CURRICULUM VITAE
Linden Elizabeth Higgins

Current Address: 11 Adams Court
Burlington Vermont
(802) 540-0872
electronic mail: Linden.Higgins@uvm.edu

Education: M.Ed. University of Vermont, Department of Leadership and Developmental Sciences. Thesis: Excellence in college teaching: A synthesis of theory and evidence.
Faculty Cup Award: "Outstanding academic performance and commitment to program initiatives"

Ph.D. University of Texas at Austin, Department of Zoology. Thesis: Life history ecology of the giant orb-weaving spider *Nephila clavipes*.

M.S. University of Chicago, Department of Biology.

B.A. cum laude. The College of the University of Chicago.

Continuing education: Relevant recent trainings include: Building empathy and disrupting racism; SENCER Summer Science Institute 2015 - 2019; Gordon Research Institute - Undergraduate Biology Education 2015, 2017, 2019; Dendros Inc. – Facilitating difficult conversations; UVM CCP – Making assessment & evaluation work for diversity, The intercultural classroom, Pedagogical & curricular issues of diversity; UVM CTL – Teaching and writing in STEM education, Reaching and teaching all students, Evaluating writing by English language learners. Transforming business, society, and self with U.Lab (MITX).

Certifications: IRB CITI-UWisc (Aug 5, 2016); UVM IRB (Sept 12, 2016); NIH IRB (Sept 28, 2016).

Recent Employment History:

University of Vermont, Department of Biology. 2002 - current. Adjunct Assistant Research Professor and Lecturer.

New Jersey City University, Department of Biology, 2017-current. Consultant: Formative evaluation. Summer STEM Academy learning outcomes and impact on success and retention.

University of Vermont, Department of Animal Sciences, 2016-2020. Consultant: Developmental evaluation. Animal disease biosecurity coordinated agricultural project.

Monmouth University, 2016-2018. Consultant: Educational impact evaluation.

Vermont Afterschools, Inc. November 2015-2018. Consultant: Professional development, Program evaluation, Research.

Lake Champlain Maritime Museum, August-November 2015. Consultant: Curriculum development.

Johnson State University, Department of Environmental and Health Science, Fall 2012, Spring 2014, Spring 2015. Adjunct Professor.

University of Vermont, Center for Teaching and Learning, Sept 2014-Jan 2015. Internship: Needs assessment. Designed a needs assessment for graduate teaching fellow training including focus groups, interviews, and survey design.

Bennington College, Science and Math Department. Spring 2010. Sabbatical Replacement Professor.

Educational experience: Using active learning strategies, I design curricula to encourage development of independent interest in science as a way of understanding and interpreting the world. I use reverse-design to develop highly structured curricula, including authentic activities, on-line formative assessments, guided discussions, and self-design laboratories for students at all levels.

Classroom teaching (with laboratory; † blended or hybrid; ß writing intensive):*

High School: Evolutionary approach to cell and molecular biology (Mt Abraham HS†, UVM Summer Academy†*)

Introductory Undergraduate:

Majors – Organismal biology†* (University of Vermont, UVM; Bennington College, BC); Cell and molecular biology†* (Johnson State College, JSC)

Non-majors – Forensic Biology †ß, Principles in biology †* (cell, molecular, and organismal; UVM, JSC), Evolutionary Biology† (UVM), Insects and Human Society (University of Massachusetts, Amherst, UMass), Ecology, Evolution and Society (University of Texas, UT); Science for Business, Law and Liberal Arts (UT)

Seminars – Biology of sex ß (UVM); Science as a way of knowing ß (UVM); Genetically-Modified Organisms: Myth, Opinion, Fact ß (writing-intensive, BC)

Advanced undergraduate – Behavioral Ecology (UVM), Introduction to Genetics* (UVM, JSC†), Advanced Genetics Laboratory* ß (UVM)

Graduate – Animal behavior (National Autonomous University of Mexico, UNAM); Seminar in the scientific method (UMass).

Professional Development Workshops:

Teaching social justice through Mass Incarceration. With Bettie Davis, St. Vincent College (SENCER) Summer Institute (SSI) 2020.

When biology and chemistry cross paths: Teaching social justice through forensic science. With Bettie Davis, St. Vincent College. (SSI 2020.

Analyzing survey data for reliability and validity. Science Education for New Civic Engagements and Responsibilities SSI 2019. Part of the *Designing Assessments of Student Outcomes* mini-symposium.

Using a "jig-saw" approach to designing civic engagement assessments in a high enrollment class. SSI 2018

Designing open-inquiry laboratories: It needn't be chaotic. UVM CTL May, November 2018

Using a "jig-saw" approach to designing civic engagement assessments in a high enrollment class. SSI 2018, 2019.

Designing student assessments to stimulate reflection on complex problems. SSI 2018. With M. Devanas.

Using SENCER courses for research on teaching. SSI 2017, 2018. With M. Devanas.

Beyond Assessment: Designing informative evaluations of student learning. SSI 2017, 2018.

Managing difficult conversations in the sciences. With C. Duckett. SSI 2017.

Designing discussion prompts for cognitive growth. SSI 2016; NCSCE webinar 2017.

Designing open-inquiry laboratories for K-12 students: It needn't be chaotic. SSI 2016.

Designing and monitoring discussions for safe learning. Life Discovery-Doing Science. 2016.

Inquiry 101. Vermont Afterschools Professional Development 2016.

Coaching for quality STEM programs. Vermont Afterschools Professional Development 2016.

Creating multiple choice questions for problem solving, content review, and practice. UVM 2016.

Education Research: General focus: I am interested in developing and documenting the effectiveness instructional scaffolding that increases student self-reflection and self-assessment, reduces the achievement gap and improves the transfer of critical thinking skills across disciplines.

Major Accomplishments:

Developing mixed strategies for direct assessment of student skills development.

Developing training workshops to engage instructors in the use of facilitated discussions to illuminate student positions and individual educational needs.

Developing on-line formative quizzes and demonstrating the positive impact on student learning outcomes in a large-lecture setting.

Developing classroom and laboratory activities encouraging critical thinking, and using proficiency-based rubrics to assess student learning.

Current research:

Designing assessments to track white-identifying students' development as allies in a D1 course.

Designing assessments to encourage and document students metacognitive development in the first-year classroom.

Impact of summer STEM bridge programs on belonging and persistence of at-risk students at a Hispanic Serving Institution. Final analysis in progress.

Research Involving Undergraduates:

Impact of exam wrappers on study habits. With Maya Sobel. In preparation for publication.

Recent presentations:

Exam wrappers exposing students to learning research change study habits. With Maya Sobel. Poster, ASCN, June 2021, ISSOTL October 2021.

Visualizing connections to document development of interdisciplinary collaboration among researchers. Poster, American Evaluators Association, 2019. Higgins and Smith.

Student assessment of learning gains: A reassessment of validity. Higgins, Duckett, and Estes. Poster, SSI 2018, Gordon UBER 2019.

Pairing humanities and the environmental sciences: Evaluating student impact. Higgins, Duckett, and Estes. Poster, Gordon Research Conference for Undergraduate Biology Education, 2017.

Changing student self-efficacy in climate action. Poster, Duckett, Estes, and Higgins. SSI 2017.

Voluntary on-line computer assessments increase student learning. Poster, Gordon Research Conference for Undergraduate Biology Education. Summer 2015.

Excellence in college teaching: A synthesis of theory and evidence. Poster, SSI 2015.

Biology Research: General focus: Evolutionary ecology, physiological ecology, and life history of size differences between male and female animals. How plasticity in life history influences the reproductive success of males and females in diverse habitats.

Major Accomplishments:

I have shown that choline, a precursor of acetylcholine and cell membrane components, is an essential nutrient (not synthesized by the spider). The spiders use choline for both physiological functions and orb-web synthesis and there are diet-dependent trade-offs.

I have shown that family lines vary in their developmental response to environmental conditions, and males and females respond differently to nutritional stress.

Developmental plasticity varies independently from mean size across species of *Nephila*, and male and female size and plasticity are evolving independently.

Research Involving Undergraduates:

UT: Students accompanied me on trips to Mexico, and were assigned semi-independent projects in the field and in the laboratory.

UVM: Biology – Students sent to Mexico on collection trips with Mexican collaborators. 10-12 students involved in animal maintenance each year. 2 independent projects each year.

BC: Student independent research projects, based upon independently- developed hypotheses, as part of the organismal biology laboratory class. One tutorial student project resulting in paper that we are preparing for submission.

Fellowships and grants:

National Science Foundation Grant, "Adaptation and migration among populations of *Nephila clavipes*" with Juan Núñez Farfan (UNAM). 2001-2007.

National Science Foundation SGER Grant, "Resource allocation by spiders: possible gene x environment effects" with M.A. Rankin (UT Austin). 1996-2000.

National Science Foundation Grant, "Nutritional ecology of the web of *Nephila clavipes*" with M. A. Rankin. 1993-1996.

Christenson Research Institute fellowship, 1993

UNAM postdoctoral fellowship, 1990-1991

Organization of American States PRA fellowship, 1988-1990

National Science Foundation Doctoral Improvement Grant, 1985-1986

Administrative experience: I work to build consensus among diverse stakeholders to identify goals, develop plans for achieving those goals, and assess progress through regular external and internal evaluation procedures.

2014-2016: Member, Board of Directors, Common Ground Center. CGC is a nonprofit, multi-age arts, education, and outdoor recreation center dedicated to and modeling environmental sustainability and strengthening families and communities through unique program offerings. The board is responsible for oversight of budget, policy, and staff hiring and evaluation that are aligned with the mission of the organization.

2015: Course evaluation for UVM Center for Teaching and Learning. Implementation evaluation of on-line course for faculty moving to hybrid or on-line teaching.

2015: Designed curriculum plan for the Lake Champlain Maritime Museum collaboration with the Addison Northwest Supervisory Union afterschool program at Vergennes Middle School.

2014: Designed and executed a personalized teaching evaluation aligned with the Darling-Hammond model.

2014: Designed a transformation of pre-service teacher training curriculum from discipline-centered to interdisciplinary, including a written brief and multiyear vision of change.

2009-2011: Chair of the School Board of the Windsor, VT School District. Provided training of the board to function more proactively and independently; identified a facilitator for training workshops; reorganized the calendar to include annual periods of reflection and appraisal; worked through consensus building; collaborated with other board chairs in the supervisory union during mandated change in governance structure; oversaw replacement of the superintendent and school administrators; represented the board in the development of the high school transformational plan; supervised development of annual school budgets; educated the community around budgets and school function.

2009-2012: Associate Editor: Behavior and Physiology for the Journal of Arachnology. Managed peer review of manuscripts, including deciding whether to submit a paper for review, correspondence with authors, identification and correspondence with reviewers, timely return of manuscripts to authors with decisions, and editing of revisions

1988-2013: Managed research teams of colleagues and students. Trained students in basic research skills; guided students through independent projects; collaborated with colleagues in development, execution, and analysis of research projects; organized international travel with students.

Professional and community service:

2019 – Organized the *Designing Assessments of Student Outcomes* mini-symposium, SENCER

2019- current: co-chair, Vermont Evaluators network

2017 – 2019: Member, ad-hoc committee for research, National Center for Science and Civic Engagement (parent organization of SENCER)

2015, 2016, 2017, 2021: Member, NSF STEM education grant review panels

2016-2017: Member. Vermont Afterschools STEM Partner Advisory Council

2016-2018: Member. Faculty Development Network – Undergraduate Biology Education

2014-2017: Member. Board of Directors, Common Ground Center

2014-2017: Member, Vermont STEM collaborative.

2013: Member, Vermont Agency of Education Elementary Endorsement Revision Panel

2009-2012: Associate Editor for Behavior and Physiology, Journal of Arachnology

Reviewer for: International Journal of STEM Education, National Science Foundation, Science Education and Civic Engagement: An International Journal, New England Educational Research Organization, Animal Behaviour, Behavioral Ecology, Behaviour, Insect Behavior, Evolution, American Naturalist, Functional Ecology, Journal of Arachnology, Biotropica, American Midland Naturalist, Annals of the Entomological Society

Memberships: Science Education for Civic Engagements and Responsibilities (SENCER), Faculty Development Network – Undergraduate Biology Education, National Science Teachers Association, American Evaluators Association, Vermont Evaluators Association, Professional and Organizational Development (POD) Network in Higher Education.

Other Skills and Experience:

Software proficiency: HyperResearch, Microsoft Office, Blackboard, Moodle, JMP statistical software, Inspiration.

Experience with: Wordpress, Adobe Illustrator, Quicken, In-class "clicker" technology.

Languages: Spanish fluent spoken.

Overseas residencies: Germany, Panama, Costa Rica, Papua New Guinea, Mexico.

Publications and reports:

Reports:

Drawing for learning, Drawing as learning. for the Maryland Institute College of Art, 2016.

Final evaluation report: Impact of 2017 FYS: Humans and the environment, a comparative study. for C Duckett and H Estes, Monmouth University. 2018.

Final evaluation report: Impact of 2016 FYS: Humans and the environment. for C Duckett and H Estes, Monmouth University. 2017.

Annual developmental evaluation reports 2016-2019: Visualizing development of interdisciplinary collaborations. Animal disease biosecurity coordinated agricultural project, USDA NIFA funded. J. Smith, PI.

Formative evaluation of educational outcomes and impacts of a novel summer STEM program at a Hispanic-serving institution. US DoE funded, J Grew PI. 2018-2021. with M. Devanas.

Peer reviewed publications:

In revision: L. Higgins, J. Smith. Documenting development of interdisciplinary collaboration among researchers by visualizing connections. Research Evaluation.

Submitted: L Higgins, M. Devanas, R. Carroll, K. Cotter, J. Grew. Community building activities improve academic success for academically at-risk Hispanic and Black STEM undergraduates. International Journal of STEM Education.

2021: Using models of cognitive development to design college learning experiences, Chapter 10 in Blessinger and Sengupta (eds) *International Perspectives on Innovative Approaches to Teaching and Learning V 35 – Humanizing Higher Education*. West Yorkshire, England: Emerald Publishing Ltd.

2017 L. Higgins, E. Dolci: Sources of biological energy. SENCER PEARLS of Practice.

2017 Babb, P.D., Lahens, N. F., Correa-Garhwal, S.M., Nicholson, D.N., Kim, E.K., Hogenesch, J.B., Kuntner, M., Higgins, L., Hayashi, C.Y., Agnarsson, I., Voight, B.F. The *Nephila clavipes* genome highlights the diversity of spider silk genes and their complex expression. Nature Genetics 49: 895-903.

2011 L. Higgins, J. Coddington, C. Goodnight and M. Kuntner. 2011. Testing ecological and developmental hypotheses of mean and variation in adult size in nephilid orb-weaving spiders. Journal of Evolutionary Ecology 25:1289-1306.

L. Higgins and C. Goodnight. 2011. Developmental response to low diets by giant *Nephila clavipes* females. Journal of Arachnology 39:399-408

2010 L. Higgins and C. Goodnight. *Nephila clavipes* females have accelerating dietary requirements. Journal of Arachnology 38: 150-152.

2007 L. Higgins. Juvenile *Nephila* (Araneae, Nephilidae) use various attack strategies for novel prey. Journal of Arachnology. 35: 530-534

2006 L. Higgins. Quantitative shifts in orb investment during development in *Nephila clavipes* (Araneae: Tetragnathidae). Journal of Arachnology 34:374-386

L. Higgins, S. White, J. Nuñez Farfán and J. Vargas. Patterns of variation among distinct alleles of the *Flag* silk gene from *Nephila clavipes*. International Journal of Biological Macromolecules 40: 201-216.

2002 L. Higgins. Female gigantism in a New Guinea population of the spider *Nephila maculata*. Oikos 99:377-385

2001 L. Higgins and M.A. Rankin. Mortality risk of high rate of weight gain in the spider *Nephila clavipes*. Functional Ecology 15:24-28

L. Higgins, M. Townley, E. Tillinghast and M.A. Rankin: Differences in the composition of orb webs built by the spider *Nephila clavipes* (Linnaeus) (Araneae: Tetragnathidae) in the field and laboratory. Journal of Arachnology 29:82-94

2000 L. Higgins. The interaction of season length and development time alters size at maturity. Oecologia 122:51-59.

1999 L. Higgins and M. A. Rankin. Nutritional requirements for orb-web synthesis in the tetragnathid spider *Nephila clavipes*. Physiological Entomology 24:263-270.

1998 L. Higgins and R. Buskirk. Spider-web kleptoparasites as a model for studying producer-consumer interactions. Behavioral Ecology 9:384-387

1996 L. Higgins and M. A. Rankin. Different pathways in arthropod post-embryonic development. Evolution 50:573-582

L. Higgins and E. Ezcurra. Thermoregulation by *Nephila clavipes* in a mid-altitude desert: a simulation. Functional Ecology 10: 322-327

1995 L. Higgins. Direct evidence for trade-offs between foraging and growth in a juvenile spider. Journal of Arachnology 23:37-43

1993 L. Higgins. Constraints and plasticity in the development of juvenile *Nephila clavipes* in Mexico. Journal of Arachnology 21:107-119

L. Higgins and R. Buskirk. A trap-building predator exhibits different tactics for different aspects of foraging behavior. Animal Behavior 44:485-499

J. Barnes, L. Higgins and C.W. Sagrosky. Predation of *Nephila clavipes* (Linnaeus) (Araneae: Tetragnathidae) eggs and review of genus *Pseudogaurax* (Diptera: Chloropidae), with a description of two new species. Journal of Natural History 26: 823-834

L. Higgins. Developmental changes in the barrier web structure under different levels of predation risk in *Nephila clavipes* (Araneae: Tetragnathidae). Journal of Insect Behavior, 5: 635-655.

1992 L. Higgins. Developmental plasticity and fecundity in the orb-weaving spider *Nephila clavipes*. Journal of Arachnology, 20:94-106

1991 L. Higgins. Response to mock predation changes with the proximity of the molt. Journal of Arachnology, 19: 231-232.

1990 L. Higgins. Variation in foraging investment during the intermolt and before egg laying in the spider *Nephila clavipes*. Journal of Insect Behavior. 3:773-783.

O. Fincke, L. Higgins and E. Rojas. Size specific ectoparasitism of *Nephila clavipes* (Linnaeus) (Araneae: Araneidae) by an ichneumonid (Hymenoptera: Polyshinctini) in Panama. Journal of Arachnology, 18: 321-330.

L. Higgins and K. McGuinness. Orientation behavior of the orb-weaving spider *Nephila clavipes* in southeastern Texas. American Midland Naturalist, 125: 286-293.

1989 L. Higgins. Effect of insemination on the morphology of the internal female genitalia of the spider *Nephila clavipes* (Araneae: Araneidae). Annals of the Entomological Society, 82: 748-753.

1987 L. Higgins. Time budget and prey of *Nephila clavipes* (Linnaeus) (Araneae: Araneidae) in southern Texas. Journal of Arachnology, 15:401-417.

In preparation:

L. Higgins. Stimulating communication practice through "teach your past self" lessons. To be submitted to *CourseSource*.

L. Higgins and M. Sobel. Exam wrappers exposing students to learning research change study habits. To be submitted to Journal of College STEM Teaching.