Science in the Learning Gardens

SciLG

**Factors that Support
Ethnic and Racial Minority Students'
Success in Low-Income Middle Schools, 2014-2017**

Dilafruz Williams & Sybil Kelley

**STEM smart: Lessons learned from successful schools
San Francisco. February 1, 2016
Project funded by NSF Grant: DR K-12: DRL 1418270**

Overall Goals of SciLG

- **Advance <u>equity</u> in STEM**
- **Strengthen pipeline to higher education**
- **Honor diversity and inclusivity**

Our Core BELIEFS and VALUES

Unyielding commitment
- **to diversity and inclusion**
- **to non-marginalization**

Reject deficit-based models of education

Students do not have to give up who they are and what defines their identity

For culturally and linguistically diverse students, the garden has potential to empower and to encourage pride and respect in their cultural heritage.

Karen Payne, Program Director of the American Community Garden Association

Curriculum:
NGSS/Culturally responsive

Instruction:
Garden as milieu/
Hands-on, experiential, holistic

Research:
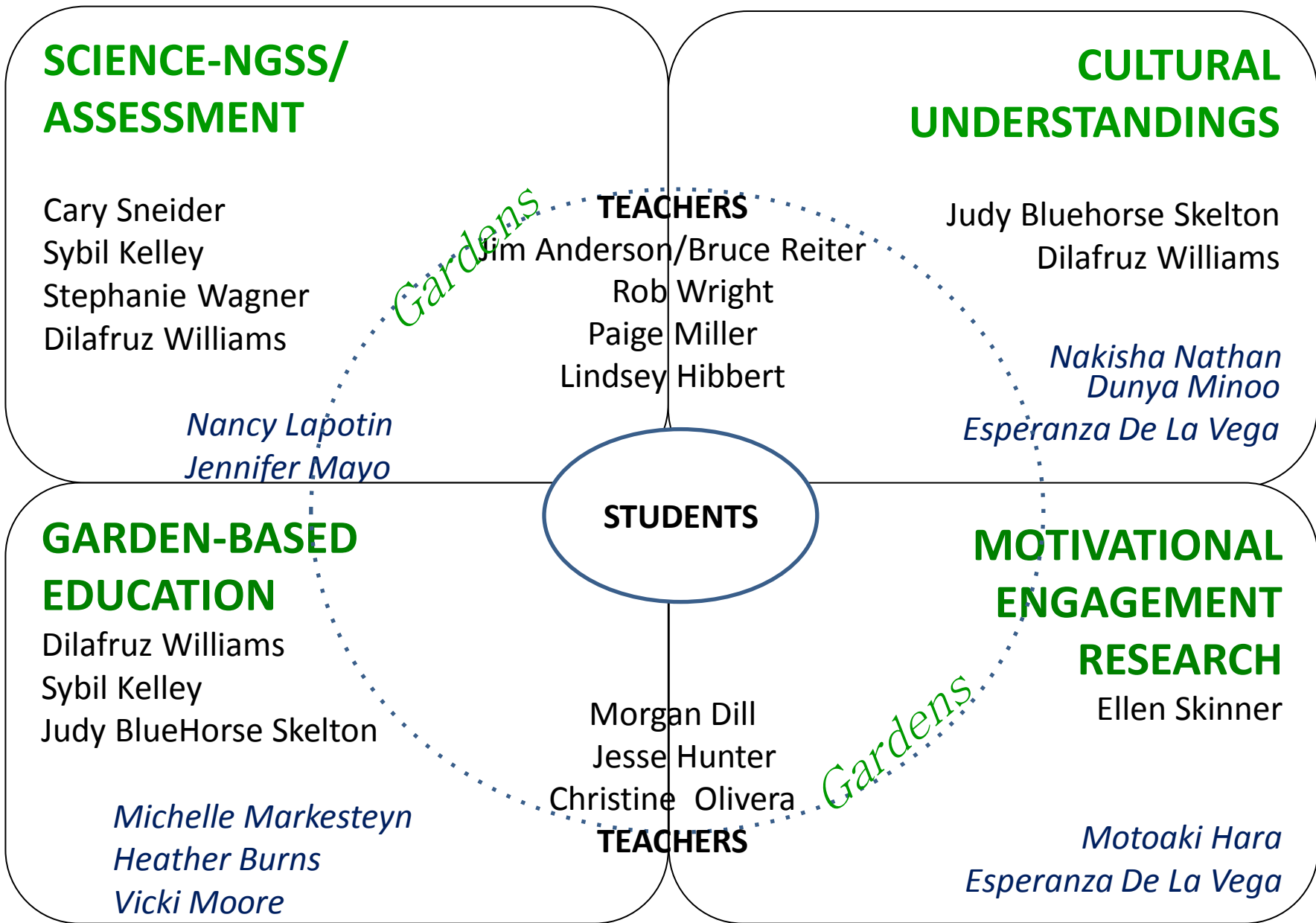**Motivational engagement**
Science learning outcome

| Grade 6: 2014-2015 | Grade 7: 2015-2016 | Grade 8: 2016-2017 |

	LANE (Grades 6-8)	LENT (Grades K-8) SciLG: (grades 6-8)
NON-WHITE	58% (Hispanic 27%; Asian 17%; African-American 6%)	76% (Hispanic 44%; Asian 15%; African-American 10%)
SPED	20%	15%
TAG	5%	0.9%
LEP	10%	33%
FRL	82%	85%
TOTAL	480	564

SCIENCE-NGSS/ ASSESSMENT

Cary Sneider
Sybil Kelley
Stephanie Wagner
Dilafruz Williams

Nancy Lapotin
Jennifer Mayo

CULTURAL UNDERSTANDINGS

Judy Bluehorse Skelton
Dilafruz Williams

Nakisha Nathan
Dunya Minoo

Esperanza De La Vega

Gardens

TEACHERS
Jim Anderson/Bruce Reiter
Rob Wright
Paige Miller
Lindsey Hibbert

STUDENTS

GARDEN-BASED EDUCATION

Dilafruz Williams
Sybil Kelley
Judy BlueHorse Skelton

Michelle Markesteyn
Heather Burns
Vicki Moore

Morgan Dill
Jesse Hunter
Christine Olivera

TEACHERS

MOTIVATIONAL ENGAGEMENT RESEARCH

Ellen Skinner

Gardens

Motoaki Hara
Esperanza De La Vega

Graduate Assistants: Heather Brule, Garrett Hirsch, Linda Hoppes, Claire Lagerwey, Caitlyn Maceli, Shea Mcwhorter, Katie Rixon, Dana Utroske, Rhea Webb.

PEDAGOGICAL PRINCIPLES
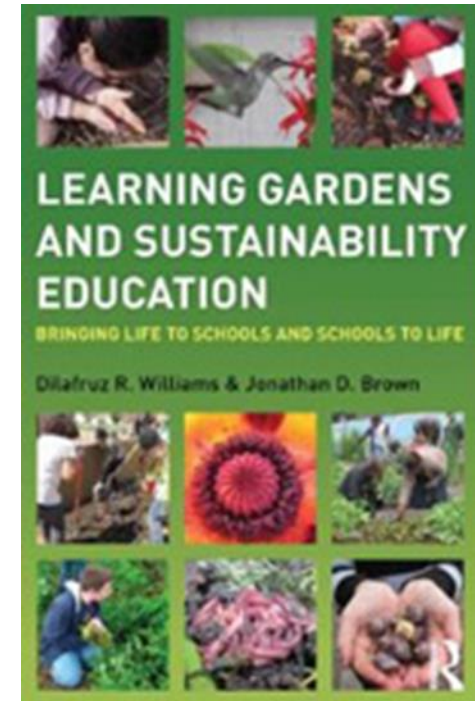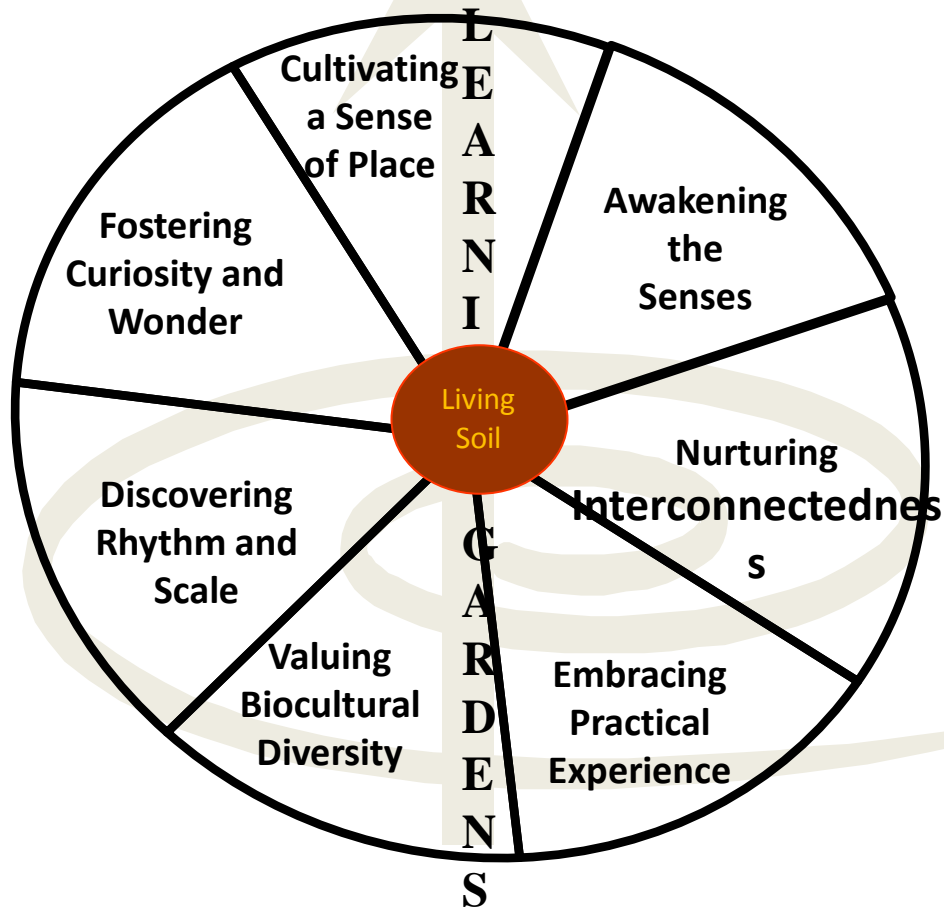
Williams, D. R. & Brown, J. D. (2011). *Learning Gardens and Sustainability Education: Bringing Life to Schools and Schools to Life.* New York, NY: Routledge.

6th Grade Yearlong Map

PPS Integrated Theme: Portland (Portland & Gardens)

PS3-3; PS3-4; PS3-5

SEPUP Units

ESS2-5; ESS2-6, ESS3-5

PSU is on later start schedule-Starting this unit first will allow kids time to learn some of the concepts that they can apply in the late fall garden design challenge (and they will start with a truncated series of lessons from "Studying People Scientifically")

Energy (Fall)

Cell Biology & Disease (Winter)

Body Works (Winter)

Weather & Atmosphere (Spring)

Gap in SEPUP: ESS2-4 (Water cycle) & ESS3-3 (minimizing human impacts): Great opportunity to bridge classroom and garden. In spring, water cycle lesson can be included during long-term investigation.

Structure & function

First design iterations in classroom? Could make and test prototypes, monitoring temperature changes, moisture loss, etc (tie in water cycle (ESS2-4)

Enrichment: LS1-4: Plant/Animal interactions/reproductive success

Enrichment/Classroom connection:Fall (LS1-1; LS1-2): Structure & Function of plants: Compare & contrast plants and bodies (in-class connections)

Possible classroom connection?

Enrichment: LS1-1 & LS1-2--plant cells; and LS1-3-cells and systems: Perhaps take specimens to class (microscope investigations? other?)

Environmental & Genetic factors (LS1-5): *Introduce in fall* while harvesting; 1st investigation could be in conjunction with Eng. Des. Challenge in winter; Spring, apply new understandings in garden/spring plantings (investigation)

Supplementing ESS3-5; ESS2-5; and ESS2-6 (look at guiding questions in Framework

Enrichment for winter/spring (LS3.2) Asexual & Sexual reproduction--May just be a thread in the garden all year as students try a variety of propagation techniques

Garden Unit (Late Fall): Energy Engineering Design Challenge: How can we grow more food through the winter? (PS3-4; PS3-5)

Collect weather data all year long (all grades/all classes); input into Google sheets--use for data analysis and claim making in spring

Enrichment: LS1-8: Sensory stimuli (e.g. sunflowers)

7th Grade Yearlong Map

Sit Spot all year long--Change over time/ journaling & writing

SEPUP Units

2015-2016 Non-Integrated

Studying Materials & Chemistry of Materials (Fall)

Water & Force & motion (Winter)

Energy & Waves (Spring)

Fall Garden Unit/Focus (PS1-3, PS1-2; PS1-6; LS2-3): Investigate the cultural, medicinal, and synthetic applications of plants in the garden; build compost/ worm bins to investigate chemistry of materials and energy flow through systems. (This gets at concepts for both integrated and non-integrated alignment and different sequence of non-integrated)

Winter Garden Unit (LS2-2; LS2-4)-- Interactions among organisms across ecosystems; changes in ecosystem components impacting populations

Spring Garden Unit (LS2-1; LS2-5)-- Resource availability, populations, biodiversity, and design solutions

Ecology

"Teachable" moments in the garden

Re-emphsize

Erosion and Deposition

Possible classroom connection

Switch order??

Chemistry of Materials

Bottle Ecology: Yearlong ecosystem

Plate Tectonics

PPS Integrated focus for 7th grade: Northwest Region/Bioregion

...sheet

designs t...

Things to consider...
• What type of...
• What mater...
• Will you use...
• How will you...
• How will you...

...in your own words.
...s when
...post instead.

...t two possible

Solution #1

Hop...

funel for water to pour in

holes for air

Worms
to break
down the
compost

- Green

- brown

- Green

- brown (?)

holes for bugs to get in

• Will you use worm... ...u use?
• How will you mix air i... ...your container?
• How will you water your c... ...compost?
• How will you help your comp... ...stay warm? (110-150°Fahrenheit)

...en el Jardín

Estaremos atrás, en el lado norte de la escuela, por el campo grande de
futbol.

Sábado, 7 de noviembre de 9am- 12pm

Habrá café y bocadillos

¡Esperamos ver lo ahí!

PORTLAND
PARKS & RECREATION
Healthy Parks, Healthy Portland

GARDENS AS A MOTIVATIONAL MILIEU

(Predicting from Winter to Spring Term)

STUDENTS' EXPERIENCES IN THE GARDEN

Autonomy (personal importance of activities) & Purpose

TEACHERS' PERCEPTIONS OF STUDENTS

Engagement In the Garden (having fun, working hard)

Expectations of Students' Potential to Succeed in Science

ACADEMIC OUTCOMES

Science Grades
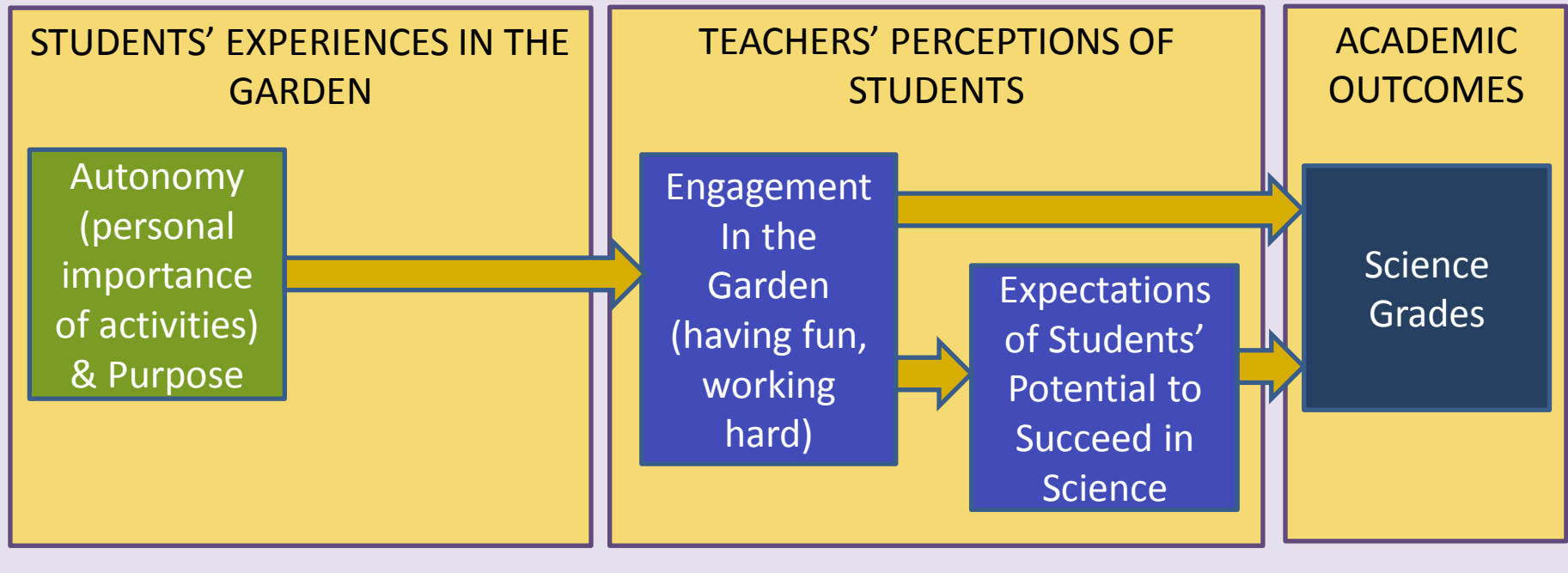
STUDENTS' EXPERIENCES *(Predicting from Spring to Fall Term)*

Belonging and Competence

Engagement In the Garden (having fun, working hard)

STEM Identity
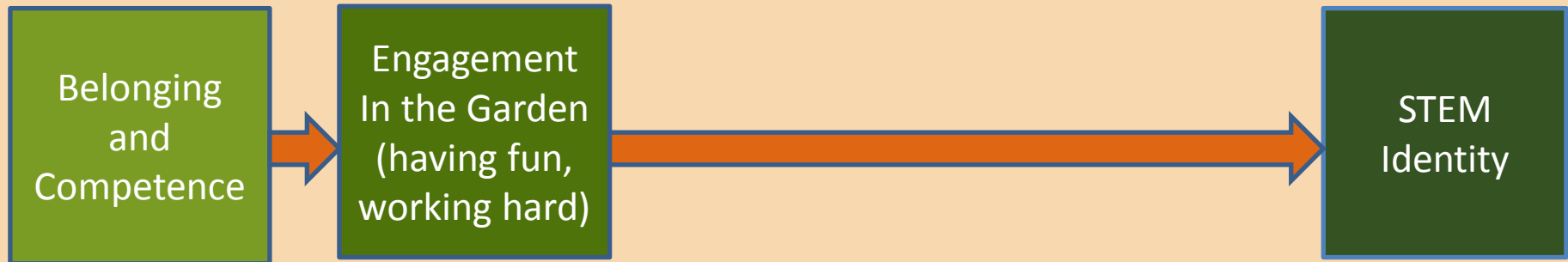
n = 104. Arrows show individual regression analysis paths in which **earlier experiences** predict changes in **the levels of later outcomes, after controlling for the prior effects of those outcome** variables. Survey items used 1-5 scale where higher levels showed stronger agreement with statements. Science grades were converted to a standard 4.0 scale. Mean of Autonomy & Purpose = 4.08, SD = 81. Mean of Belonging & Competence = 3.77, SD, 77.

What do you feel?

"I feel safe at the Learning Gardens."

"It releases stress from me. I feel really happy."

"No one (is) judging me for who I am. It is a circle of life, of friendship."

"It's like I'm a member. I'm home. I'm safe. I'm comfortable."

"I feel smart. I feel like a better learner."

"It's hands-on (with) plants. You actually get to touch them, see them, when we learn about plants. There's fresh air. At school, we just sit on our butt on our desk and write. It's more interesting here. We get to walk around and learn stuff. We get to get dirty."