Integrating Molecular Biology and Bioinformatics Education

The article addresses the growing need for scientists trained in both molecular biology (wet lab) and bioinformatics (dry lab).

Traditional education often separates these fields, which can limit students' understanding and collaboration across disciplines.

- **Course Design**

Two complementary university courses were developed to bridge this gap:

1. Applied Genome Research

   - Combines genomics and transcriptomics.
   - Teaches DNA/RNA isolation, sequencing, read trimming, genome assembly, gene annotation, and variant analysis.
   - Uses tools like Trimmomatic, FastQC, SOAPdenovo2, AUGUSTUS, BLAST, BWA, GATK, STAR,
   - featureCounts, and DESeq2.
   - Students present journal club talks and write peer-reviewed reports to reinforce learning.

2. Molecular Methods in Genome Research

- Focuses on validating bioinformatics findings through lab experiments.
- Students design primers, run PCR assays, perform cloning and sequencing.

- Each student works on unique Arabidopsis thaliana accessions, contributing new data to the field.

- Results are documented in a shared wiki, promoting collaboration and peer feedback.

- **Teaching Innovations**

    - Peer Review: Used to improve reports and wiki pages, enhancing critical thinking and feedback skills.
    - Digital Documentation: Wikis replace traditional lab reports, encouraging creativity and HTML literacy.
    - Real Research Projects: Students engage in experiments with unknown outcomes, boosting motivation and independence.

- **Outcomes**

    - Students reported high satisfaction and recommended the courses.
    - Peer review and interdisciplinary collaboration were especially valued.
    - Challenges included reviewer quality and resource demands, but solutions like reusable materials and experiment pooling were proposed.

- **Broader Impact**

This integrated teaching model can be adapted to other life science fields, promoting interdisciplinary education and preparing students for modern research environments.