NeuroLab

Discovery science-based explorations in developmental neuroscience

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www.NeuroLabSEPA.org

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PROJECT SUMMARY

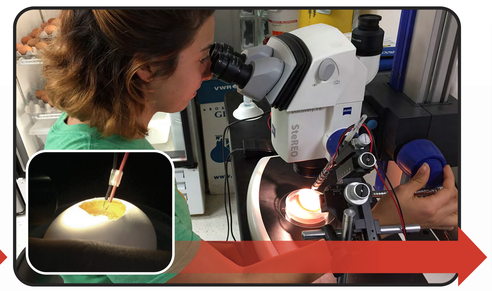
NeuroLab forms direct linkages with NIH-funded research and establishes a model of biomedical citizen science that serves the compound interests of science education and neuroscience research. The project's educational strand includes 10-day residential research institutes that engage upper-level high school students in deep explorations of developmental neuroscience and the scientific model-building enterprise. These highly collaborative and immersive experiences provide unique opportunities for students to generate professional quality data and identify new tools to visualize/manipulate neurons during embryogenesis. The project's scientific strand supports these activities by creating web-based technologies for students to organize, analyze, validate, annotate, and share molecular genetic and neuronal expression data with the neuroscience community. The project also involves the development of new instructional/curriculum resources, including an interactive, neuroscience-centered game space, that are aimed at extending program reach into traditional high school learning settings.

DIRECT STUDENT ENGAGEMENT | Residential Research Institutes in Comparative Functional Genomics, Neural Development, and Neuroinformatics

Browse Vista Enhancer Browser

Create reporter constructs and maps

Microinject into neural tube of chick embryos

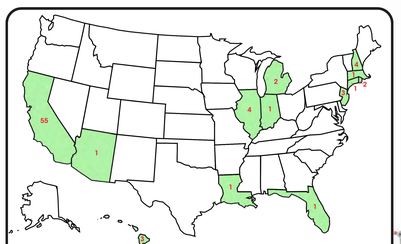


Electroporate into spinal cord neurons

Visualize and document reporter expression

PRELIMINARY FINDINGS

GEOGRAPHIC REACH BY STATE



Data shown for Cohorts 1-8

GENDER AND RACE

Female	60	(76%)
Male	19	(24%)
African American	4	(5%)
Asian | Pacific Islander	20	(25%)
Caucasian	32	(40%)
Hispanic or Latino	11	(14%)
Mixed Race	1	(1%)
Native American	1	(1%)
Other	6	(8%)
Prefer not to respond	4	(5%)

Data shown for Cohorts 1-8

NON-COGNITIVE SCALE MEANS

	Pre-Survey M	Pre-Survey SD	Post-Survey M	Post-Survey SD	6-month follow-up M	6-month follow-up SD
Self-efficacy | Conducting Research (15 items | max = 7)	4.17	0.82	6.34	0.82	6.04	0.68
Self-efficacy | Persistence (11 items | max = 7)	5.11	1.00	6.21	0.80	6.20	0.67
Collaboration (19 items | max = 4)	Refer to handouts for mean performance on individual items (Post-Survey only)					

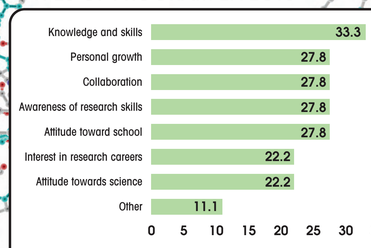
Data shown for Cohorts 5 and 6 (N=19)

CONTENT KNOWLEDGE

	Pre-Survey M	Pre-Survey SD	Post-Survey M	Post-Survey SD	6-month follow-up M	6-month follow-up SD
Light Production (11 items)	0.65	0.09	0.80	0.09	0.72	0.11
Basic Molecular Genetics (13 items)	0.61	0.11	0.74	0.09	0.71	0.09
Lab Methodologies (27 items)	0.62	0.06	0.72	0.06	0.61	0.17
Models (10 items)	0.66	0.09	0.75	0.12	0.72	0.12
Neurobiology (15 items)	0.68	0.10	0.76	0.07	0.71	0.06

Data shown for Cohorts 5 and 6 (N=19)

TYPES OF PROGRAM EFFECTS



Data shown for Cohorts 3 and 4 (N = 18)

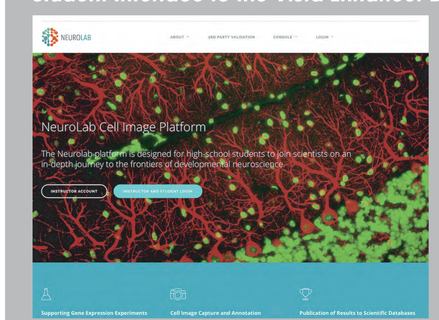
Students completed a fall follow-up survey containing questions about their impressions of NeuroLab and its effects on their knowledge, skills, and attitudes. Percentages do not equal 100 because responses could be coded in multiple ways.

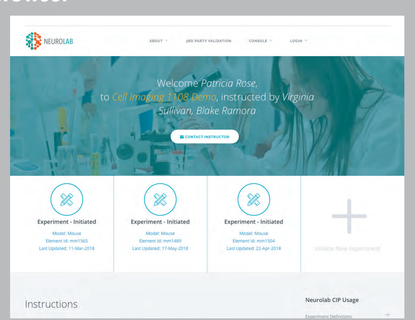
Follow-up questions probed students on specific impacts, producing the following results:

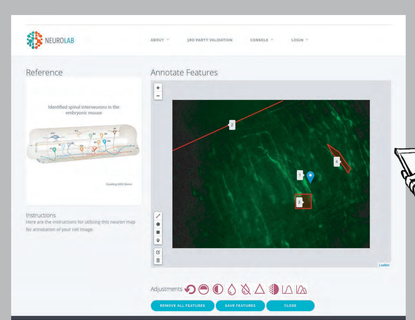
1. All students reported that the experience had improved their knowledge and skills.
2. All students felt that they made a real contribution to the scientific community.
3. Most students (83.3%) changed their perceptions of what scientists are like or how they work.
4. Residential institutes either bolstered (50%) or reinforced students' interest in (and confidence for) studying neuroscience.
5. Most students (83.3%) indicated that NeuroLab had positively influenced their interest in pursuing a career in science field.

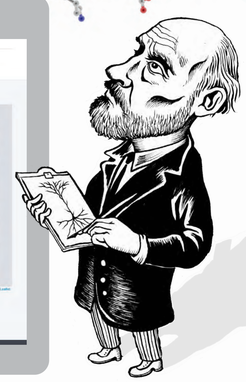
RESOURCE DEVELOPMENT

Student Interface to the Vista Enhancer Browser









Interactive Game Space Centered on Axon Pathfinding

Powered by: INVIVO®

Users will learn fundamental principles of axon guidance by solving 2D simulations of key guidance events that occur during the embryonic development of a fictitious organism. Game mechanics are cell-centered and focus on the dynamic expression of cell-surface receptors on an axonal growth cone that the user must guide to an appropriate target neuron.

- **Survey Micro- and Macroenvironment:** understand developmental objective of each simulation | evaluate 3D spatial/anatomical relationships that are mapped onto 2D grid|define starting neuron's functional identity | examine the game board to identify appropriate target cell(s) and relevant guidance information
- **Design/Configure Growth Cone:** examine guidance receptor structure/function from integrated game menu with links to relevant scientific resources | turn on guidance receptors that can be activated by navigational signals distributed on game board | map the temporal expression of receptors using an integrated timeline
- **Test Growth Cone Design:** visualize axonal trajectory | advance to next level or make corrections

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