

# How do entry-level biology students learn and succeed at UC Merced ?

Sarah S. Abboud

Liza Gómez Daglio

# Overlook

- Background
  - UC Merced students population
  - Contemporary biology I
  - Learning modalities
- Goals
- Methods of assessment
- Results
- Main conclusions

## • Demographics

- ❖ 58.8% are first generation college goers (UCM IPA 2012)
- ❖ 56% of students reported communicating often with the instructor about grades or assignments (UCM IPA 2010 BCSSE; UCUES Surveys 2012)



<http://studentsfirst.ucmerced.edu>

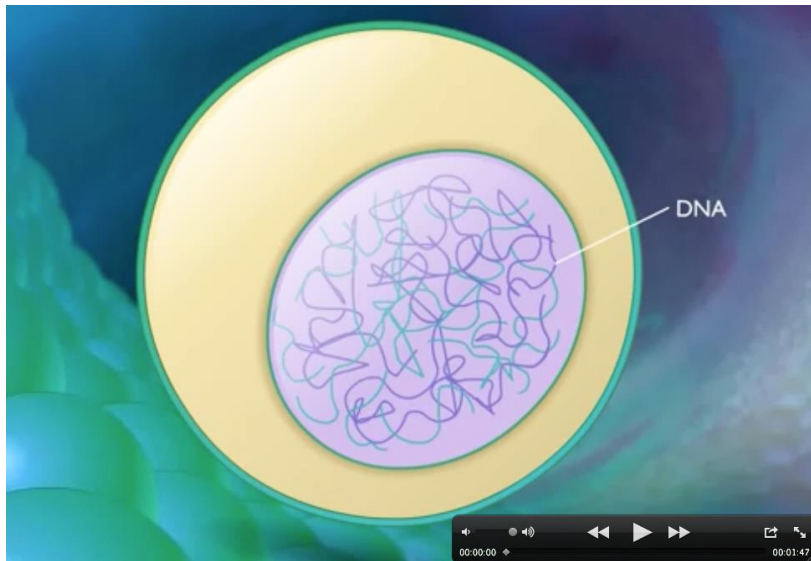
## ● Contemporary Biology

- ❖ Entry-level, 3 credits (9 hours per week)
- ❖ Spanning 49 chapters.  
Book “Life: The Science of Biology” (Sadava et al. 9<sup>th</sup> ed.)
- ❖ Main learning outcome  
Recognize the relationship between structure and function at all levels: molecular, cellular, organism, and community.
- ❖ Main program learning outcome  
An **understanding of the tenets of modern biology** and an understanding of how cellular functions are integrated from the molecular level to the cellular level, through to the level of organism and functioning ecosystems.

# • Learning Modalities

Background

- 1) Auditory
- 2) Kinetic
- 3) Visual



Learner-centered styles

Felder & Silverman 1988  
Dodson & Shimamura 2000

Is student preparation effective  
without intervention?

Do students recognize how they  
best learn?

Which learner-center activity is  
most effective?

# Objectives

- (a) to identify which learner-centered activities are most effective in teaching entry-level biology
- (b) to help students recognize their learner type.



# Methods

- 3 time-point surveys: entry, mid-semester, and final

## ENTRY

- Major
- Why take BIO 1?
- Desired grade
- Language
- What learner type are you?

## MID-SEMESTER

- Expected grade
- Actual grade
- What learner-center activity helped most?

## FINAL

- Expected final grade
- What learner type are you?



# Methods

- Sample size (N=146 students in 6 discussion sections [13-30 students])
- Two TA's (each taught 3 sections)
- Each week:

Entry  
Assessment  
(15min)

Learner-  
centered activity  
(25 min)

Exit  
Assessment  
(5-10 min)

# Methods

Entry  
Assessment  
(15min)

- Each week:

## Example of Lesson Plan

My lesson's highlighted technique will be **'visual'**.

### **Related Course Learning Outcomes:**

- Today's lesson will help my students to meet these specific course outcomes
  - Recognize the relationship between structure and function at all levels: molecular, cellular, organism, and community.
  - Describe the flow of genetic information, the chromosome theory of heredity and the relationship between genetics and evolutionary theory.
  - Students will be able to identify the taxonomy and phylogenetic relationships of the major groups of organisms.
  - Diagram and explain the major cellular and/or systemic processes.

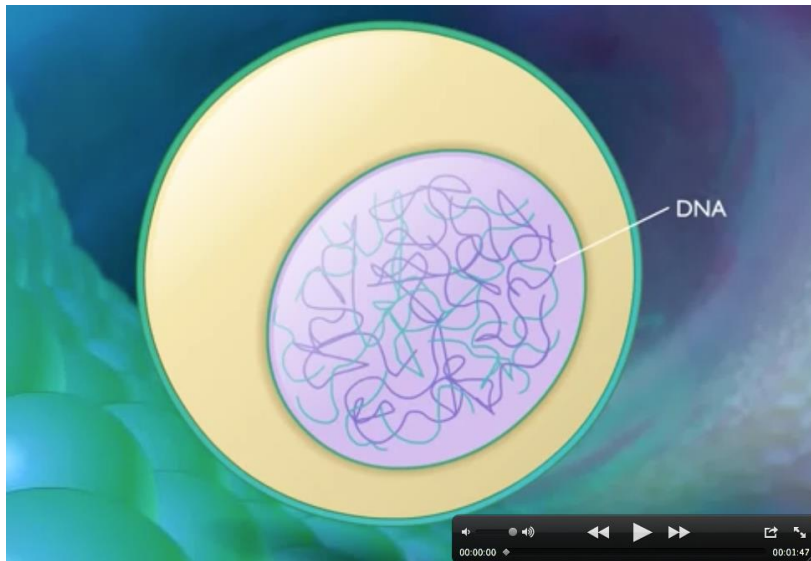
### **Lesson Plan**

- Administer quiz # 3 (10 mins)
- Divide students into groups of 4 (1 min)
- Go over quiz # 3 answers (5 mins)
- Students will be working on a prompt regarding a topic from either chapter 4, 5, or 6 (~25 mins)
- Exit Assessment

# ● Learning Modalities

Background

- 1) Auditory
- 2) Kinetic
- 3) Visual

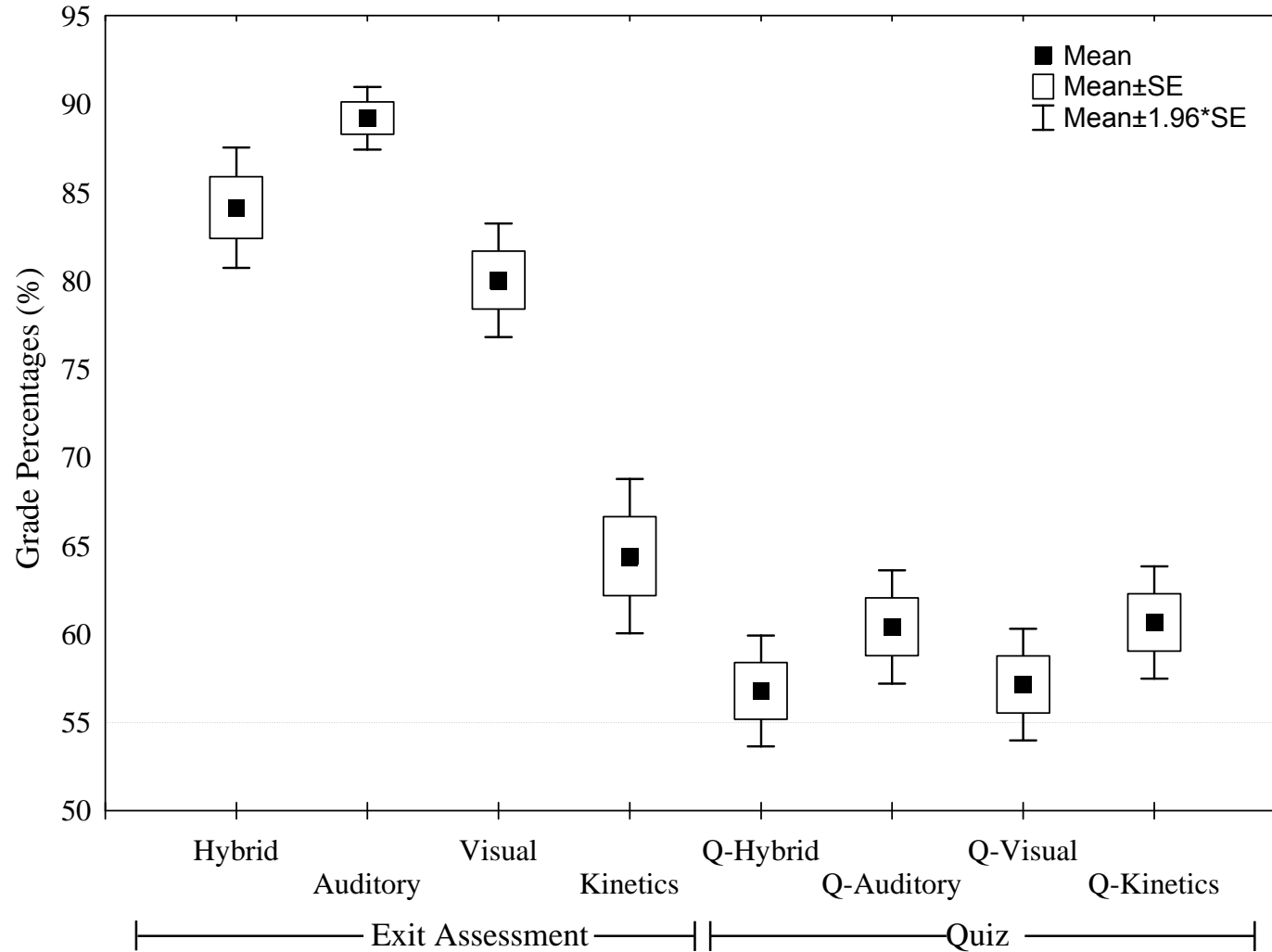


Learner-centered styles

Felder & Silverman 1988  
Dodson & Shimamura 2000

## Is student preparation effective without intervention?

Direct evidence



# Results

Do students recognize how they best learn?  
Which learner-center activity is most effective?

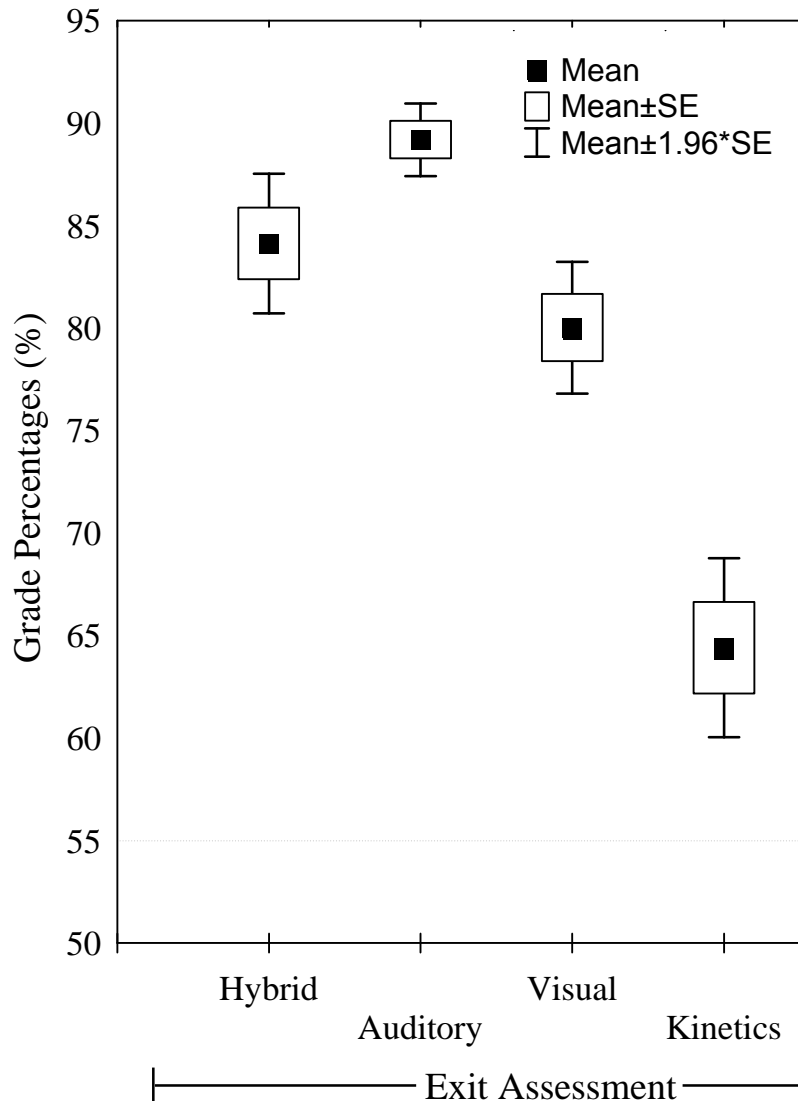


Table 1. Percentage of students who classified themselves as learning best through Auditory, Visual, Kinetic, or Hybrid techniques (N=146).

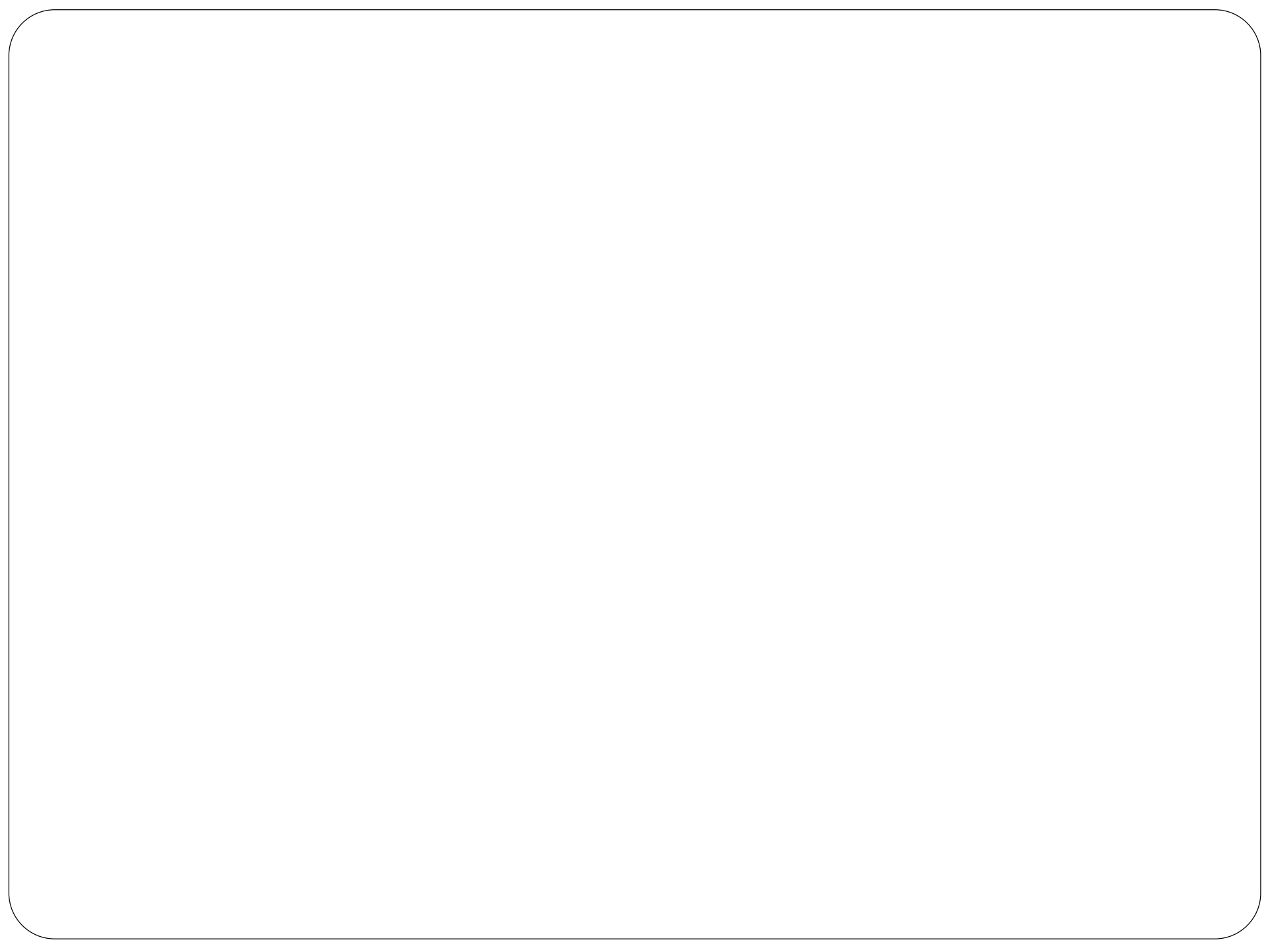
Activity	Entry	Mid	Final
Auditory	17.5	20.5	23
Visual	44	33.8	44.6
Kinetic	38.5	19.7	32.4
Hybrid	-	26	-

# Conclusions

- UCM student are **not prepared** for their courses and need significant intervention to succeed.
- Students only **slightly** became more aware of their learning preference.
- Effectiveness of learner-centered activity **depends on content**
- **If the curriculum and course outcomes remain the same,** there should be more auditory and hybrid learner-centered activities in discussion and lecture.

## Acknowledgements

- UC Merced Council of Graduate Schools: Undergraduate outcomes Assessment: Pedagogy and Program Planning
- UC Merced CGS support staff
- Faculty Advisor: Christopher Swarth
- CRTE
- SATAL





# Learning outcomes

- Learning Outcomes for Bio 001 (\*numbers referenced in timetable above)
  1. Recognize the relationship between structure and function at all levels: molecular, cellular, organism, and community.
  2. Describe the flow of genetic information, the chromosome theory of heredity and the relationship between genetics and evolutionary theory.
  3. Students will be able to explain the role of natural selection in the development of life on Earth.
  4. Students will be able to identify the taxonomy and phylogenetic relationships of the major groups of organisms.
  5. Students will recognize the ecological relationships between organisms and their environment.
  6. Diagram and explain the major cellular and/or systemic processes.
  7. Describe the underlying concept of homeostasis and the interconnections among physiological systems
- Your undergraduate learning outcomes: Program Learning Outcomes for the Biology Major Graduates from the Biological Sciences programs will have demonstrated:
  1. An understanding of the tenets of modern biology and an understanding of how cellular functions are integrated from the molecular level to the cellular level, through to the level of organism and functioning ecosystems.
  2. An ability to develop and critique hypotheses and to design experiments, models, and/or calculations to address these hypotheses.
  3. The ability to use appropriate instrumentation and computational tools to collect, analyze and interpret data.
  4. The ability to read, evaluate, interpret, and apply numerical and general scientific information.
  5. A familiarity with and application of safety in good laboratory and field practices.

## Is student preparation effective without intervention?

Indirect evidence

