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Student Self-Reflection: Gauging Engineering Students' Presence

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C O L L E G E O F E N G I N E E R I N G

ABET Outcome 7

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An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Session Outline

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- Purpose of reflection
- Lower-division example
- Upper-division example
- Graduate example
- Steps to getting started with reflection

Reasons for Student Reflection

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Why take time to have students reflect?

Helps students:

- Think about their learning and learning progress
 - Can lead to planning and greater commitment to actions
- Practice communicating new terminology and concepts
- Make sense of course content
 - Particularly when connected to their experiences

**Develop reflective practitioners
(lifelong learning strategy)**

Reflective & Reflexive Practice

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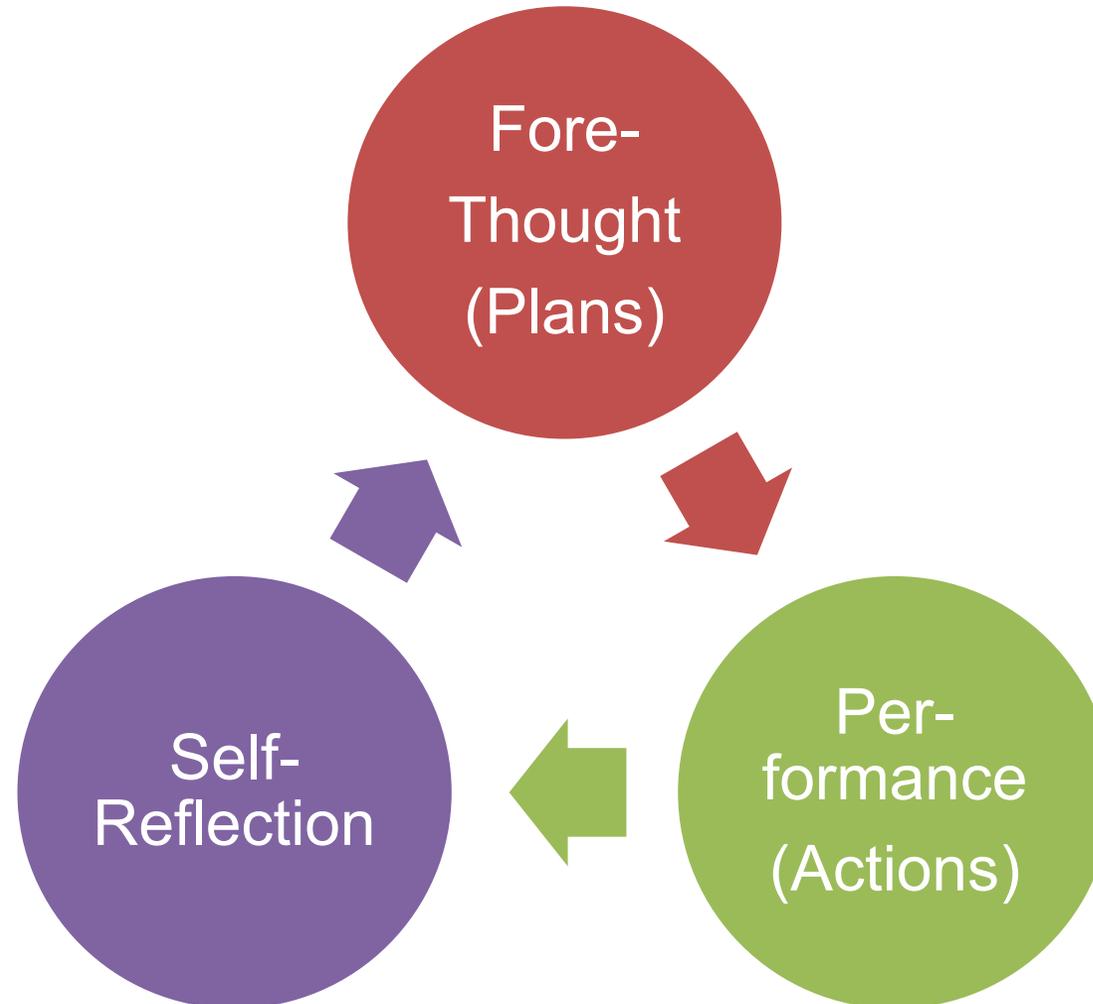
- **Reflective practice:**
 - ability to reflect on one's actions as means of engaging in a process of continuous learning (Schön, 1983)
 - person thinks about what they have learned or experiences / What does it mean to them?
- **Reflexive practice:**
 - Person considers implications of learning or experience in wider context they work within / What are they going to do about it?
- **Rationale:** Experience alone does not necessarily lead to learning (Loughran, 2001)
- **Reality of Our Abilities:** We are not naturally able to do this; it must be learned and practiced.

Reflection in Lower-Division

Emphasis: Think about their learning

Self-Regulation Phases (Zimmerman, 2000, 2002)

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Minute-Paper

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- What did you learn this week?
- What is helping you to learn?
- What is hindering your learning?
- What questions or comments do you have for me?

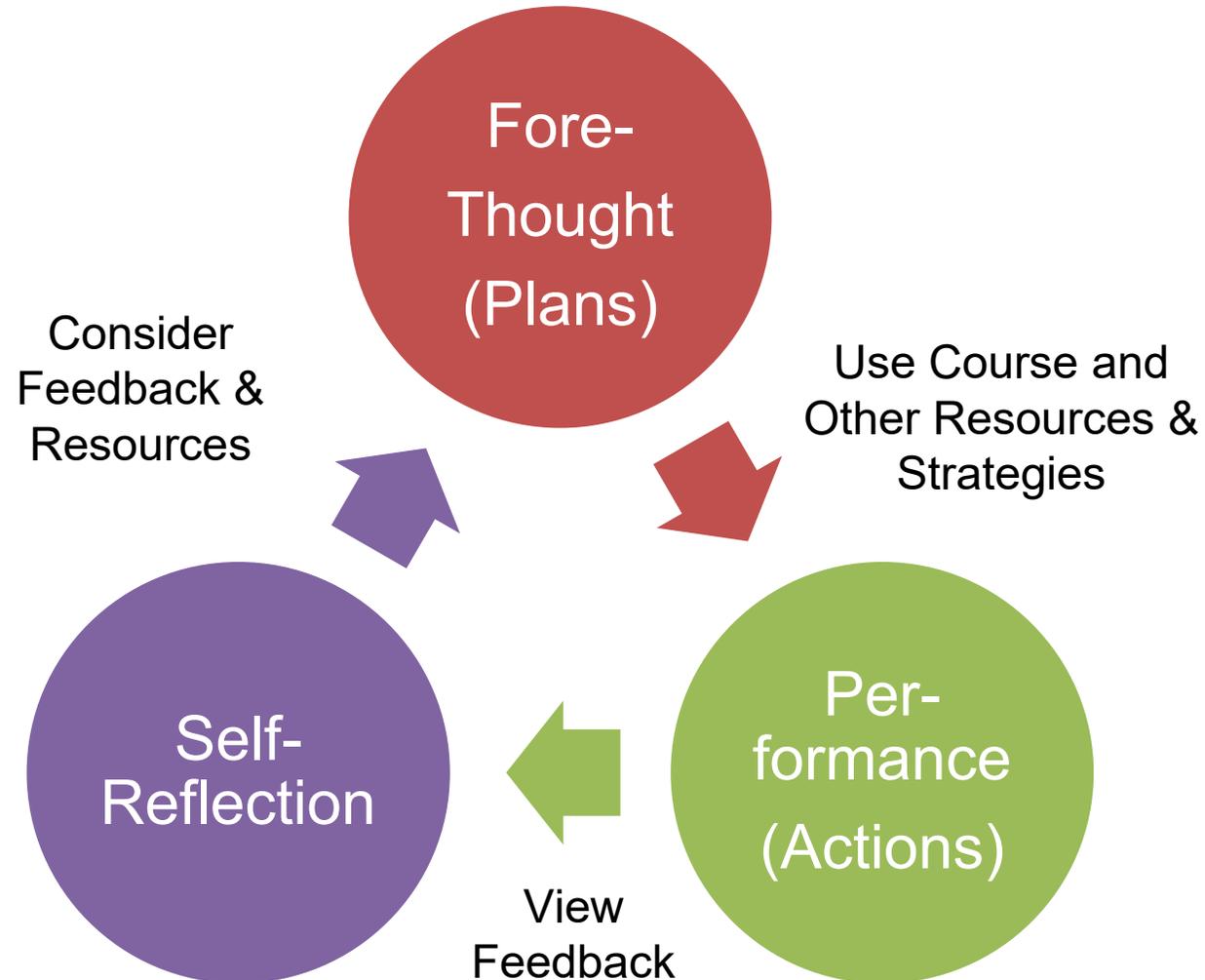
First-Year Students (2017) - Connecting Assessment and Self-Regulation

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My Goal:

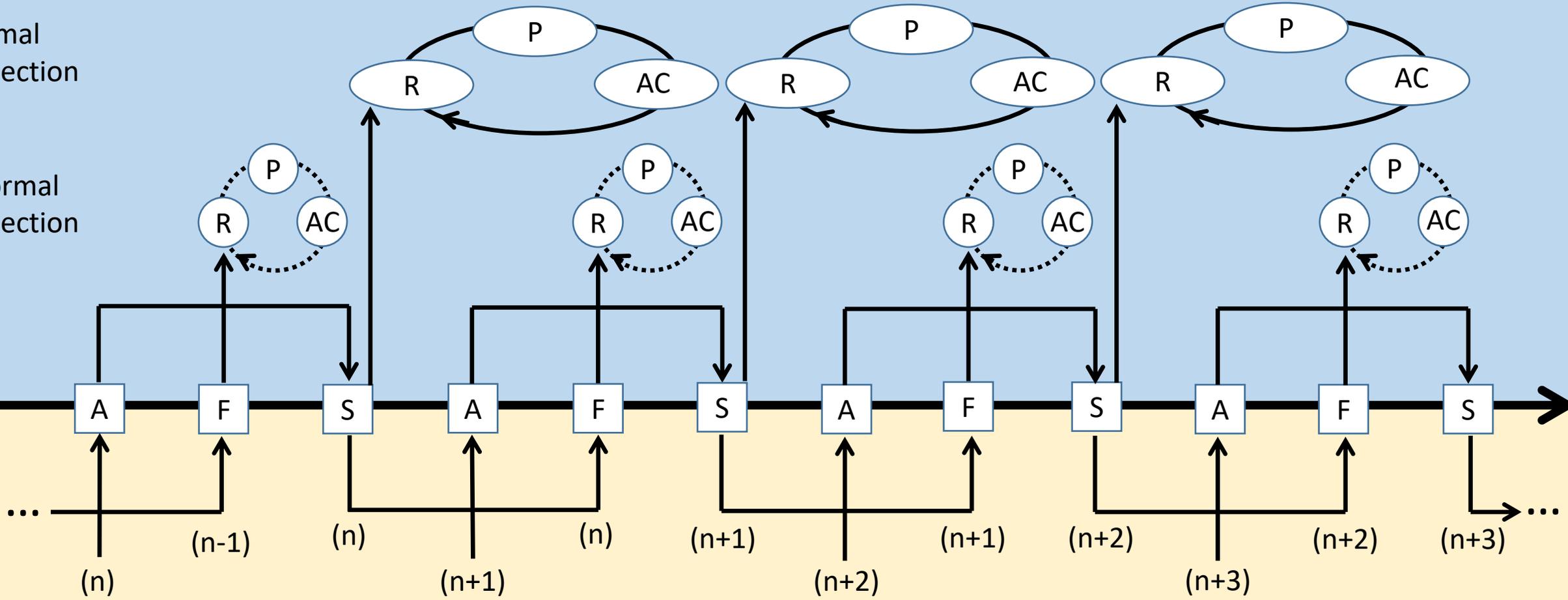
Get students to access their feedback and use it as a means to process their progress and make plans to improve.



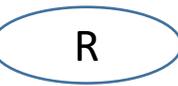
Student Actions

Formal Reflection

Informal Reflection



Instructional Team Actions

Key		Assignment			Reflection
		Submission			Plans
		Feedback			Actions

2017 Reflections



- Rate ability with recent learning objectives

04.01 Create a script that adheres to programming standards.

- I can do this on my own without referring to resources
 - I can do this on my own if I refer to some resources
 - I need more practice with this
 - I need someone to help me understand and do this
 - I am not sure what this means
- Open-ended Prompts
 - Actions taken based on feedback
 - Actions planned based on feedback and reflection

2017 Reflections



Related to Returned Assignment

- Based on your feedback, *what actions have you already taken* to improve your abilities? Refer to specific learning objectives and be specific about your actions.
- Based on your feedback, *what actions do you still plan to take* to improve your abilities? Refer to specific learning objectives and be specific about your planned actions.

Related to Submitted Assignment

- Rate ability with recent learning objectives
- For those learning objectives that you are not able to do on your own, *what do you plan to do to improve your abilities over the next week*? Refer to specific learning objectives and be specific about your planned actions.

Student Actions

Formal Reflection

Informal Reflection

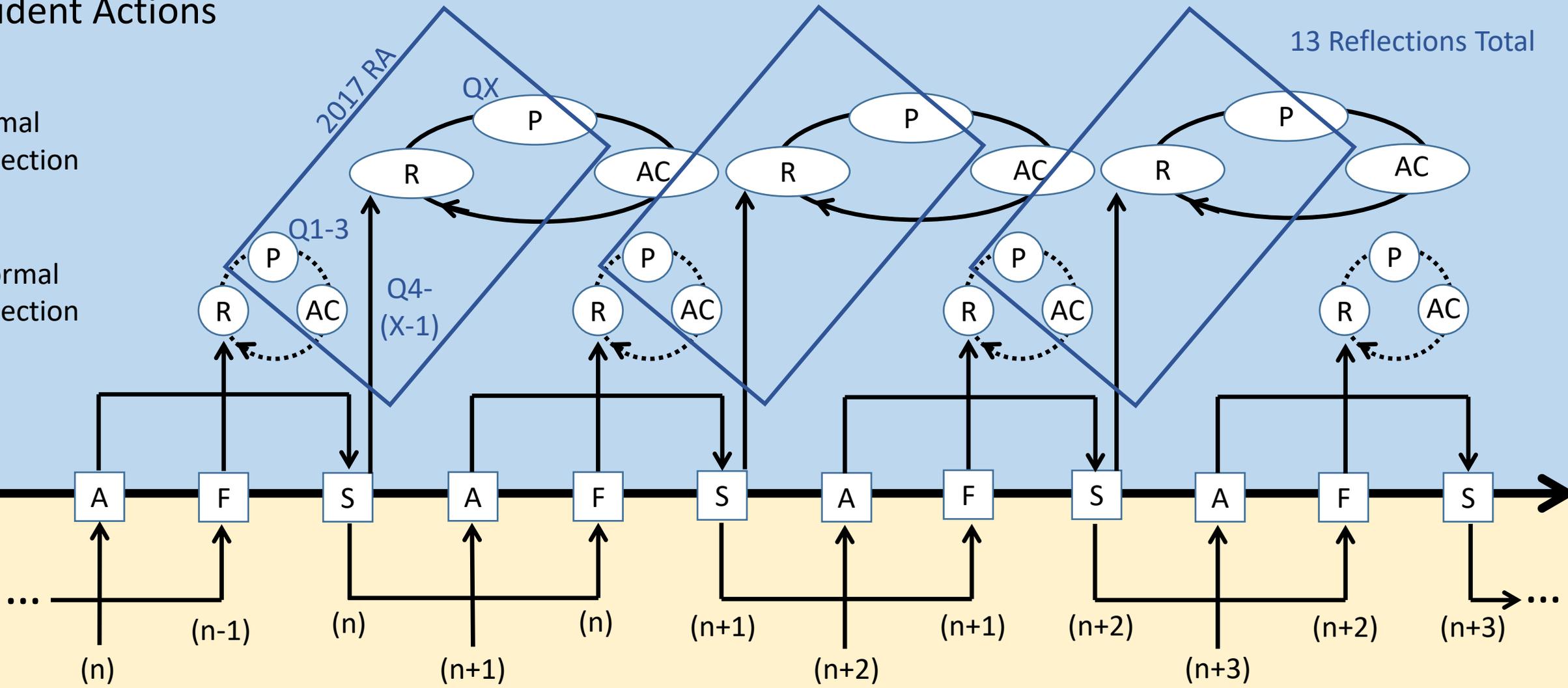
13 Reflections Total

2017 RA

QX

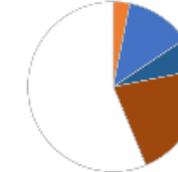
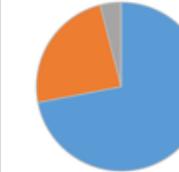
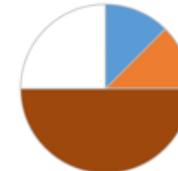
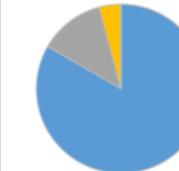
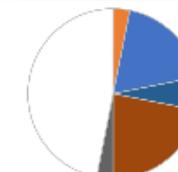
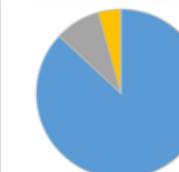
Q1-3

Q4-(X-1)



Instructional Team Actions

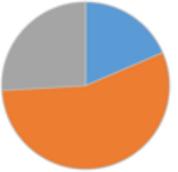
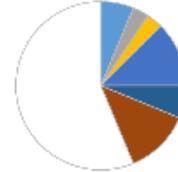
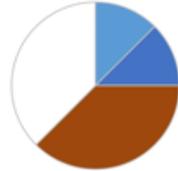
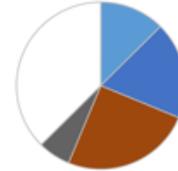
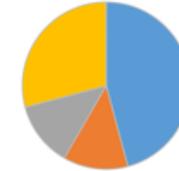
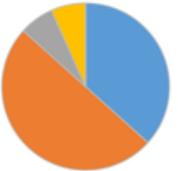
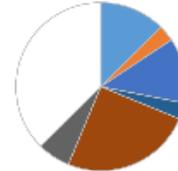
Key	
A	Assignment
S	Submission
F	Feedback
R	Reflection
P	Plans
AC	Actions

Exam Period	LO Self Rating	Problem Set Performance	Reflection Actions	Reflection Plans	Exam Performance
1	 27 LOs	 27 LOs	 3 codes	 14 codes	 25 LOs
2	 26 LOs	 26 LOs	 6 codes	 12 codes	 24 LOs
3	 30 LOs	 30 LOs	 6 codes	 17 codes	 23 LOs

LO Self Rating		Reflection		Performance	
	No Resources		Ask		Proficient
	Some Resources		Check		Developing
	Need Practice		Create		Emerging
	Need Help		Logistics		Insufficient Evidence
	Not Sure		Metacognition		No Attempt
	No Rating		No Action		
			Practice		
			Review/Read/Research		
			Study		
			No Comment		

Case ABA
(Sp17)

Case
CFF
(Sp17)

Exam Period	LO Self Rating	Problem Set Performance	Reflection Actions	Reflection Plans	Exam Performance
1	 27 LOs	 27 LOs	 6 codes	 13 codes	 25 LOs
2	 26 LOs	 26 LOs	 5 codes	 20 codes	 24 LOs
3	 30 LOs	 30 LOs	 4 codes	 20 codes	 23 LOs

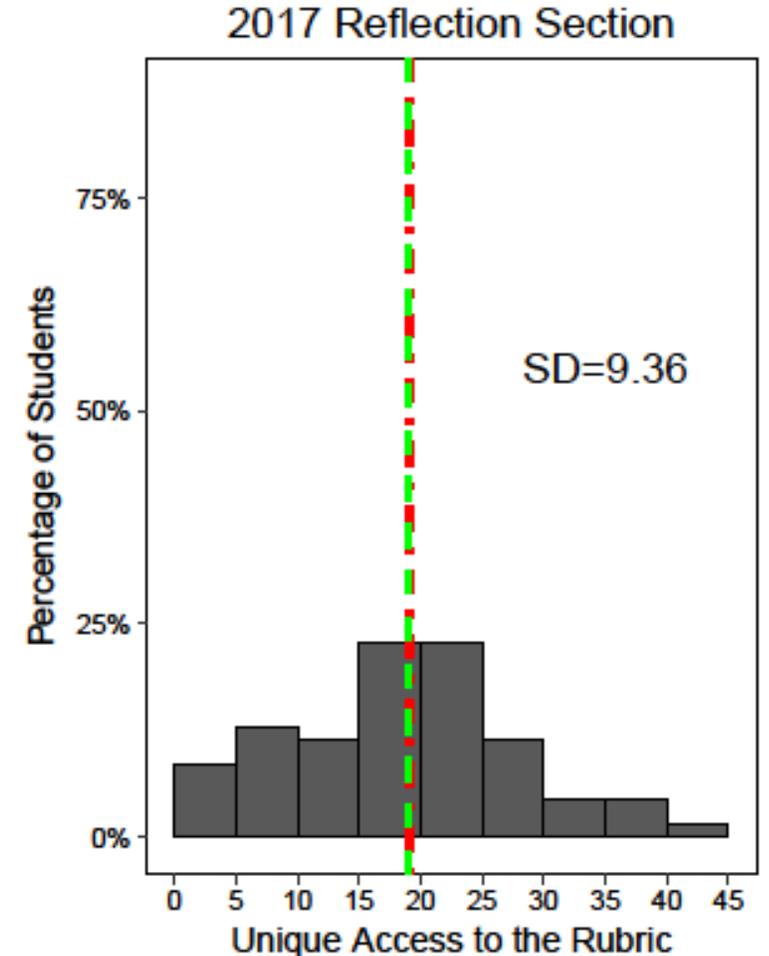
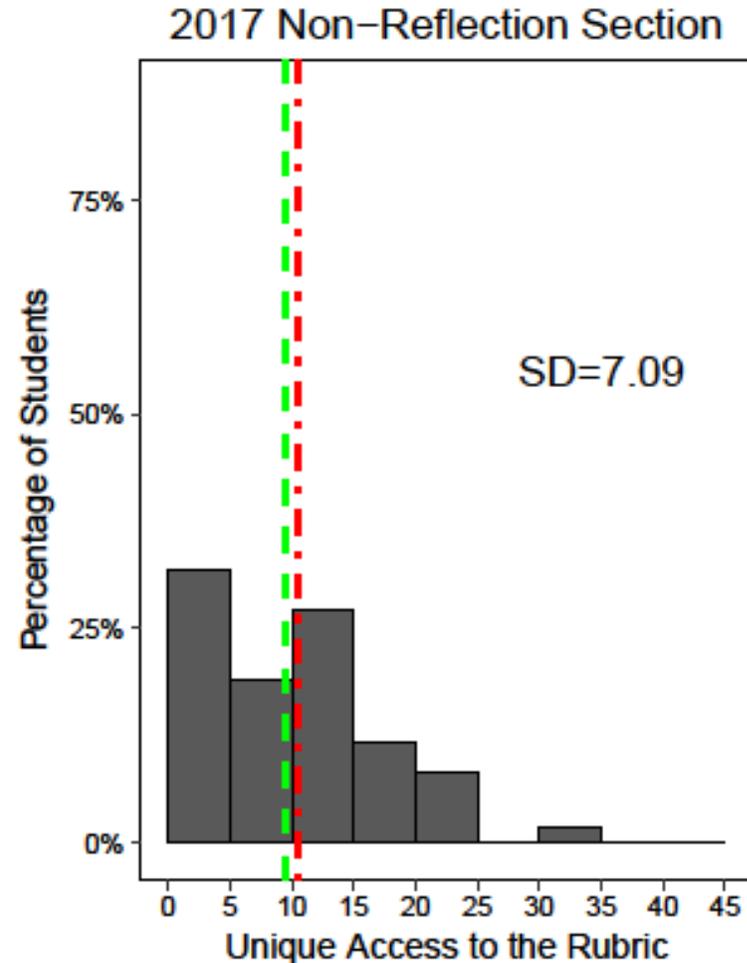
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	No Rating		No Action		
			Practice		
			Review/Read/Research		
			Study		
			No Comment		

Findings



Significant increase
in number of rubric
accesses when
weekly reflections
are done

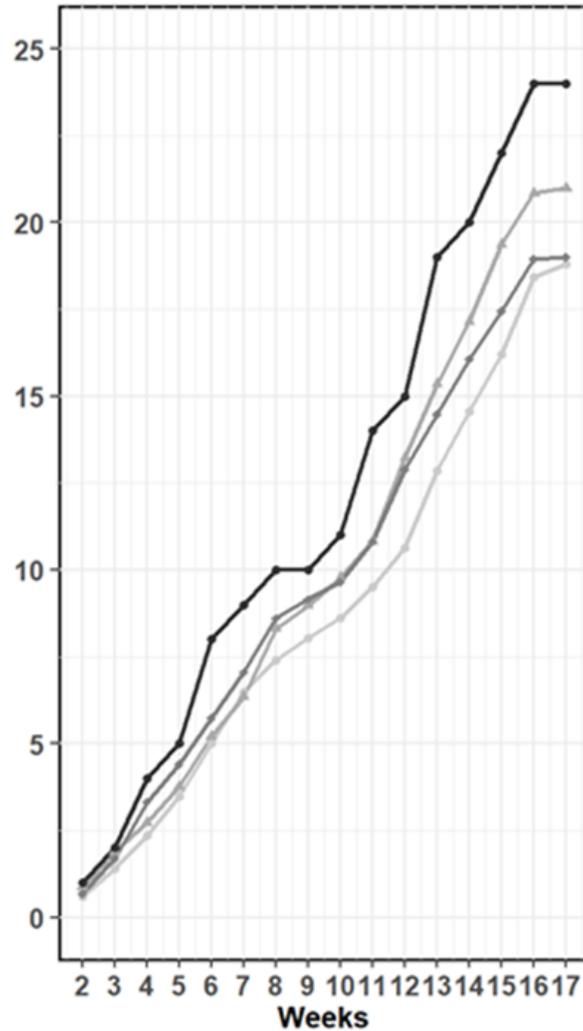
(Diefes-Dux & Cruz
Castro, 2018)



Findings

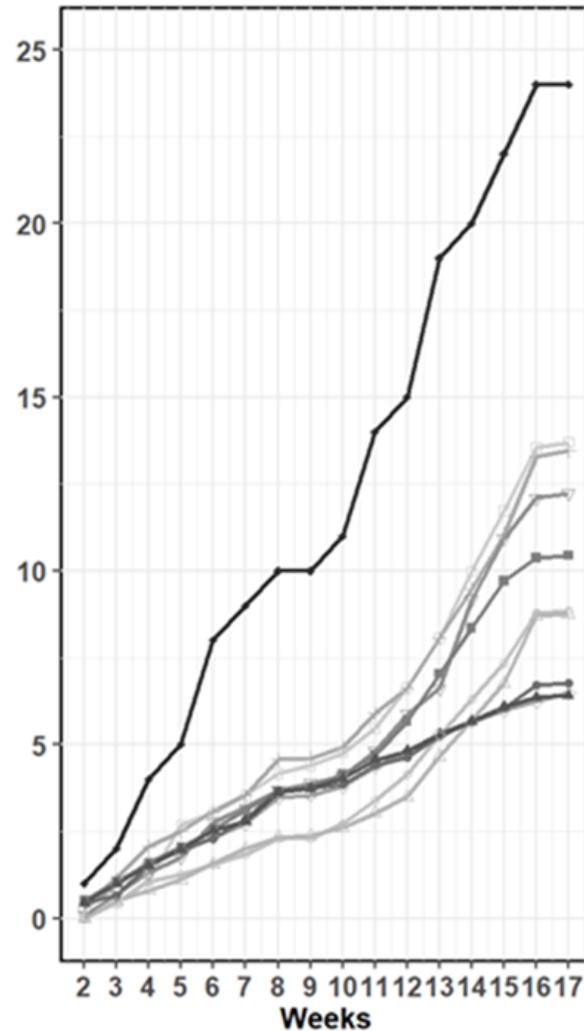


Reflection A



→ RA1 → RA2
→ RA3 → REF

Non-Reflection



→ NR1 → NR10 → NR2 → NR3 → NR4
→ NR5 → NR7 → NR8 → NR9 → REF

Student doing reflection reviewed feedback as it became available
(Diefes-Dux & Cruz Castro, in review)

Evidence that reflection can lead to desirable learning strategies – feedback seeking

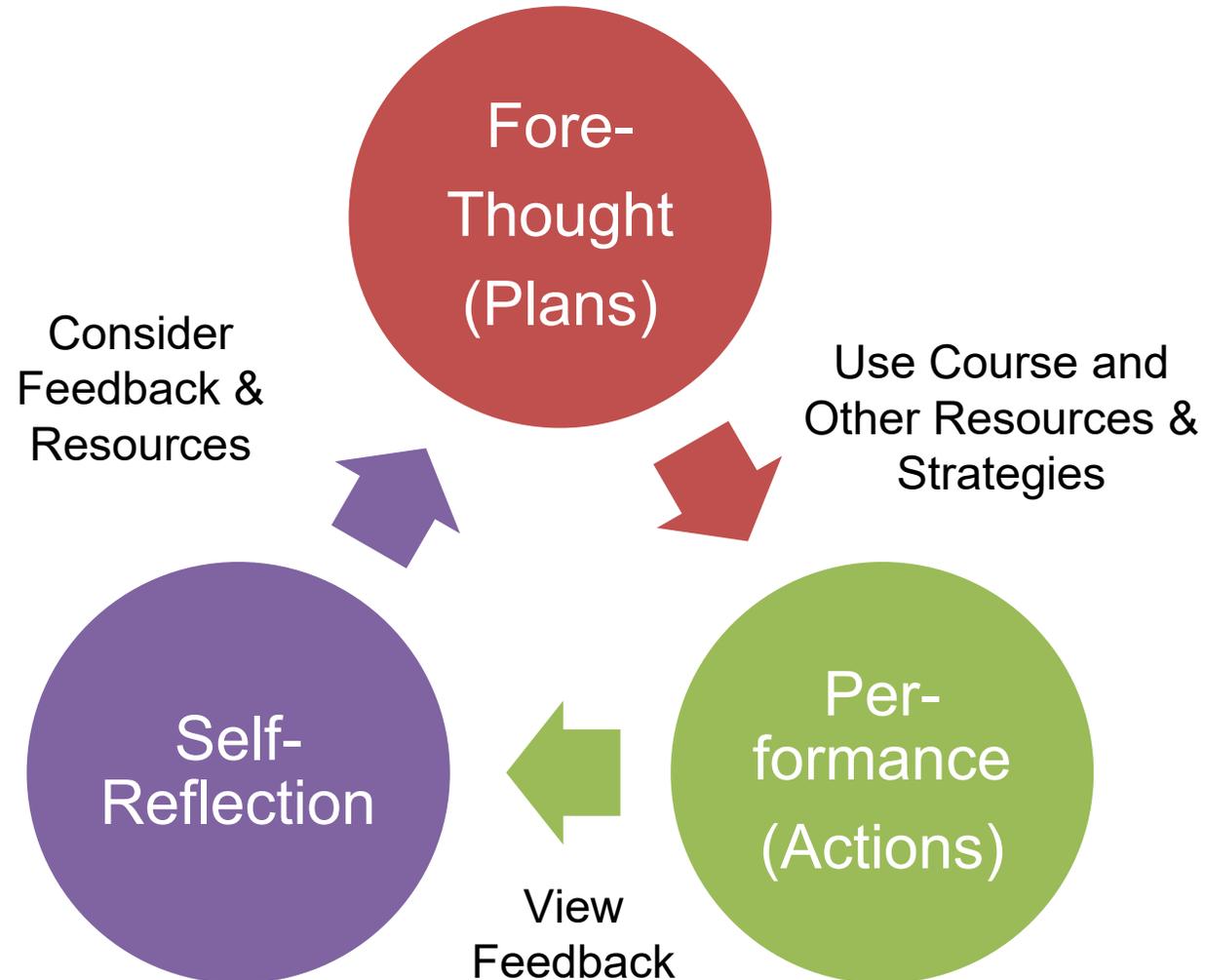
First-Year Students (2018) - Connecting Learning Strategies and Self-Regulation

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My Goal:

Improve depth of students thinking about their learn and orient them to a variety of resources (not just feedback) to help them improve



2018 Reflection Changes

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Related to Submitted Assignment

- While completing PS XX, what actions did you take to help you attain proficiency with the LOs? **Check all the apply. [e.g., Go to office hours]**
- Rate ability with recent learning objectives

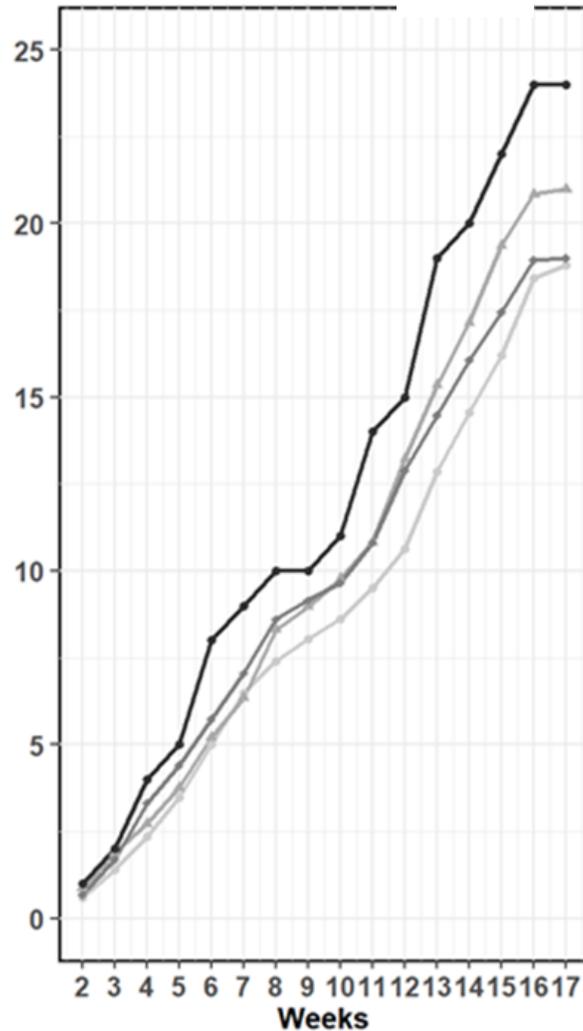
Related to Returned Assignment

- Considering the evidence of proficiency for the LOs, what is going particularly well for you? Be specific.
- Considering the evidence of proficiency for the LOs, what is particularly difficult for you? Be specific.
- What do you plan to do to improve your proficiency with the LOs over the next week? **Check all the apply. [e.g., Go to office hours]**

Findings

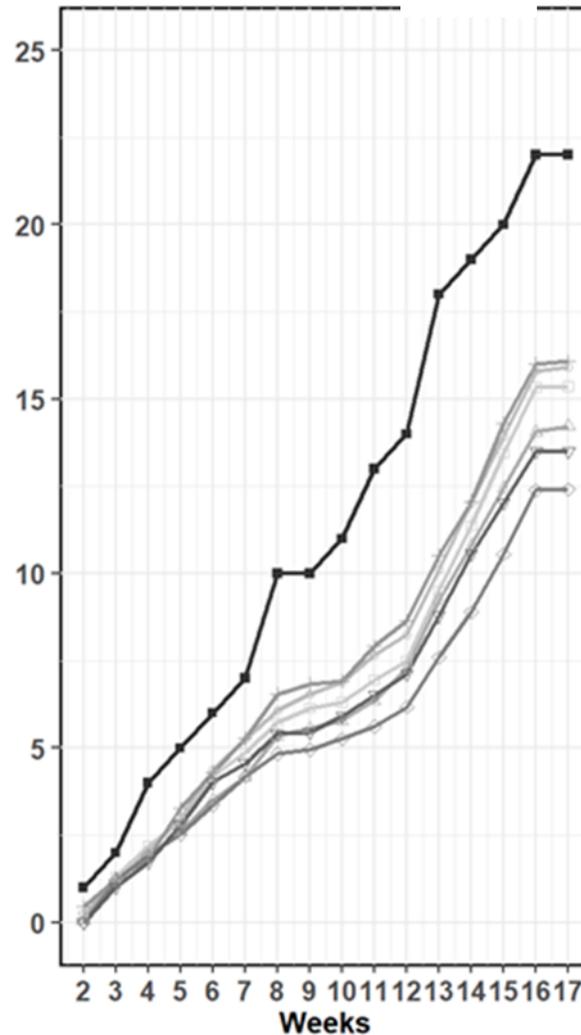


Reflection 2017



→RA1→RA2
→RA3→REF

Reflection 2018



→RC1→RC2→RC3→RC4
→RC5→RC6→REF

Students look at feedback less when not specifically direct to in reflection prompts

(Diefes-Dux & Cruz Castro, in review)

Need to be sure prompts are aligned to instructional goals.

Reflection in Upper-Division

Emphasis:

Think about their learning

Practice communicating new terminology and concepts

Junior Level Course: Professional Reflexivity for Lifelong Learning

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My Goal:

Have junior students identify their own problems and develop plans to improve their practice



Junior Level Course Reflections

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Class 1: Submit work

Class 2: Correct work & complete reflection

Reflection Prompts

- Rate ability with recent learning objectives
- For those learning objectives that you are not able to do on your own, **what do you plan to do to improve your abilities?** Refer to specific learning objectives and indicators of proficiency and be specific about your planned actions.

Reflection at Graduate Level

Emphasis:

Make sense of the course content

Practice communicating new terminology and concepts

Graduate Level Course:

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My Goal:

Have graduate students use the ideas discussed in class to make sense of their engineering education experiences

Reflection Prompted After a Topic

Examples:

- In what ways has the establishment of competencies ultimately impacted your experience in engineering education?
- Discuss your personal experience with these the broad engineering education goals of design, teaming, and diversity and inclusion and who has been responsible for educating you on these knowledge, skills, and abilities.
- In what two or three ways has the evolution of thinking about what and how design should be taught impacted your own engineering design education?
- How do you think or hope you might use your learning about the history of engineering education in the future?

Graduate Level Course:

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My Goal:

Have graduate students start to make sense of readings before class

Reflection Prompted By Weekly Readings

Instructions:

Center your reflection on what you feel is the “***single most important idea***” coming out of readings.

Personalizing - make a brief but explicit personal connection

- What surprised you and why?
- How does an idea in the reading confirm or conflict with your experience?
- How does this idea make you feel?

Internalizing – consider how the idea makes you think differently about your beliefs

- What do you believe with regards to this idea?
- Why do you believe this?
- How do the readings confirm or make you think differently?

Externalizing – considering how the idea will impact your practice.

- How *specifically* would you use this idea in your work?
- What might you create or change based on this idea?

Getting Started with Reflection

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1. Think through your students' stage of development as reflective practitioners
2. Think through your goals
 - What habits do you want your students to develop?
 - How do you want students to engage with the course material?
 - What do you want to learn about your students? [*Reflection is course data*]
3. Develop clear prompts that align to your goals
4. Be transparent with your students & place value on reflection
 - Explain why you are asking them to do it
 - Make reflection part of your course goals
 - Provide incentive for doing it (e.g., extra credit, part of course grade)

Syllabus Course Objective & Learning Objectives

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ABET Outcome 7: An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

At the conclusion of this course, you will be able to:

First-Year

- demonstrate habits of a professional engineer
(extra credit; up to 2% added to course grade)

Junior Level

- employ the habits of mind of a reflective practitioner (4% of course grade)

Graduate Level

- reflect on your engineering education experiences and future participation within in the field in light of its historical roots, current expressions, and future directions (8% of course grade)
- reflect deeply (personalizing, internalizing, externalizing) on new ideas in term of your current practices (10% of course grade)

Getting Started with Reflection

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5. READ your students reflections
 - Give feedback to help student improve their engagement in reflection
 - Talk about themes you are seeing in class
6. Engage in reflection yourself
 - Try out your own prompts (you'll find it's not so easy!)
 - Reflect on what worked and didn't work so your reflection intervention improves



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