

Faculty Participation in a Learning Community Improves STEM Student Success

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WHAT (Background/Materials)

- STEM educators receive relatively little formal training in teaching, and many lack skills in assessing student learning, and translating that assessment into effective changes to classroom practices.
- The CNSM at CSULB is currently undertaking a cross-discipline, STEM-specific faculty development project to empower STEM faculty to engage in active and effective pedagogical practices.
- The funding to create the CNSM FLC initially came from the Highly Valued Degree Initiative, with the goal to target faculty teaching low completion rate courses. It is currently supported by the College.
- Our preliminary results have been replicated in four completed cohorts, and suggest that STEM-focused FLC can directly affect the pedagogical practice of faculty participants and these guided changes can significantly impact student learning and engagement.



- Students Today**
 - Familiarizes faculty with the device-phillic millennial generation, i.e., how should we embrace technology in our own teaching?
 - Helps faculty see the connection between students' diverse backgrounds and various learning modalities.
- Assessment**
 - Tools and resources are provided to faculty in framing formative and summative assessments to determine (1) whether students are learning and (2) if specific pedagogical practices are contributing to students' learning.
- Student Engagement**
 - Provides methods on engaging students with STEM-specific case studies.
 - Provides research-driven literature on culturally responsive pedagogy in STEM learning.
 - Discusses the consequences of making substantial changes (e.g., flipped classes) and/or small modifications (e.g., replacing 15 minutes of lecture with group work) in classroom.
- Active Learning**
 - Defines the meaning of active learning and provides multiple STEM-specific examples.
 - Illustrates the utility of active learning in engaging Under Represented Minority students.
 - Provides information and local examples about service learning.

WHO (People Involved)

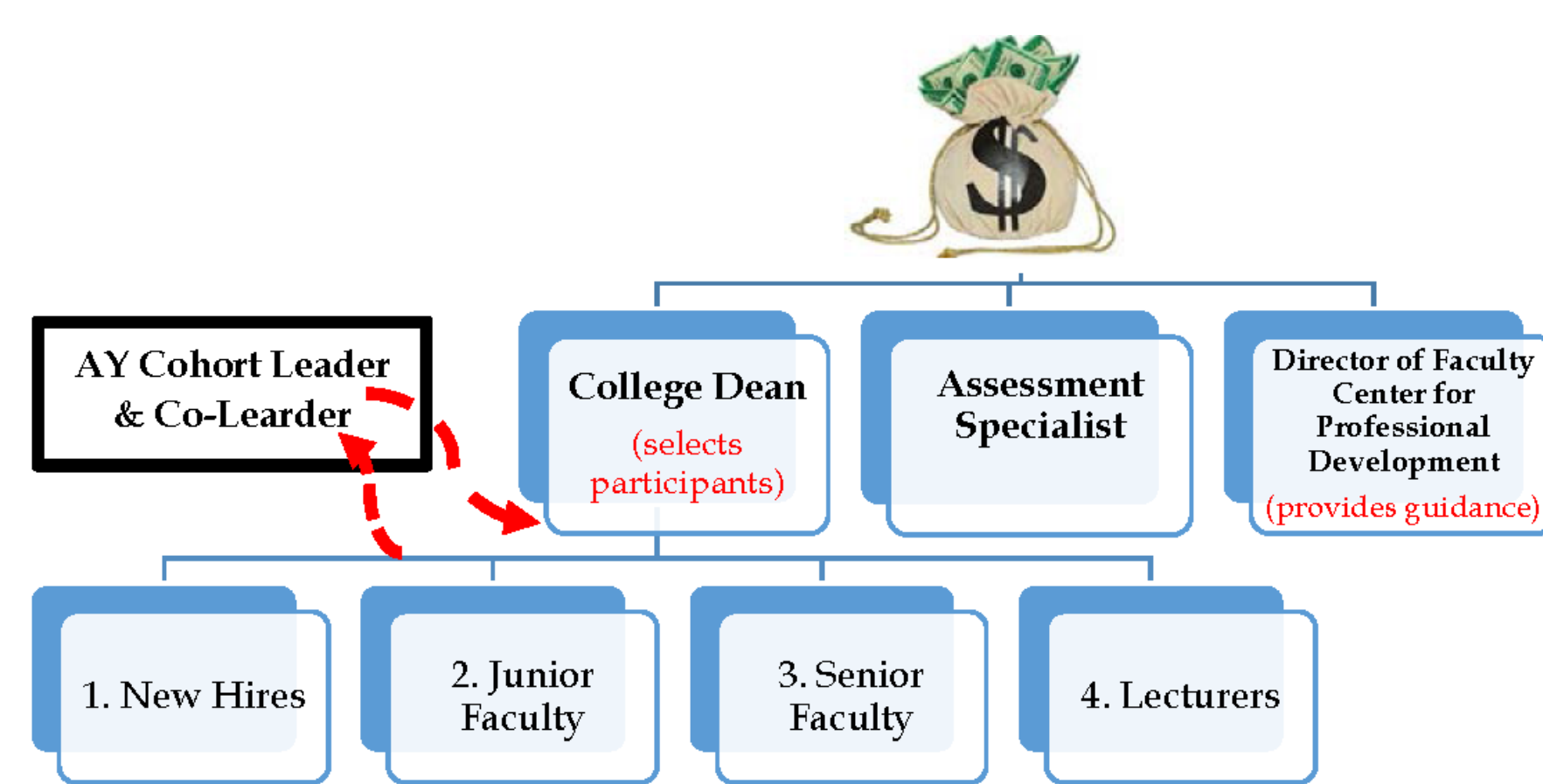


Figure 1: The hierarchy of the Faculty Learning Community at CSULB.

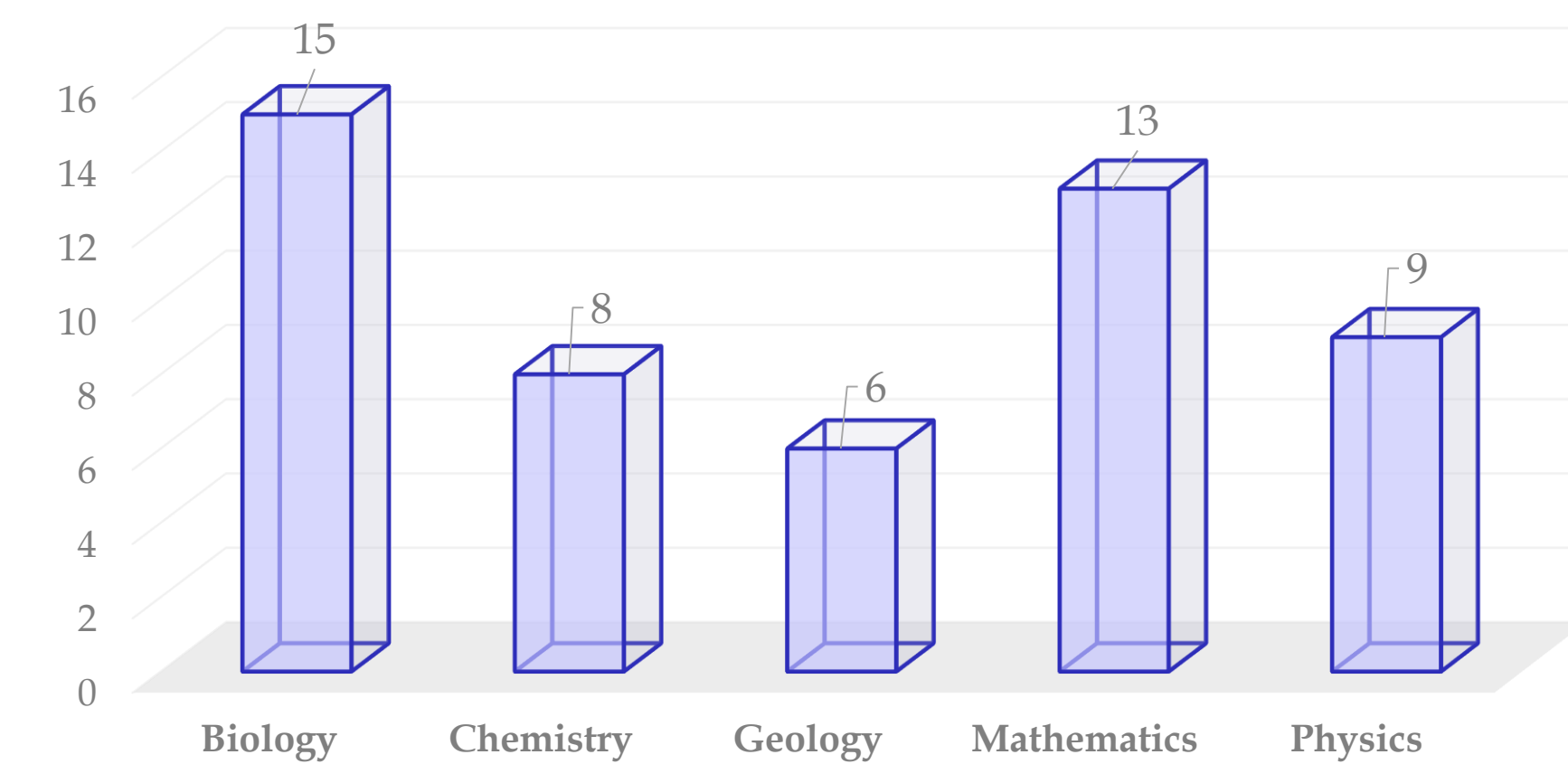


Figure 2: The total number of faculty members involved in the FLC by departments from Fall 2011 to Fall 2014.

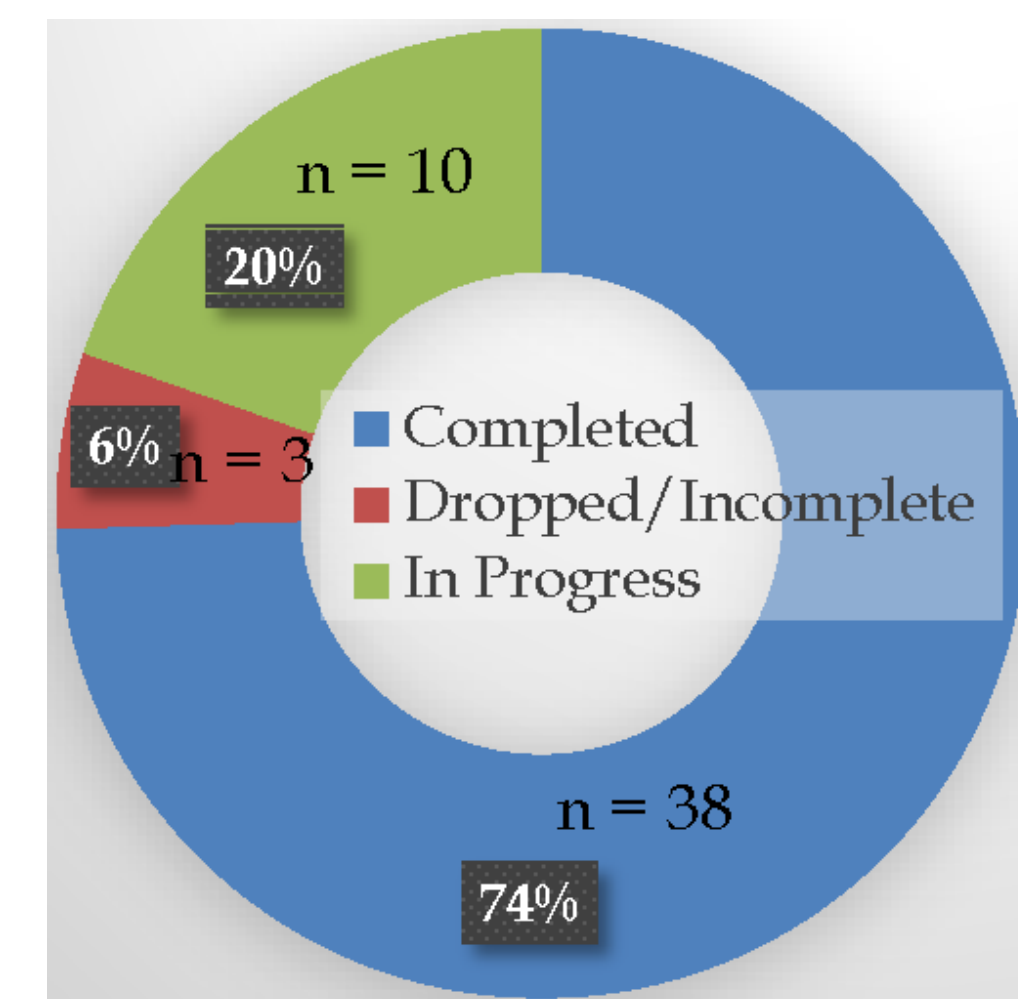


Figure 3: The status of the faculty members who were invited to participate in the FLC from Fall 2011 to Fall 2014. This includes 26% of our full-time faculty members in the CNSM.

WHEN (Timeline)

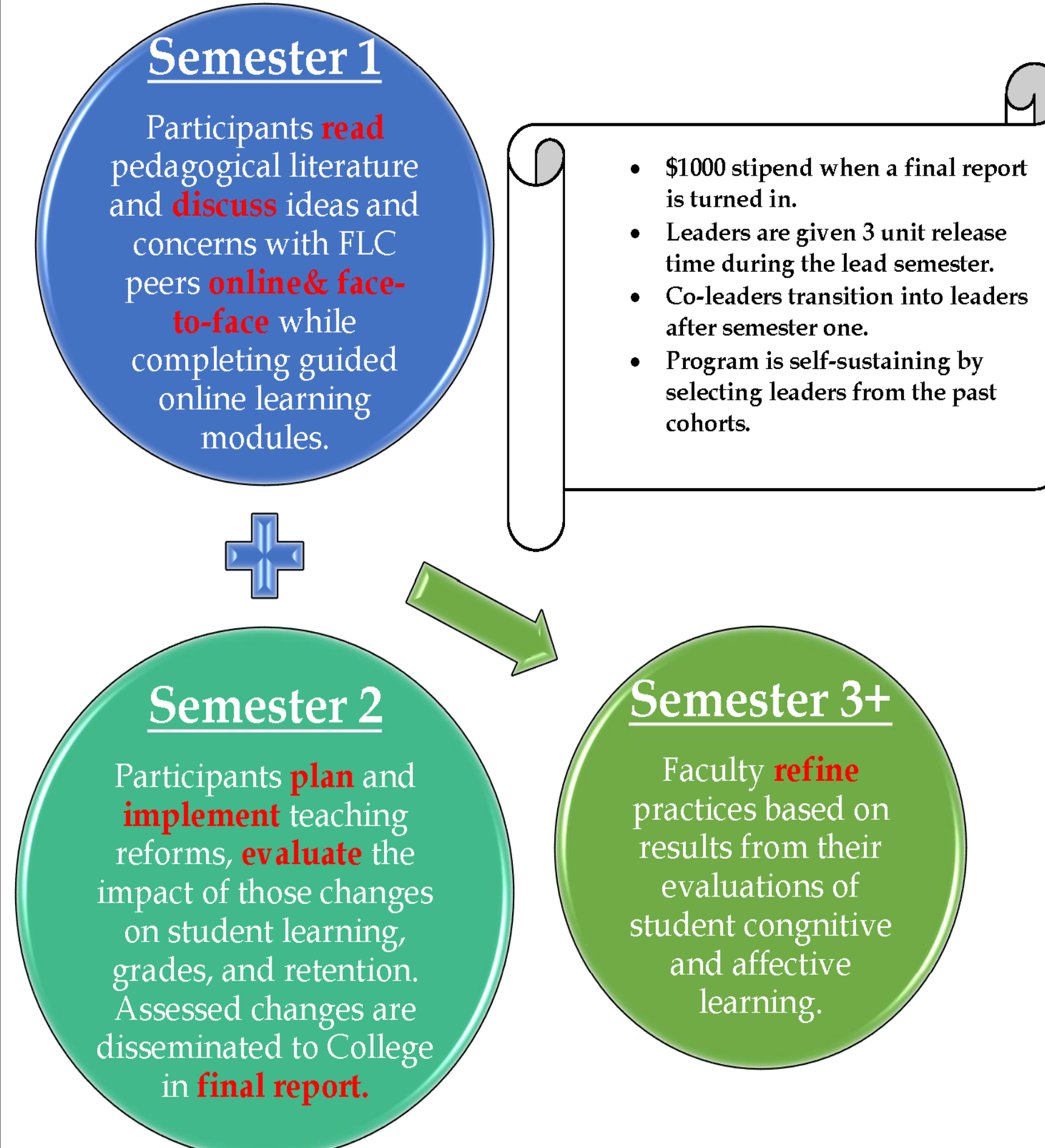


Figure 4: FLC unfolds over a minimum of 2 semesters with optional 3rd and 4th semesters for faculty who would like to become peer-leaders. Faculty are encouraged to disseminate their findings to a wider audience.

WHERE (Platforms)

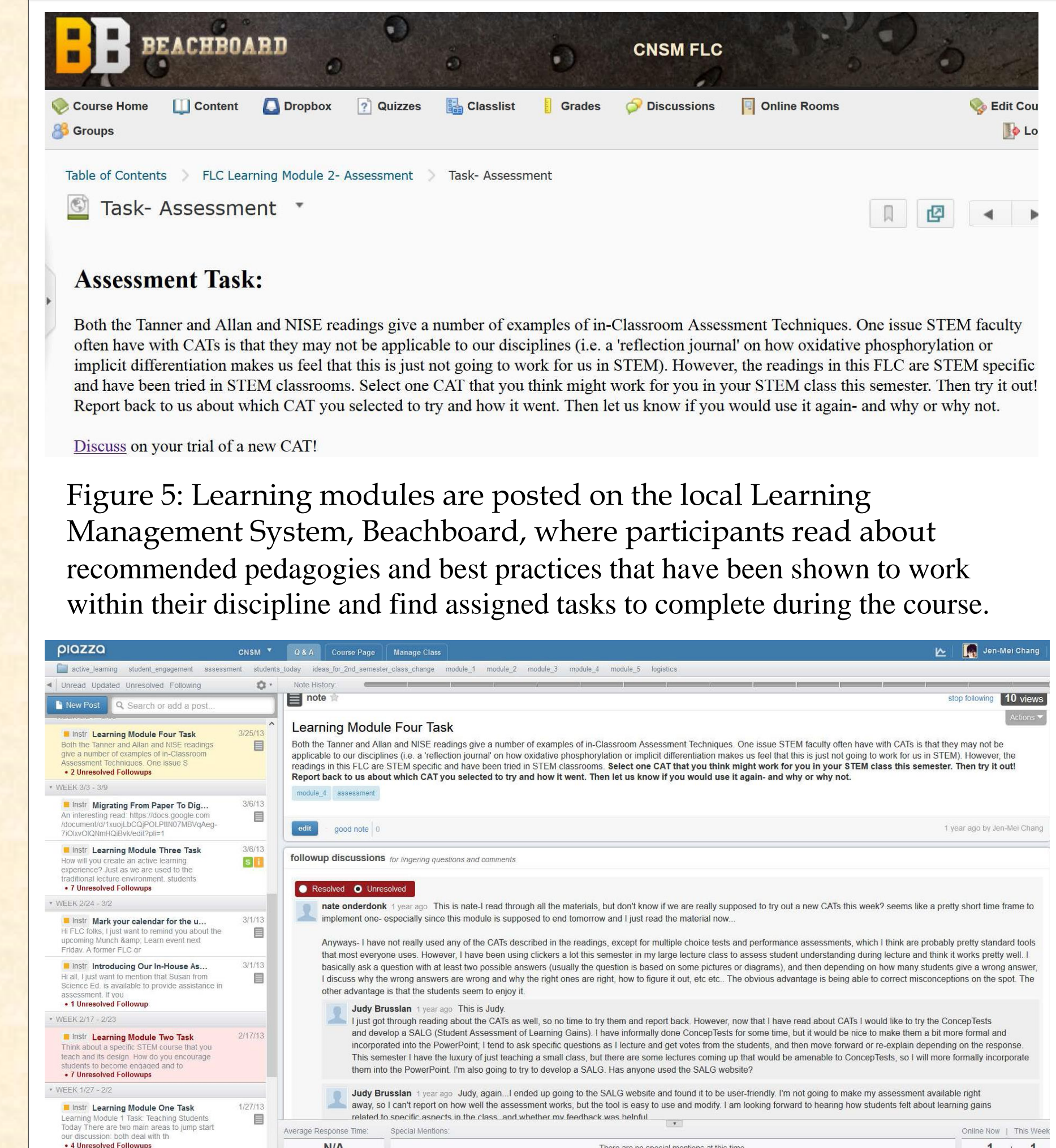


Figure 5: Learning modules are posted on the local Learning Management System, Beachboard, where participants read about recommended pedagogies and best practices that have been shown to work within their discipline and assigned tasks to complete during the course.

Figure 6: Online discussions are conducted through Piazza, an open source and interactive platform that facilitates real time and asynchronous interactions among participants.

SUMMARY

- The CNSM Faculty Learning Community surpassed conventional learning community outcomes using the novel two-semester format where faculty members apply what they have learned.
- Incorporating multiple peer leaders not only legitimizes the goals of the FLC, but also fosters leadership skills among CNSM faculty members.
- Completing the two-semester FLC enhanced student success (grades, exam scores, student affect towards subject), increased how faculty members viewed teaching, and fostered a sense of community across departments within the college.

RESOURCES

- Teaching & Learning @ The Beach:
<http://www.csulb.edu/colleges/cnsm/learning/>
- Timetable and responsibilities of the cohort leader:
http://www.csulb.edu/~jchang9/flc_leader_coleader_tasks.html
- For more information, please contact Jen-Mei Chang via jen-mei.chang@csulb.edu

IMPACTS & RESULTS

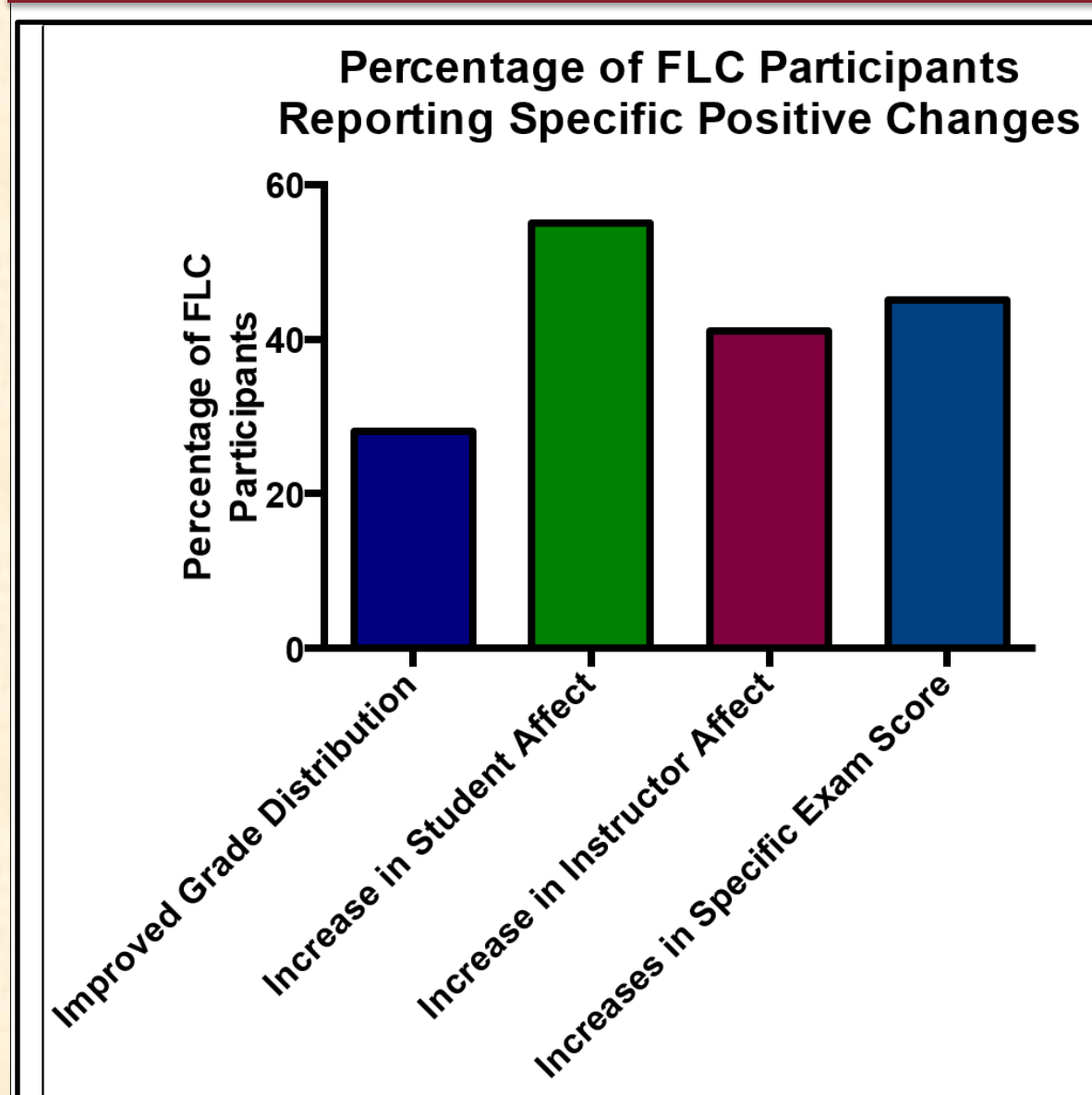


Figure 7: Of the 38 members who have completed the FLC, 32% observed a + shift in their final grade distribution. Affects on students' view towards learning STEM in restructured courses increased by about 54%. 38% of participants reported a strong increase in their own affect towards teaching. Not all faculty members compared individual exam scores; however 41% of the participants reported an ↑ in exam scores for both classroom and standardized tests administrated in the restructured course.

FLC participants have collectively modified **28 individual courses**, ranging from remedial mathematics to senior and graduate level courses in hydrogeology.

Many FLC participants related of feeling **less isolated** and more **connected** to both their colleagues and their students.



Figure 8: A college-wide **Munch And Learn** was a by-product of the successful FLC where faculty in the college gather on a Friday afternoon to share ideas about best teaching practices and catch up with one another. (Photograph was taken in an Active Learning Classroom.)

Jen-Mei Chang + FLC + MATH {224, 247} = ↑ {pass rates, exam scores, satisfaction}

collaborative learning & instant instructor-to-student and peer-to-peer feedback

reinforce conceptual understanding & logical reasoning

P. Rate	T1	T2	Final	M247	Overall
Fall11 (s8)	62	62	62	58	62
Sp12 (s8)	68	70	77	76	64

1. (5 points) This question concerns the concept *linear combination*.

(a) Forget about the notations. In your own words, tell me what *linear combination* means to you.

(b) Let $u = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$ and $v = \begin{bmatrix} -3 \\ 1 \end{bmatrix}$. Give three vectors that can be written as a linear combination of u and v . How many more can you give?

(c) If we restrict the vectors that we can write as the linear combinations of u and v , what do we get? Why?

(d) Is $b = \begin{bmatrix} 4 \\ 1 \end{bmatrix}$ a linear combination of u and v ? Why or why not? Can you give a linear combination of u and v that is not a linear combination of u and v ? Why or why not?

(e) Give an example of x, y, z , all elements of \mathbb{R}^3 , such that z is *not* a linear combination of x and y . Justify your answers.

(f) Discuss what you learned from this exercise.