HITS: A network to create inquiry-based case studies that make high-throughput approaches and discovery accessible

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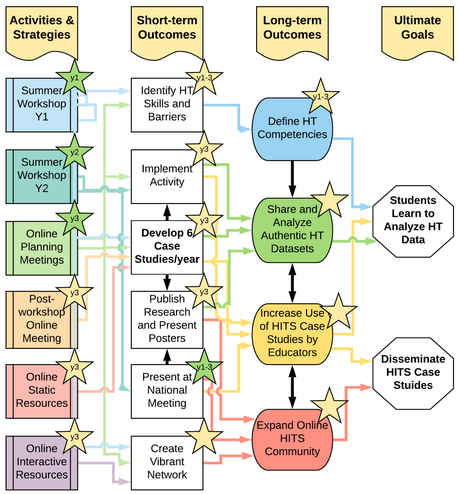
High-Throughput (HT) Technologies

Modern molecular biology techniques are increasingly utilizing automation and miniaturization to test numerous samples or conditions simultaneously. High-throughput (HT) approaches include massively parallel sequencing of DNA, synthesis of numerous nucleic acids and peptides, automated microscopy, microfluidics for single-cell analyses, small molecule screening using robotics, and genome-scale phenotypic characterization using CRISPR/Cas9 gene editing technologies. These approaches produce a wealth of results, often labeled 'big data.' However, there are limited educational case studies that address authentic high-throughput approaches using real data. We believe well-designed accessible educational case studies focusing on HT approaches and using original datasets empower students to learn current approaches and exercise quantitative reasoning in data analyses.

We created the NSF-funded *High-throughput Discovery Science & Inquiry-based Case Studies for Today's Students* (HITS) Research Coordination Network to address this gap. HITS brings together interdisciplinary groups of HT researchers and instructors to produce authentic HT case studies that can be implemented in a variety of courses, allowing students to analyze real data and learn valuable quantitative skills. Since 2018, twenty-one faculty Case Fellows, numerous case study experts, and HT researchers have formed interdisciplinary groups to design, improve, and implement HT case studies. Using QUBES, groups have created novel cases for broad curricula.

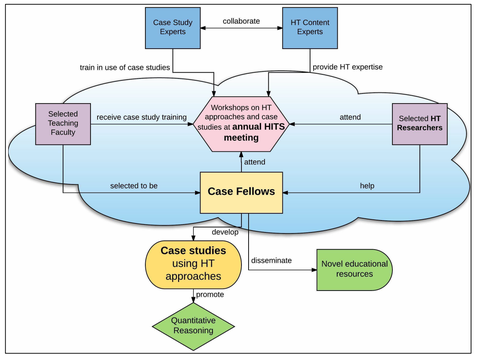
HITS: A Network to Create High-throughput Cases

HITS
High-throughput Discovery Science & **I**nquiry-based Case Studies for **T**oday's **S**tudents



Logic Model for the HITS RCN Network. We have successfully organized two summer workshops and began planning with the HITS Steering Committee for year 3. We currently have two HITS Case Fellow groups (2018 with ten fellows, and 2019 with eleven). Current Case Fellows have developed online resources for the HITS website as they work on their cases studies. Several groups have implemented their activities in their courses this year and are working on publishing their resources and giving poster presentations at national meetings.

HITS Case Fellows



HITS Case Fellows

- **Support to attend summer HITS workshops**
- Yearly stipend (two years)
- Exposure to different high-throughput (HT) approaches and graduate students, faculty, and postdoctoral fellows from different fields.
- Opportunity to **design novel case studies using authentic datasets** that can be implemented in a variety of courses.
- Case Fellows are expected to attend two summer workshops and participate in monthly virtual check-ins to continue making progress on their cases.
- **Apply online**
  https://qubeshub.org/community/groups/hits/get_involved

We will honor requests for reasonable accommodations.

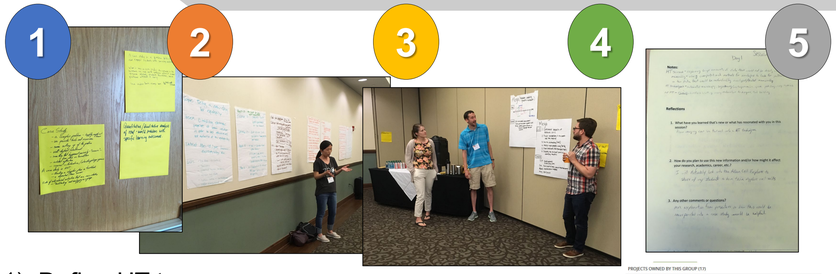
Case Fellows	College/University/Institute	Location	Carnegie Classification
*Nik Stasulli	University of New Haven	West Haven, CT	R1 Doctoral University, Highest Research Activity
*Misty Thomas	North Carolina Agricultural and Technical State University	Greensboro, NC	R2 Doctoral University, Higher Research Activity, HBC
Adam Kleinschmidt	Adams State University	Alamosa, CO	M1: Master's Colleges & Universities: Larger Programs
*Stephanie Mathews	Campbell University	Buies Creek, NC	M1 Master's College, Large Program
Melissa Haswell	Davenport University	Grand Rapids, MI	M1: Master's Colleges & Universities: Larger Programs
*Linda Niedziela	Elon University	Elon, NC	M2: Master's College, Medium Program
*Alfred Simkin	Elon University	Elon, NC	M2: Master's College, Medium Program
Todd Levine	Carroll University	Waukesha, WI	M3: Master's Colleges & Universities: Small Programs
Justin Pruneski	Heidelberg University	Tiffin, OH	M3: Master's Colleges & Universities: Small Programs
Stefanie Carr	Hartwick College	Oneonta, NY	Baccalaureate Colleges: Arts & Sciences Focus
*Melissa Srougi	High Point University	High Point, NC	Baccalaureate College, Diverse Fields
*Heather Miller	High Point University	High Point, NC	Baccalaureate College, Diverse Fields
Andy Bixler	Clarke University	Dubuque, IA	Baccalaureate Colleges: Diverse Fields
Amanda Solem	Hastings College	Hastings, NE	Baccalaureate Colleges: Diverse Fields
Tara Jo Holmberg	Northwestern Connecticut Community College	Winstead, CT	Associate's Colleges: High Transfer-Mixed Traditional/Nontraditional
Shuangying "Ying" Yu	Central Piedmont Community College	Charlotte, NC	Associate's Colleges: High Transfer-Mixed Traditional/Nontraditional
Kathleen McAdams	Nashville State Community College	Antioch, TN	Associate's Colleges: High Transfer-Mixed Traditional/Nontraditional

Overview of the Annual HITS Meeting.

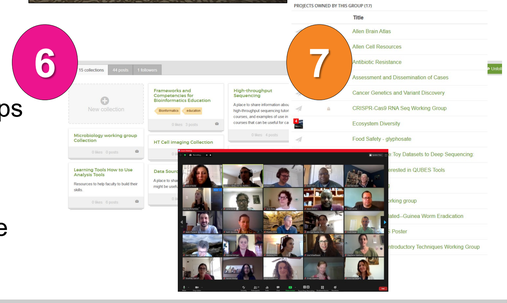
Scientific Sessions	Case Study Sessions	Case Study Development
Speakers include HT experts from industry, government, and academia.	Speakers include experienced case study users who have created and implemented case studies in college classrooms.	NCSU Office of Faculty Development will present on rubrics and assessment. Groups will present updates at the end of this session.
Attendees include educators and Case Fellows, HT experts, and HT Researchers.	Attendees include case study experts, case study fellows, and selected HT Researchers.	Attendees include case study fellows and HT Researchers.
Attendees will learn about HT approaches. Collaborations are expected to emerge through interactions at this small but focused meeting.	Attendees will learn the value of well-designed educational case studies. Working groups will be formed by pairing HT Researchers with Case Fellows.	Groups will work to design and write novel case studies using HT approaches/datasets that can be readily implemented in college classrooms.

HITS Case Fellows. Case Fellows are selected to attend the summer workshop and learn about available high-throughput datasets and novel technologies. Scientific sessions focus on emerging high-throughput technologies and case study workshops emphasize backward design, inclusivity, assessment, and implementation of educational case studies. Workshops include hands-on demonstrations and case fellows implement their case studies to "test them" and obtain feedback from the new cohort of participants. The last day of the workshop is devoted to the formation of interdisciplinary groups to work on new case studies that will be developed throughout the year and implemented at various institutions in the spring semester.

HITS Case Study Development



1) Define HT terms
2) Brainstorm ideas for HT cases
3) Form interdisciplinary groups
4) Present case design ideas
5) Reflect & Discuss
6) Work virtually on cases
7) Implement and disseminate HT Cases



Learn more about HITS!

Reach out to us and the **HITS Case Fellows** to learn about our cases and use them in your courses.

Examples of cases and workshop schedule can be found:
go.ncsu.edu/hits2020

Visit our group on QUBES:
go.ncsu.edu/hits

Acknowledgements

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Questions?

Contact:
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Visit:
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