

## Adopting a storyline-based approach to translate an ISE experience for high school course integration

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## PROJECT OVERVIEW

Our project goal is to translate an authentic, ISE experience hosted at our biosciences lab into a more inclusive, NGSS-aligned classroom learning experience. To this end, we are developing a storyline-based instructional unit for high school course integration. The resources generated through this effort aim to support three-dimensional science instruction and engage students in a wide range of investigative practices required to model a complex biomedical phenomenon affecting human movement.

## OUR APPROACH

During the first phase of the project, science teachers assisted our team in the creation of resources to guide students through a collaborative and multidisciplinary model-building mission. Teacher co-developers are now using these resources to conduct an implementation trial of the NeuroLab experience in their high school science classrooms.

In the second phase of the project, resources will be refined by our development team and used by a larger pool of teachers to enact the NeuroLab experience in their high school life science courses (after attending PD institutes hosted at our lab).

## TARGET OUTCOMES

### Direct impacts on teachers

- Changes in teaching practices that align with the NRC Framework and NGSS
- Self-efficacy for storyline-based lesson design
- Enhanced understanding of scientific modeling and knowledge of project-related content

### Indirect impacts on students

- Enhanced understanding of scientific modeling and knowledge of project-related content
- Application of investigational practices associated with scientific modeling

**We are developing a storyline-based unit to support scientific modeling in the high school classroom.**

*During the collaborative model-building mission, students connect ideas, concepts, and data that bridge clinical neuroscience, human genetics, molecular genetics, and developmental neurobiology.*

"I knew I was right about chemotropism"



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## MODEL-BUILDING ACTIVITIES

- Students observe the behavior of patients affected by Congenital Mirror Movement Disorder (CMM; the anchoring phenomenon; OMIM: 157600, 618264).
- Students formulate questions about the disorder and relate their questions to prior knowledge of, or experience with, related phenomena
- Students discuss, categorize, and prioritize their questions about the disorder
- Students explore investigative areas that align with their questions. During these explorations, they interpret real data and make discoveries that they assimilate into an emerging model.
- Students discuss, evaluate, and revise their models as they make new discoveries. Models increase in complexity, dimensionality, and explanatory power over time.

## SUPPORT RESOURCES (Draft v.1)

### Lesson Organizer

An at-a-glance breakdown of investigative areas (lesson clusters), component lessons, supporting lesson presentations, and scheduled model versions. Provides information for teachers to guide the prioritization of student questions.

### Multimedia Lesson Presentations

- Support visual-based explorations in core investigative areas linked to student questions
- Guide interpretation of behavioral, electrophysiological, molecular genetic, developmental, and imaging data (students also explore big data to build their model)

### Discovery Map

Links target discoveries to student questions, model dimensions, data encountered within and across lesson presentations, and data sources

### Lesson Navigator

Helps teachers and students connect concepts, ideas, and data within and across lessons

### Model Tracker and Evaluation Rubric

A tool for teachers to assess models based on the information and data encountered by students during discrete investigative segments of the NeuroLab experience

### Sample Questions and Library

Contains an extensive catalog of questions (categorized and uncategorized) formulated by students after observing patients affected by CMM. Helps teachers anticipate student questions and guide their categorization into investigative areas.

### Editable Sample Lesson Tables

Created by teacher co-developers to plan classroom activities, articulate strategies, link activities to standards (e.g., NGSS elements, CTE Model Curriculum Standards), etc.