

# Assessing Scientific Literacy and Applied Anatomy across the Biology Curriculum

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## Biology Department

- 35 faculty members
- 126 undergraduate students
  - 103 enrolled in Biology BS program
  - 23 enrolled in Biology BA program

## Biology BS/BA Program Outcome Assessed

By the end of their degree, students will be able to **analyze and synthesize** advanced concepts and demonstrate implicit knowledge and understanding in at least one major sub-field of biology.

## Background

- We wanted to evaluate both the **theoretical and practical** knowledge of students.
- **Scientific literacy** emphasizes “students’ abilities to make use of scientific knowledge in real-world situations.” (Gormally et al., 2012).
- **Practical examinations** in anatomy courses test students’ abilities to “relate clinical and functional anatomical knowledge with 3D examples” of structures on dissections and models (Yaqinuddin et al., 2012).

## METHODOLOGY

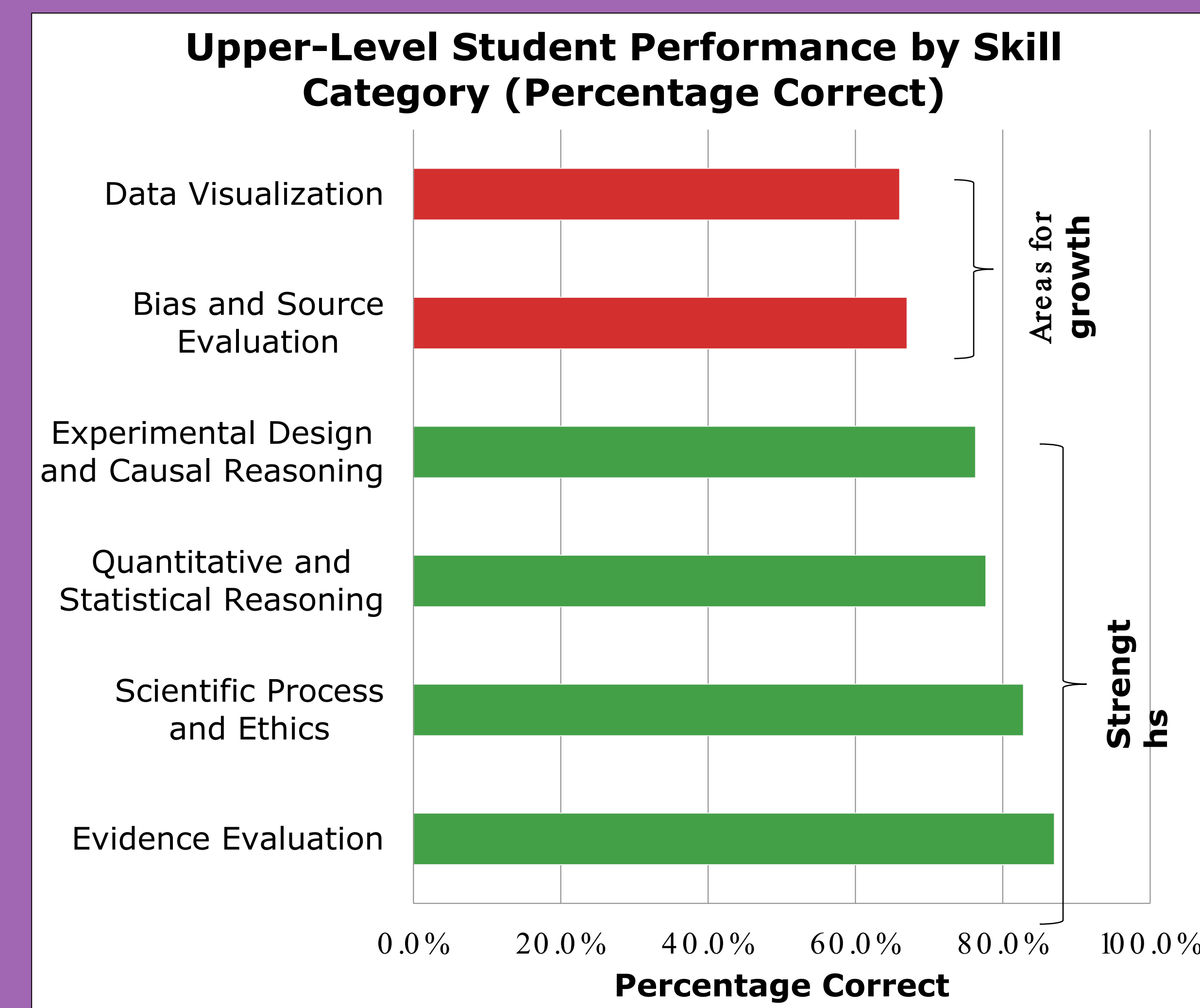
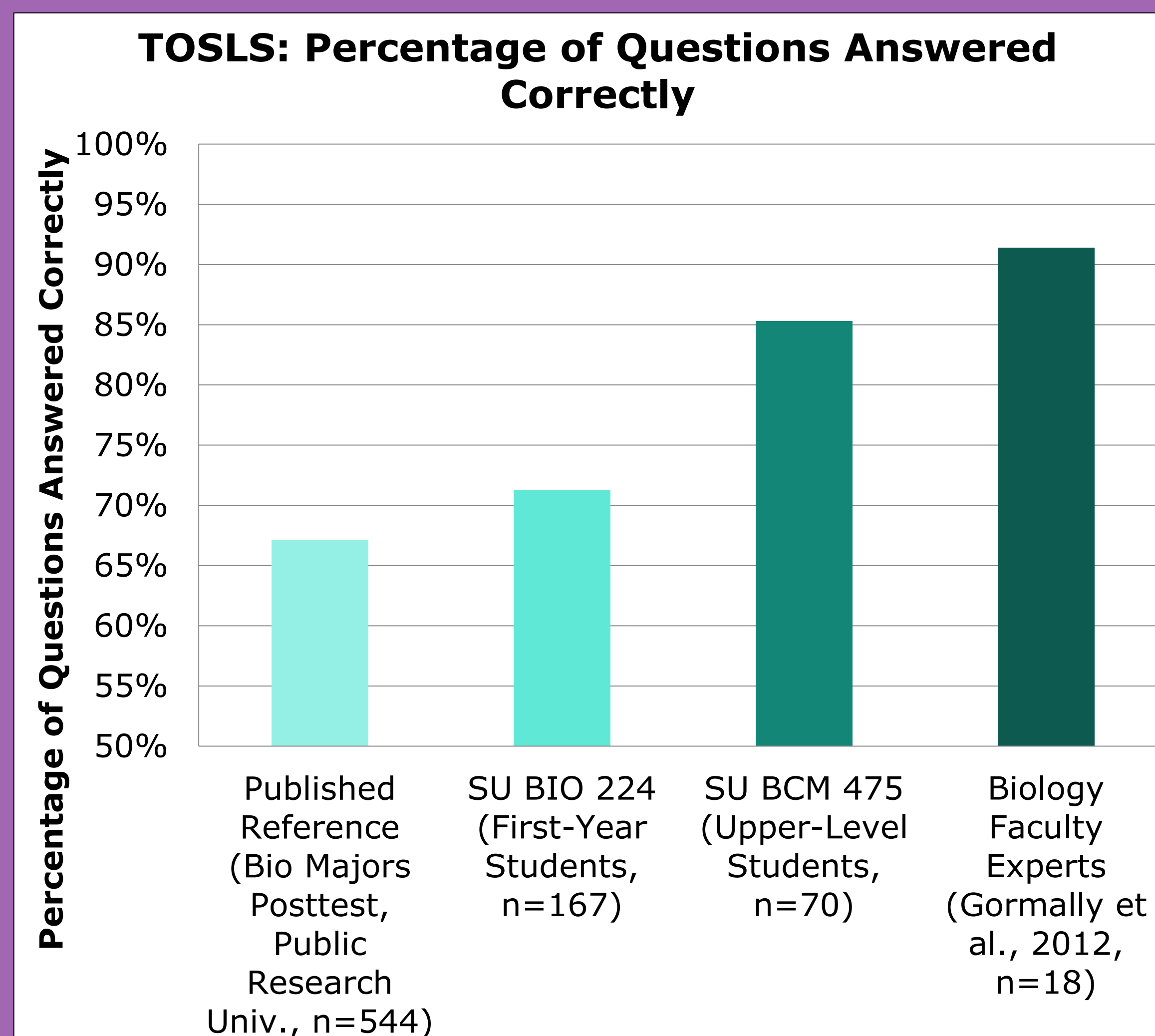
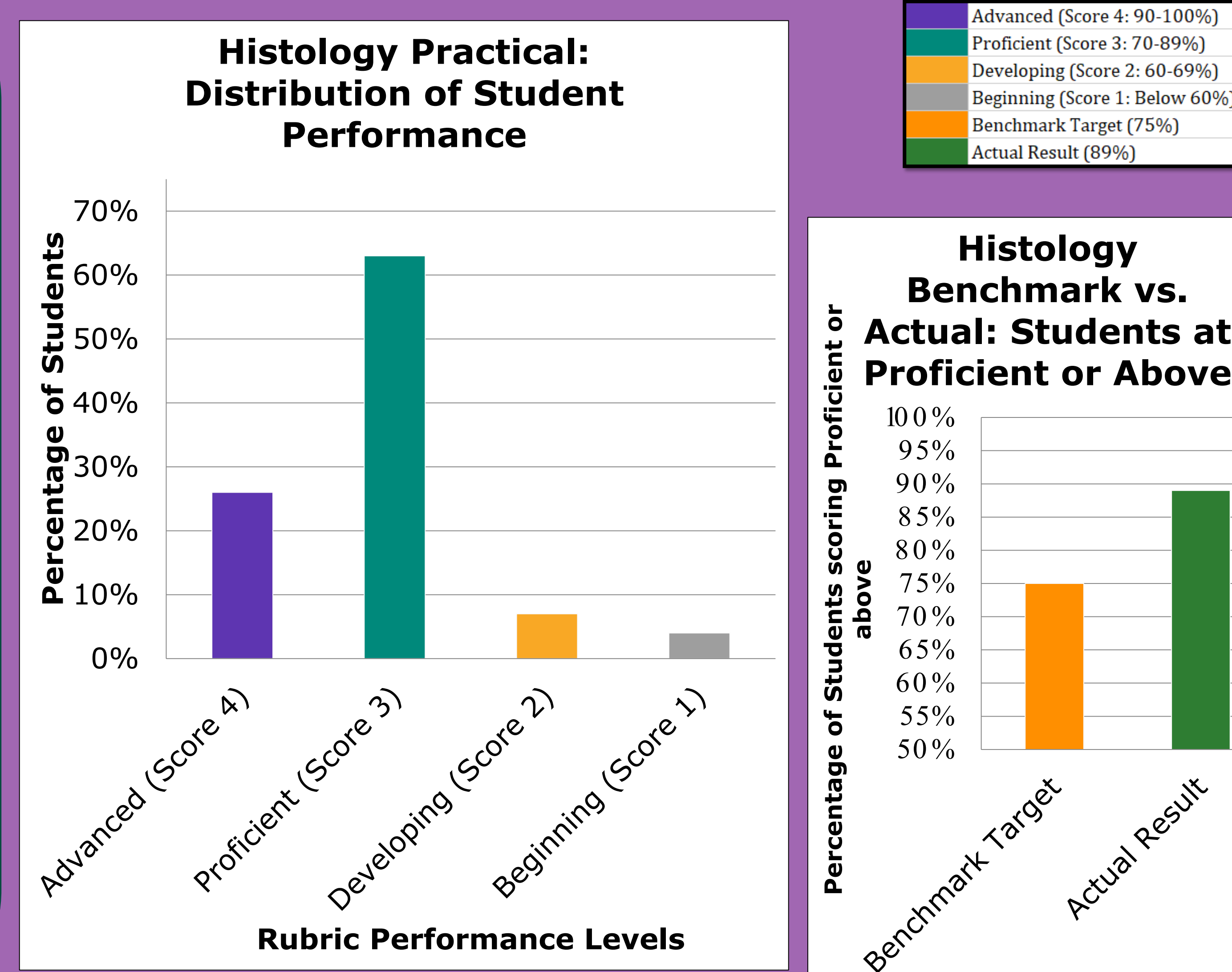
### Assessment Design

- **Test of Scientific Literacy Skills (TOSLS; Gormally et al., 2012)**, which includes categories under two broad themes:
  - *Understanding methods of inquiry that lead to scientific knowledge*
  - *Organizing, analyzing, and interpreting quantitative data and scientific information*

**Takeaway:** Assessments measuring students’ scientific literacy and practical anatomy knowledge demonstrate the Biology BA & BS curricula effectively build analytical and synthetic thinking.

## Assessment Benchmarks:

1. **TOSLS:**  $\geq 80\%$  of questions show 10% improvement when administered in upper-level course (BCM475) compared to lower-level course (BIO224)
2. **Histology Practical Exam:** At least 75% of students score  $\geq 3$  (Proficient) on the four-point rubric



✓ **Both assessment benchmarks were achieved.**  
 First-year students already outperform published reference data, and upper-level students approach faculty expert-level performance on the TOSLS.

Gormally, C., Brickman, P., & Lutz, M. (2012). Developing a test of scientific literacy skills (TOSLS): Measuring undergraduates’ evaluation of scientific information and arguments. *CBE—Life Sciences Education*, 11(4), 364-377.  
 Yaqinuddin, A., Zafar, M., Ikram, M. F., & Ganguly, P. (2013). What is an objective structured practical examination in anatomy?. *Anatomical sciences education*, 6(2), 125-133.

## Assessment Design

**Histology Practical Exam:** Evaluates students’ ability to identify tissue types from microscope slides they have not previously seen, explain structure-function relationships, and determine anatomical location based on tissue characteristics

### Advanced (4)

90-100%

### Proficient (3)

70-89%

### Developing (2)

60-69%

### Beginning (1)

Below 60%

## Sample Overview

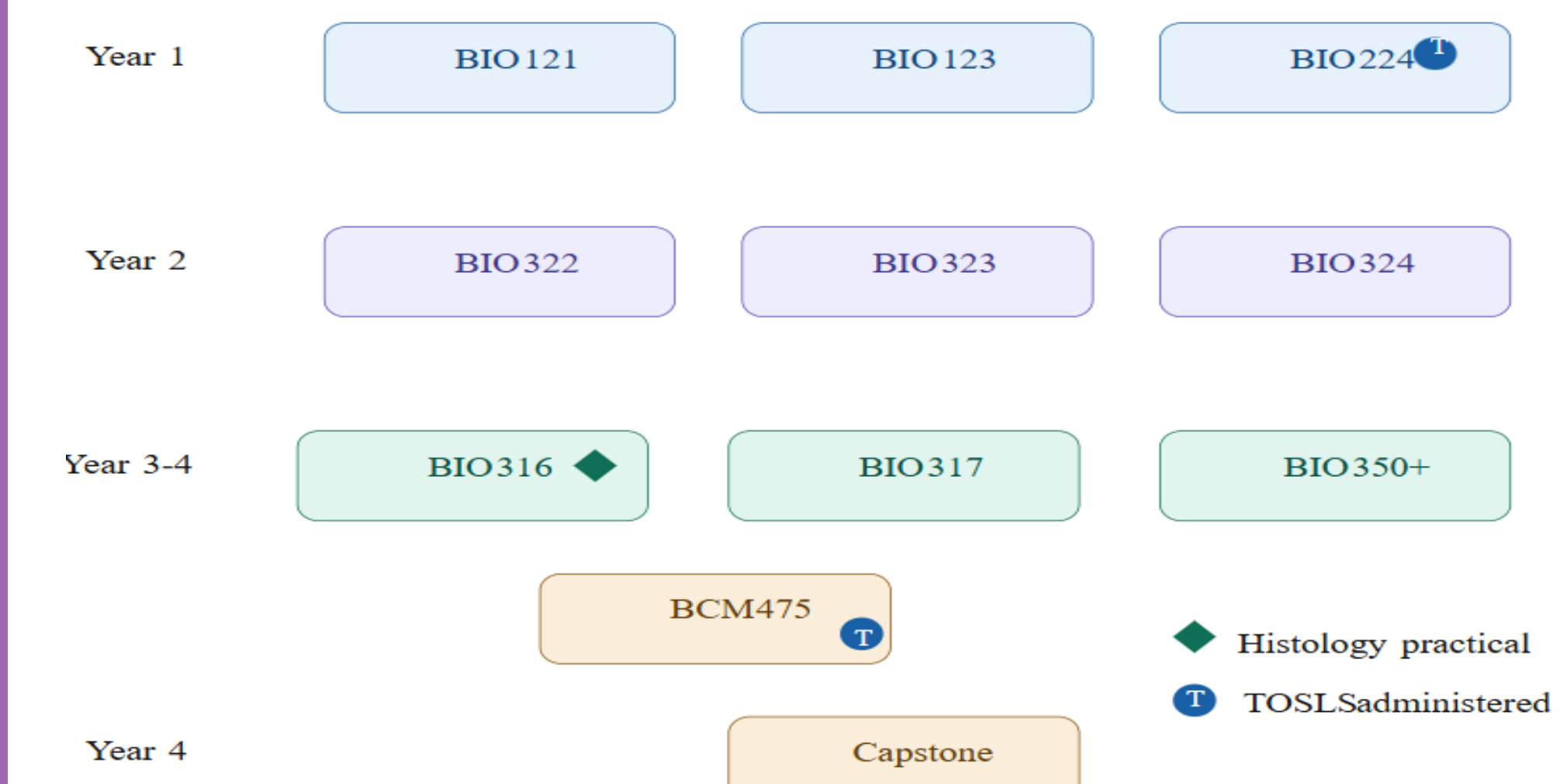
### TOSLS in BIO 224 (Integrative Biology Lab) & BCM 475 (Biochemistry 1)

n = 167 students from BIO 224  
 n = 70 students from BCM 475

### Histology Practical Exam in BIO 316 (A&P 1):

n = 46 students

## Curriculum Map Snapshot (BS & BA)



## Action Plan & Next Steps

- Integrating case-based information literacy modules in 300-400 level courses on commercial bias, publication bias, and source classification. (*In progress*)
- Developing student guidelines for evaluating the strength of scientific evidence. (*In progress*)
- Including graphical reasoning in 200-level labs in which students have opportunities to create visualizations, justify format choices, and compare representations. (*In progress*)
- Gathering additional data to capture program-level identifiers (major, class standing) and to explore broader TOSLS administration across all graduating biology majors. (*Due AY 2025-2026*)
- Revising the measurement process to build infrastructure to capture assessment data separately by degree track (BS vs. BA). (*Due AY 2025-2026*)