

# Portable Genomics Hackathon for Pathogen Detection: a practical application of adaptive sampling to engage undergraduate learning

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**A Gateway to Genomics:**  
Multi-week workshop engaging undergraduate students with little to no background in Genomics

- Hand-built and tested a portable genomics module: Nvidia Jetson GPU combined with ONT MinION
- Utilized GPUs for accelerated genomic analysis
- Applicability of Genomics in Public Health

## Experimental Design

Adaptive Sampling Applied to Enrich a Microbial Genome from Mock Community



**Sequencing Methods:** Using a ZymoBIOMICS mock community (D6322), prepared rapid libraries (RAD-004) for sequencing using a R.9.4.1 flowcell. Half of the channels (256) had adaptive sampling (Enrich) turned on to selectively sequence one bacterial genome in our community (e.g., *Pseudomonas aeruginosa*) with the other half used as a sequencing Control. Students ran 3 technical replicates (8-hour each) on 4 different bacterial community members.

## Learning Modules

- 1. Introduction:** Application in Pathogen Surveillance
- 2. GPUs:** Hands on Build of the Compute Device
- 3. Sequencing:** Theory and Hand on Nanopore Sequencing
- 4. Bioinformatics:** Genomic analysis Tools and Analyze Results
- 5. Sharing:** Visualization of Results and Create Presentations
- 6. Summary:** Exit survey. Discuss Ideas for Future Directions

## The Next Generation of Genomics Researchers



The COVID-19 pandemic has taught us that we need to grow a larger workforce for understanding the spread of novel pathogens and interpreting genomic data.

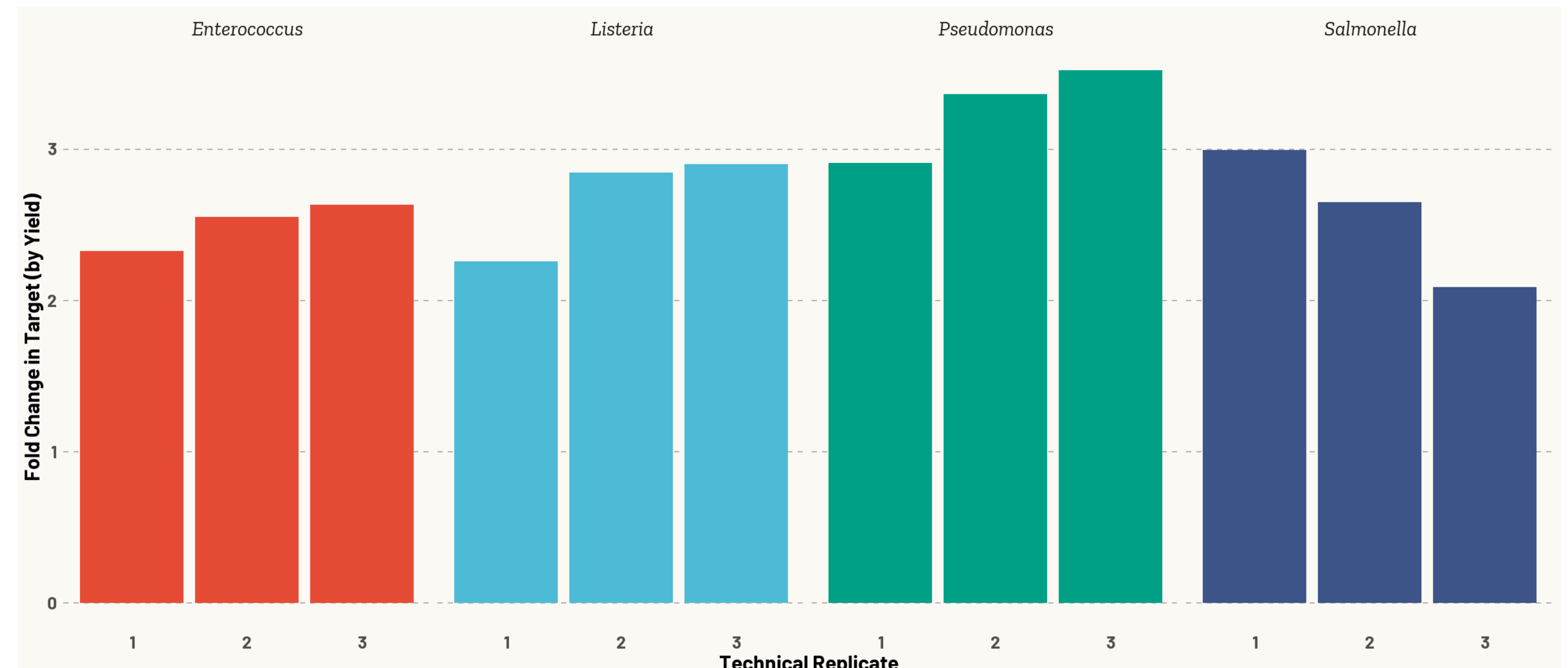
While most of the students had experience working at the lab bench, very few had prior data science knowledge or experience working in bioinformatics.

Results of a pre- and post-learning survey suggest students gained confidence in their skills across many topics during the workshop.

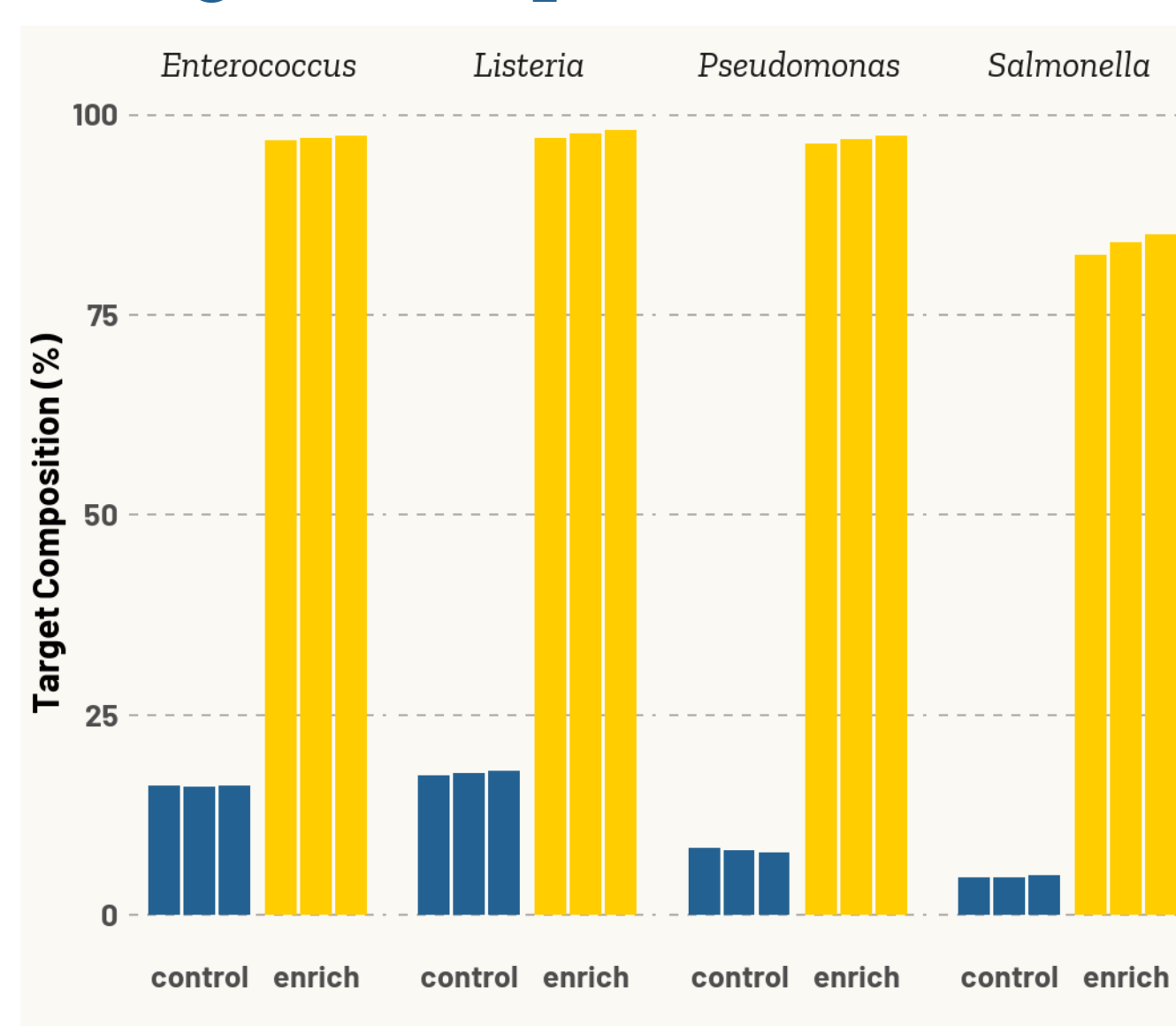


## Experimental Outcomes

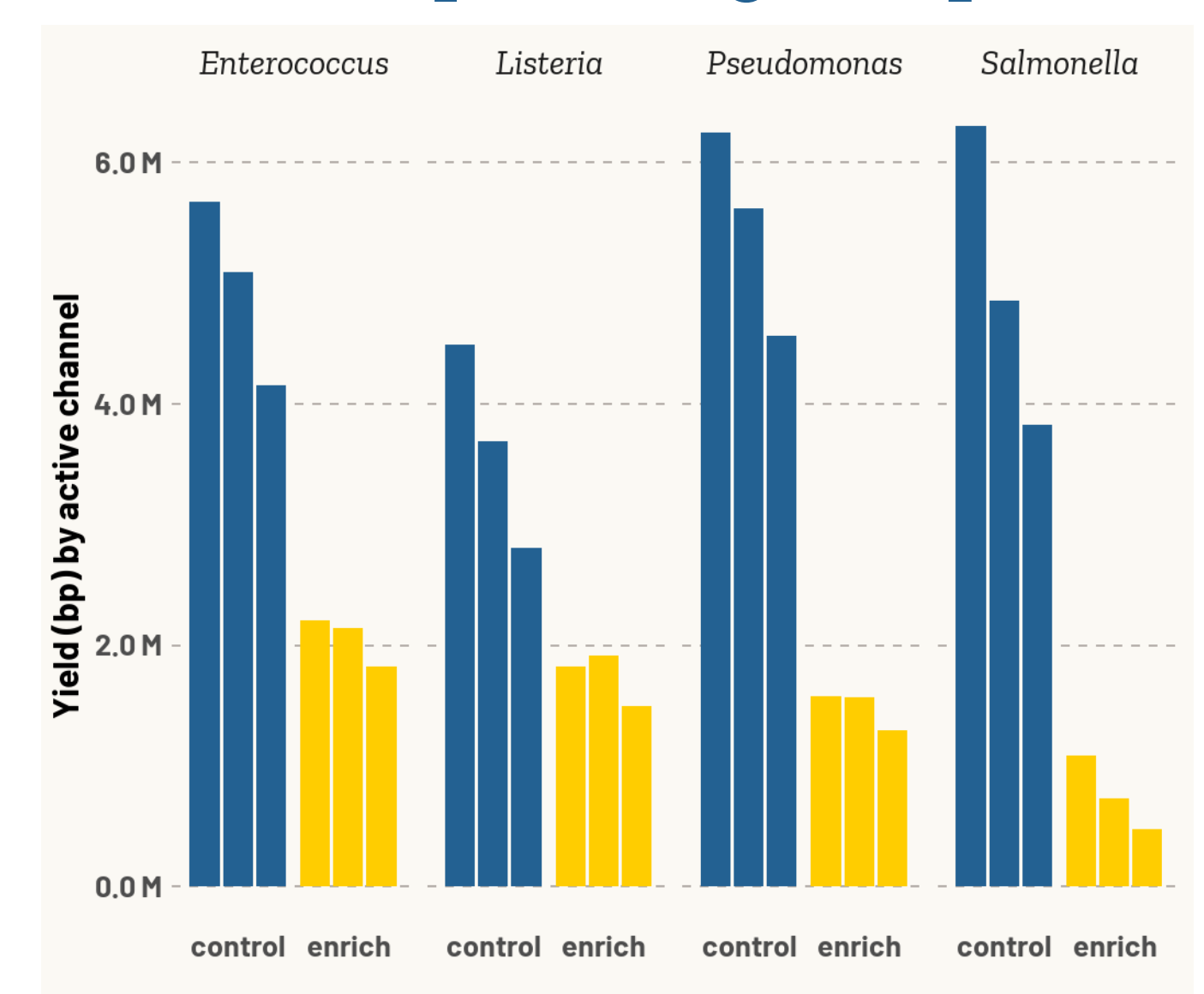
### Adaptive Sampling Increases Target Yield



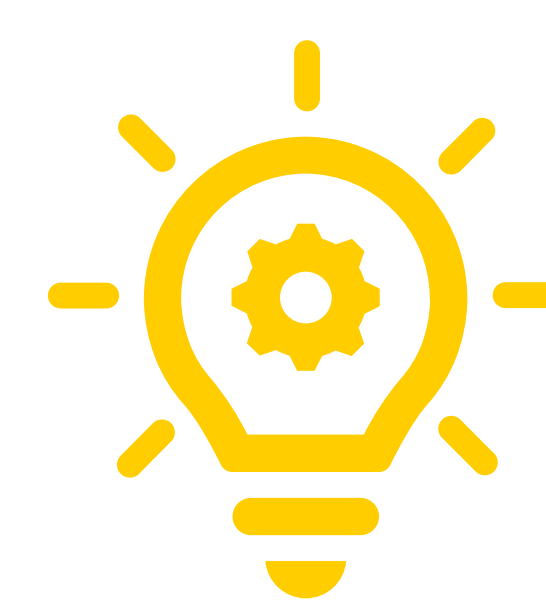
### Adaptive Sampling Increases Target Composition



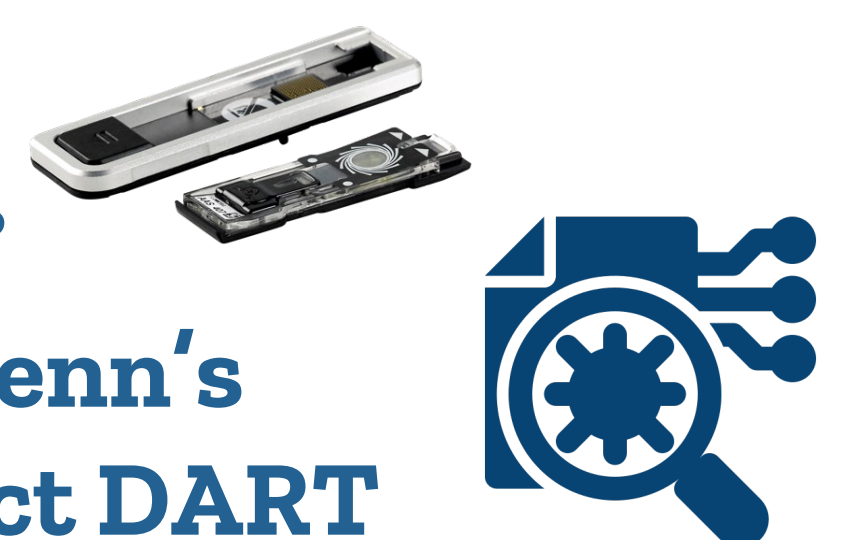
### Adaptive Sampling Decreases Overall Sequencing Output



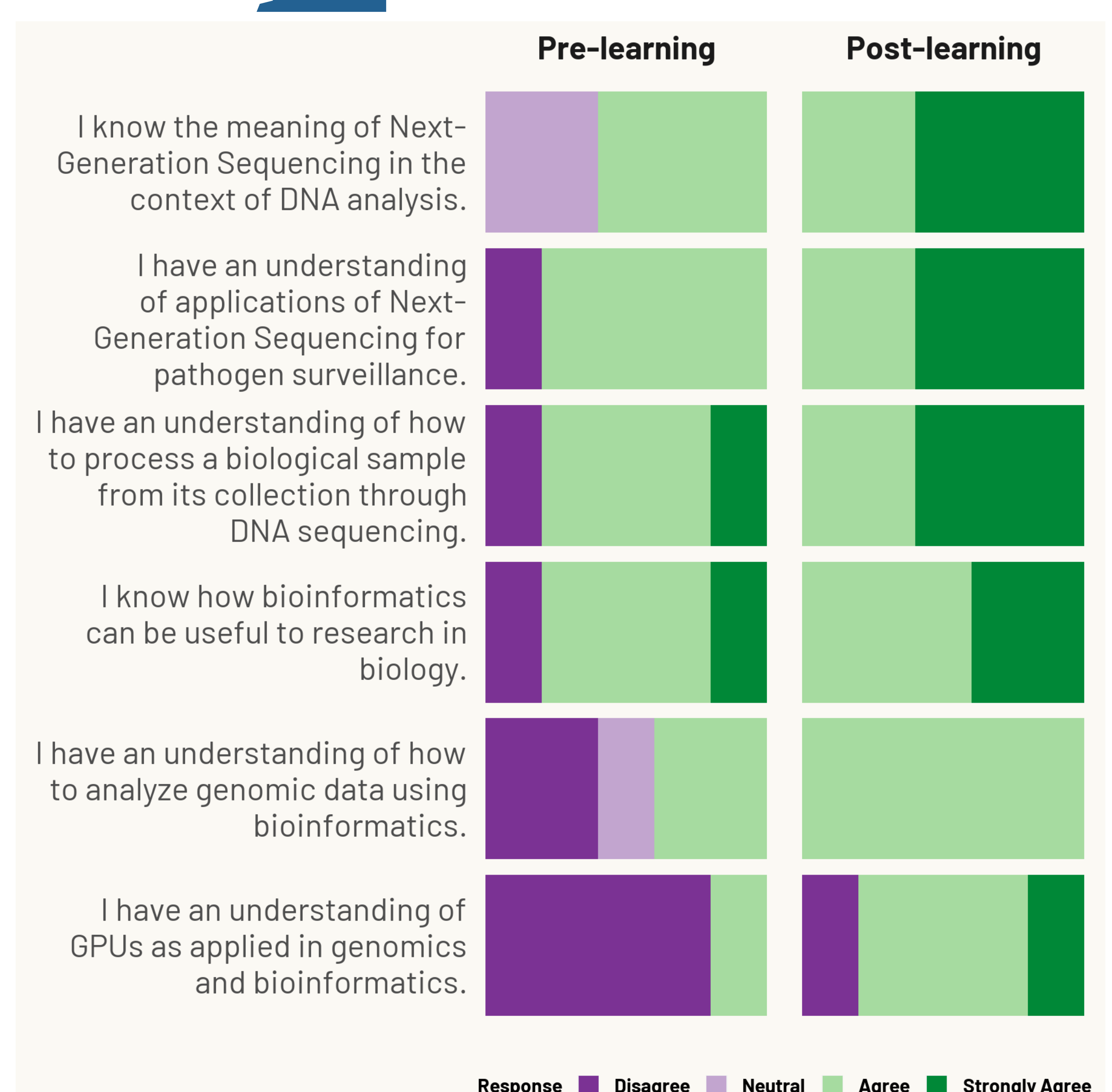
Decrease in yield, consistent with Martin et al (2021), likely influenced by handling time ejecting the non-target reads.



Adaptive Sampling and Antibiotic Resistance? Check out **Danielle Wrenn's** Spotlight talk on **Project DART**



## Learning Outcomes



## Funding and Acknowledgements

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