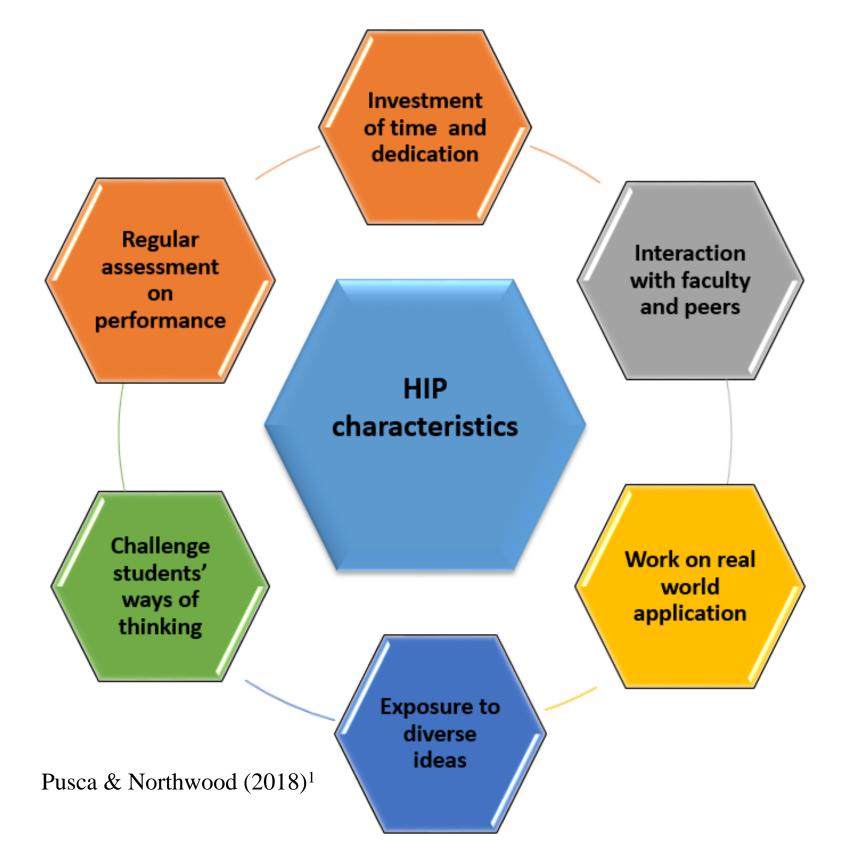




The Cotton Uncharacterized Protein Annotation Course-based Undergraduate Research Experience (CUPA-CURE) engages students in an authentic research experience that contributes to the functional characterization of the cotton genome by manually annotating cotton proteins of unknown function.



As a characteristic High Impact Practice (HIP), this CURE provides students with benefits such as increased engagement and confidence in the field while at the same time developing subject-specific skills in bioinformatics and literature review.

Learning Objectives address recommended subject-specific content in molecular biology (Structure and Function Core Concepts from AAAS 'Vision and Change^{'2),} core competencies in bioinformatics (Core Competencies 1, 2, 4, 5, 8 from NIBLSEs³), and basic scientific literacy skills related to finding and evaluating sources (TOSLS⁴).

Sequence

Where does the protein function; What are predicted superfamily, family, domains, and motifs

- Predicting subcellular location and transmembrane regions
- Navigating databases: UniProt and InterPro

Homology

What taxa have homologs; Where are conserved residues; How is the family structured

- Analyzing trees of gene families for relatedness
- Annotating homolog alignments using literature findings

Structure

What regions can be confidently modeled; Are there similar structures; Where are potential bindings sites

- Modeling and visualizing structural features
- Exploring markers of potential binding sites

Computational CUREs also have the unique advantage of adaptable modality and accessibility that minimize barriers to participation. This CURE has been taught at two institutions as an in-person capstone, an online summer course, an independent research project and a biochemistry lab.

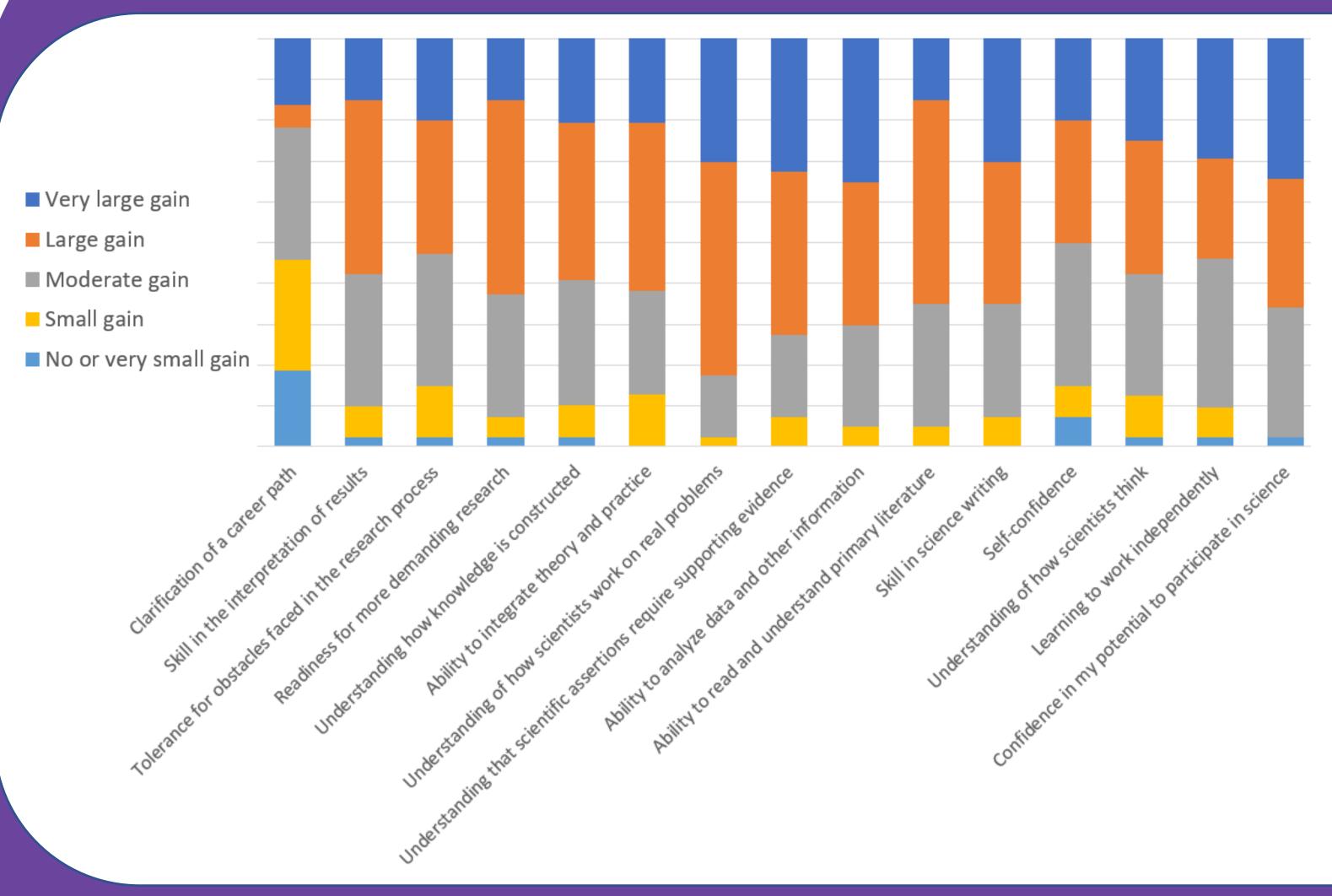
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CUPA-CURE: A computational course-based undergraduate experience **Amanda Storm¹** and Amanda Hulse-Kemp^{2,3}

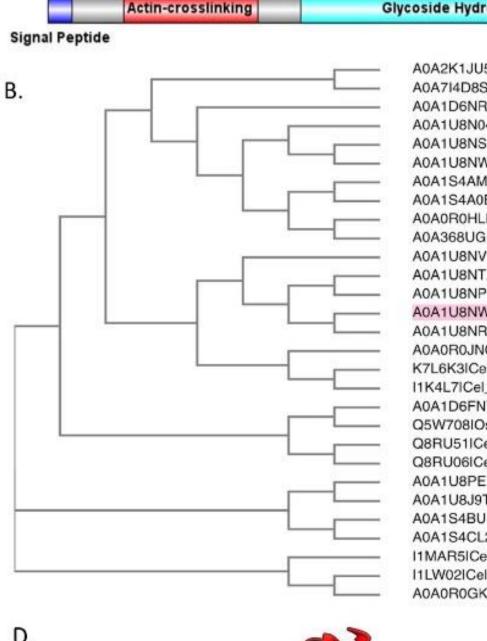


Assessment indicates comparable reported gains in standard CURE measures



Student research is professionally communicated and contributes to the field

- Students communicate results in format of microPub article www.micropublication.org
- Interested students can continue with manuscript submission and revisions as first author
- 2 published, 4 submitted and indexed to CottonGen database

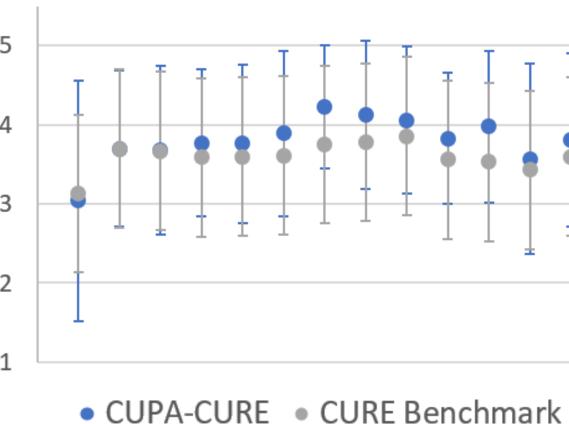


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CURE materials (Guided Notebooks and Videos) available for use, contact arstorm@wcu.edu

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¹Western Carolina University; ²USDA-ARS; ³NCSU



- Students completed pre and post surveys including items from the Grinnell CURE survey⁵
- Gains reported in practical skills and \bullet attitudes about research
- Mean student-reported gains from multiple semesters (n=42) were comparable to means of 3-year aggregate CURE benchmarks

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