The STRIDES project uses state-of-the-art technology and natural language processing (NLP) models to provide teachers with detailed evidence of students’ progress in achieving the multi-dimensional proficiency called for by the Next Generation Science Standards (NGSS). The Teacher Action Planner (TAP) in the STRIDES web-based curriculum environment presents patterns in students’ evolving understanding in real time and provides research-based activities for the teacher to respond to students’ ideas. STRIDES professional development activities guide teachers to customize the curriculum to address diverse students’ evolving ideas. Project video.

STRIDES Progress

STRIDES Unit: Genetics of Extinction

Students explore inheritance and variation of traits, use a simulation to discover ideas about natural selection and evolution, and investigate the world's biodiversity and how species go extinct.

• They use "offspring" that have specific characteristics.
• They observe effect on dark and light fish populations.
• A graph shows how fish populations grow or decline over generations.

The Fish Model

Students explore dominant and recessive genes by trying allele combinations and seeing the resulting trait.

• Students vary color of the sand, # of fish, # of predators.

Embedded Assessment: Lizards

How did the introduction of a predator affect the length of this lizard-specialized back legs over time? Why?

Your explanation should include:
• Evidence from the graph
• Your understanding of natural selection

Assessing NGSS Dimensions & Knowledge Integration

Lizards Scoring Rubrics (NGSS Performance Expectation: MS-LS4-6)

DCI: Natural Selection

0 No mention of anything relevant to natural selection
1 A species changes in response to changes in its environment
2 A species changes in response to changes in its environment + traits that support survival and reproduction in the environment become more common; those that do not become less common

SEPI: Evidence from graph

0 No mention of trend in the graph
1 Mention a trend, but no specifics about the changes taking place over generations
2 Mention the trend and graph + specific data from one or more generations

Knowledge Integration

0 No mention of relationship
1 Off-track, vague or incomplete ideas
2 Accurate but isolated idea(s)
3 Partial link: Accurate but isolated idea(s)
4 Full link: Links two accurate ideas
5 Complete link: Links more than two accurate ideas

Sample Explanations

"Introducing the predators made the lizards back legs longer over time. The graph shows in the 15th generation the predators were introduced and the back legs started getting longer over many generations. The lizards might have gotten longer to escape the predator."

"Longer back legs most likely allowed them a better chance of surviving and running from the snakes, and so the lizards with longer legs had a better chance of being able to live long enough to reproduce. Lizards with shorter legs were killed more often by these snakes. The long-tailed trait got pushed down throughout generations of long-legged lizards that survived, and this kept happening and happened, and the average length kept rising."

NLP Model

158 human coded responses

Human-machine agreement: quadratic weighted Kappa r=.75 for DCI; .79 for DCI; and SEP scores for initial explanation (N = 445) were highly correlated: r = .71, p < .001

Design-Based Research: Teacher Action Plan Year 1

Report Supports Teacher to Guide Students During Instruction

• Implemented during remote instruction due to COVID-19
• Recommended actions featured comments teachers could send to their students to support them remotely
• Comments tailored to NGSS score levels and guided students to support activity in the unit

Teacher responses to the TAP:

Teacher 1: Used TAP sent pre-made comments
Teacher 2: Used TAP sent their own comments
Teacher 3: Used TAP, modified comments
Teacher 4: Did not use TAP, supported students with comments or gave other

Teacher Design-Based Research: Teacher Action Plan Year 2

Report Supports Curriculum Customizations During Professional Development

• During PD, teachers use the TAP and added/modified student work to plan customizations to refine the unit.
• They explore the KI rubric to deepen their understanding of the impact of the guidance and the unit.
• They use Curriculum Visualizer to plan customizations.

Review of Student Work

Teacher 1: Categorized small sample of student responses using the KI rubric.

Curriculum Visualizer

Each slide represents an activity. Teachers can view full curriculum or zoom in to customize.

Customization Goals and Moves During PD

Teacher PD with 23 participating teachers.

• Most common customization goals were "adding missing concepts" and "increasing accessibility."
• Most common customization moves were "adding new activities using the STRIDES unit authoring system" and "modifying existing activities."
• Also common was "adding outside resources." Teachers interrelated STRIDES units with their own teaching practice.
• Number of customization moves per teacher (customizing one unit) ranged from 0-21.