a shared goal. | Considers scientific evidence independently. | Does not meet Level 1 standards |
| Personal Responsibility | Utilizes investigative skills and scientific evidence to develop multiple approaches to an ethical decision and can articulate the reasons for choosing the approaches. | Utilizes investigative skills and scientific evidence to develop multiple approaches to an ethical decision. | Utilizes investigative skills to develop an acceptable approach to an ethical decision. | Attempts to investigate an ethical decision but does not use an acceptable approach to do so. | Does not meet Level 1 standards |
| Social Responsibility | Applies scientific principles to real world situations; and considers multiple perspectives, experiences, and biases to make decisions regarding the natural and human world. | Applies scientific principles to real world situations and considers multiple perspectives and experiences to make decisions regarding the natural and human world. | Makes connections and evaluates the impact of human actions on the natural and human world. | Begins to make some connections between an individual's personal decision-making and certain local and global issues. | Does not meet Level 1 standards |
| Content Program Outcome | Clearly explains, describes, or identifies scientific knowledge and content with multiple examples, applications, or implications that illustrate mastery of the subject. | Clearly explains, describes, or identifies scientific knowledge and content with multiple examples. | Clearly describes or identifies scientific knowledge and content but does not provide examples. | Attempts to explain, describe, or identify scientific knowledge and content but has not reached a level of understanding to do so. | Does not meet Level 1 standards |

# EAC: To look at the results:



Needed resources and support for faculty:
- EAC training on how to connect it to Blackboard assignments
- Faculty need real-time feedback (just like students!) to stay motivated to do this.