Preview of Award 1449815 - Annual Project Report

Cover

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PD/PI Name:	Colin Phillips, Principal Investigator Hal Daume, Co-Principal Investigator Robert M DeKeyser, Co-Principal Investigator William J Idsardi, Co-Principal Investigator Rochelle Newman, Co-Principal Investigator
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Accomplishments

* What are the major goals of the project?

The impact of "Big Data" analysis on language science and technology is exemplified by tools like Siri and Google Translate. This technology relies on analysis of billions of words and sentences in English, but it is squarely outperformed by human children, who learn language using only modest amounts of data. Understanding how human learners make

such economical use of language input and translating these insights into "smarter" methods in language technology requires an interdisciplinary approach. Our NRT project combines team based research on the efficient use of language data ("Beyond Big Data") with a strong emphasis on student leadership, science communication, outreach, public policy activities and preparation for diverse careers.

Major goals of the project include: (i) understanding efficient use of language data, with a focus on the informativity of data to human and machine learners; (ii) adopting team-based approaches to complex research problems spanning multiple fields; (iii) providing students with the experience and skills to be flexible communicators in writing and speaking; (iv) training students to become future leaders in interdisciplinary research.

The project's training model is designed to train future leaders in the field of language science: researchers who are creative, adaptable, and skilled at working in teams to solve complex problems.

Building on lessons learned from our IGERT program, emphasis is placed on "enabling" activities-- activities that may at first seem like distractions, but in fact build communication skills and catalyze cross-disciplinary interactions, providing students with skills needed to become leaders in interdisciplinary and translational research. Specific activities fall into one or more of the following six categories: community activities, communication training, team-based research on flexible data use, career development, public policy experiences, and training that pushes students beyond their comfort zone. These activities are discussed in greater detail in the Major Activities section of this report.

We have been working in close conjunction with our NRT evaluator, Prof. KerryAnn O'Meara, to develop a comprehensive training and evaluation model. The model comprises a detailed program objectives statement, a logic model, and guidelines for measuring outcomes. Each of these components are included in the report. The program objectives statement is included in the Specific Objectives section. The logic model is included as a PDF attachment to the Accomplishments section. Finally, guidelines for measuring outcomes are included under the relevant subheading of the Major Activities section.

LANGUAGE SCIENCE CENTER

Our NRT program is housed in the Maryland Language Science Center (LSC), an interdisciplinary initiative with a mission to "advance an integrated science of language, through research and training that links fundamental science with applications in education, technology, and health." Students and faculty from around 20 departments and programs are involved with the LSC, and the range of research is correspondingly broad.

The creation of the Language Science Center in 2013 was a direct consequence of efforts developed via our NSF IGERT program (2008-2015). It builds upon the interdisciplinary community that the IGERT program had already strengthened. The NRT program reinforces the activities of LSC in many ways.

Some major areas of interdisciplinary research include:

- Cognitive neuroscience of language development and processing

- Computational modeling of language, language processing, and language learning

- The role of language development/processing in literacy and school achievement

- Adult language learning and second-language processing

- Individual differences in language learning and processing

- Atypical language development and processing

- Language diversity and linguistic theory

A few representative projects directly supported by LSC staff:

- The LSC's Field Station in Guatemala is a multidisciplinary hub for research and training. It hosts independent researchers throughout the year. In an annual summer field school, students and faculty spend a month on intensive language classes and linguistic fieldwork in Mayan languages. We plan to expand activities to serve local community needs, and encompass new disciplines including public health, nutrition and education.

- The UMD Toggle Talk Project (led by LSC Associate Director Jan Edwards, funded by an IES Goal 3 grant) is a 5-year study investigating whether ToggleTalk®, a curriculum supplement on dialect shifting, improves reading scores of kindergarten and first grade children. 30 public elementary schools in Baltimore and DC are participating. The project involves 30-50 undergraduate and graduate students each year.

- Naomi Feldman (Linguistics) and Jan Edwards (HESP) are collaborating on an interdisciplinary project funded by an R21 grant from NIDCD. These faculty members met through the LSC and became interested in using computational modeling to predict which language interventions are most effective for helping children with developmental language disorders.

* What was accomplished under these goals (you must provide information for at least one of the 4 categories below)?

Major Activities:

RESEARCH

As our NRT program has developed we have been pleased to see clusters of research projects emerging, spanning trainees from multiple departments with multiple mentors. In most cases these are the product not of a single 'seed' activity but rather the result of multiple planned and organic activities that built interest around these themes. This year the most prominent areas of interdisciplinary research among trainees were:

(i) Computational modeling of language acquisition and processing at the cognitive and neural level. This represents a persistent growth area among our students, consistent with the goals of our NRT program. Trainees are using computational modeling and natural language processing tools to tackle a wide range of psychological and linguistic questions: from how infants infer grammatical rules from limited and/or noisy input, to how raw acoustic input is mapped to abstract speech representations in the brain. This research area involves trainees from Linguistics (Gaston, Hitczenko, Liter, Muller, Perkins, Thorburn), Neuroscience and Cognitive Science (Ovans), and Electrical Engineering (Joshi).

(ii) Language processing in the face of auditory or cognitive limitations. A key theme of our NRT program is learning from limited or noisy data, including human successes and struggles. Many of our trainees are using behavioral and electrophysiological experiments to investigate the cognitive and neural mechanisms of speech perception/production and sentence processing, particularly (a) the role of general cognitive mechanisms like working memory and attention in sentence processing, and (b) differences in speech and language processing in special populations, such as those affected by developmental language delay, autism, or cochlear implants. This research area involves trainees from Hearing and Speech Sciences (Blomquist, Buntrock, Garbarino, Johnson, Oppenheimer), Neuroscience and Cognitive Science (Maher, Ovans), and Linguistics (Liter).

(iii) Language processing and literacy in children and adults using multiple dialects or languages.

Trainees are pursuing both lab- and classroom-based research to understand the impact of linguistic diversity on language processing, and subsequent effects on literacy development and educational outcomes. Populations of particular interest include (a) children who experience "dialect mismatch"--hearing different varieties of English at home vs. at school, and (b) children and adults who are bilingual or learning a second language with a different orthographic system than their native language. Trainees have invested significant time in building relationships with schools and communities to gain access to these target populations. This research area involves trainees from Hearing and Speech Sciences (Byrd, Erskine, Exton), the School of Education (Glanbock, Li), Second Language Acquisition (Karatas), and Neuroscience and Cognitive Science (Maher).

EDUCATION AND TRAINING

(i) Integrative seminars continue to be one of the most valuable tools for developing new cross-cutting research areas. They bring together students from different fields and help them explore unfamiliar research areas. We have found them to have a more lasting impact than workshops or survey courses, and we suggest a few reasons for this. The semester-length duration allows time for participants to build trust and to come to understand different approaches. The exploratory format allows students and faculty to feel that they are engaged in a joint discovery process. The novelty encourages non-registered students and faculty to take part, adding to the sense of intellectual adventure. Two notable examples this year were a computational cognitive neuroscience seminar led by computational linguist Philip Resnik and postdoc Shohini Bhattasali. This proved so successful that it fed into a successful reading group that continues to the present, drawing together students from quite diverse backgrounds (physics to speech pathology). Also, a seminar on language and infant conceptual development, led by Valentine Hacquard and Jeff Lidz, took faculty and students alike into a relatively unexplored boundary area.

(ii) Our program's communications training is closely tied with our public engagement efforts. Some of our activities are local, but others are coordinated with the Language Science for Everyone (LfE) network, which jointly organizes activities at various large events, such as the USA Science and Engineering Festival (Washington DC) and the AAAS Family Science Days event. The LfE activities have received supplemental support from NSF's Linguistics program. In 2020, as part of the network's activities at AAAS we organized a science communication training event at the Pacific Science Center in Seattle, serving around 20 students from UMD, Ohio State and other universities, coordinated by NRT program coordinator Dr Shevaun Lewis. It was led by Elizabeth McCullough of PSC, a linguistics PhD who went on to lead programs for connecting scientists to the public. The workshop was very well received--one trainee described it as "a highlight of the year".

RESPONSE TO COVID-19: See the section "Actual or anticipated problems or delays" for details about how COVID-19 restrictions have already begun to affect our research and education activities and how we are adjusting.

EVALUATION

The NRT internal evaluation is guided by case study methods and three research questions: (1) To what extent has the NRT program achieved its seven stated goals? (2) Which elements of the program were most influential in accomplishing these goals? (3) Are there challenges or context constraining the NRT program, or the LSC more generally, from achieving its goals? The evaluation draws primarily from qualitative data sources including interviews, focus groups, and ethnographic observations of NRT program events. To date, the evaluation team has conducted focus groups with both students (3) and faculty (3), interviewed 23 trainees, conducted exit interviews with 9 graduating trainees, interviewed 6 key institutional informants (including faculty and administrators involved in graduate education), and observed approximately 60 hours of NRT programs and activities.

In addition, a survey was conducted over three years (2018-2020). In Wave 1 and Wave 2, the experiences of UMD NRT students were compared to language science students at three peer institutions (University of Connecticut, The Ohio State University, and University of Wisconsin). These institutions are all public flagship universities with some kind of cross-departmental coordination of language science activities, and so their inclusion as comparisons is valuable for understanding the value added by our program. This survey was also distributed with permission to the students in another NRT program at UMD (COMBINE, a program based primarily in physics and biology). In Wave 3, the survey was distributed only to students in our NRT program.

The evaluation team prepared and presented a comprehensive final report of their findings to the PI and program staff in April 2020, which is included as a supporting document. They have also contributed to the field of social science research on practices that facilitate the development of graduate students as interdisciplinary scholars (see details in the section on dissemination).

Specific Objectives:	Our research objectives have not changed since last year. We aim to create productive bridges between cognitive and computational research on language, to examine how human and machine learners can do more with less, and to create sustainable research teams that draw from multiple fields. The project falls under the NRT "data-enabled science" umbrella, but in our case this does not entail a focus on Big Data. Rather, the focus is on how to do more with less.

Our training objectives are also the same as last year. We aim to (i) enhance students' 'agency' as interdisciplinary researchers, via their research skills, independence, collaborative skills, risk-taking and ability to move beyond the personal comfort zone, and ownership of program activities; (ii) change

students' professional networks, across disciplines, institutions, career stages, and career types; (iii) enhance students' ability to connect specific research problems with their broader context ("zooming in" and "zooming out"); (iv) enhance student ability to communicate particular research problems and the contexts surrounding them to diverse academic and nonacademic audiences in writing, in speaking and in diverse contexts; and (v) enhance students' ability to pursue careers within and outside of academia by helping them assess their own skills and values, understand the career options available, and make a plan to achieve their career goals.

Significant Results:	**RESEARCH**

(i) A recurring theme for our program is that culture change takes time, and that it has deep and lasting effects. This can be seen clearly in our long-standing efforts to bridge computational and psychological/neuroscientific approaches to language through our IGERT (2008-2015) and NRT (2015-present) programs. What was a dream in 2008 and a specific goal in 2015 is now standard practice for our students and faculty. Student-led collaborations led to faculty re-orientations which led to progressively closer alignments of research groups. Our psycholinguistics students routinely incorporate computational modeling or tools from computer science in their research. Computer science faculty routinely collaborate with students and faculty who do human subjects research. This can be seen in collaborative research projects, in reading groups, in course enrollments, and what students regard as 'normal'.

(ii) In 2008 another of our dreams was to see research combining expertise in human language and animal cognition. After some initial false starts, this is now a reality, with two groups in our community pursuing thriving research programs. Adam Fishbein is the student lead on a project that compares human speech perception to songbirds' perception of their song. Adam is co-supervised by a team of neuroscientists, ethologists, and linguists. Amritha Mallikarjun (not a trainee, but a participant in many NRT activities) is the student lead on a project that explores dogs' understanding of human vocalizations. This project is grounded in co-PI Rochelle Newman's research on speech perception in human infants. Both lines of research have been published in the scholarly literature and have reached broader audiences. Fishbein published an article in Scientific American in 2018, and the dog lab's research was featured in the Washington Post in early 2020.

EDUCATION AND TRAINING

(i) Trainees continue to lead peer-to-peer teaching and learning in statistics, and report feeling increasingly confident in their ability to choose and implement advanced analysis methods for their research. This year's Winter Storm included a number of student-led workshops and working groups on analysis methods:

- Phoebe Gaston and Hanna Muller co-led a 6-session workshop on "Improving your statistical questions", using material from a Coursera course.

- Adam Liter led a 2-session workshop on "R best practices".
- A postdoc led a 4-session workshop on "Analyzing MEG responses to continuous speech."
- Trainees invited an expert from the School of Information Studies to give a workshop on data visualization, which was very well received.
- Zach Maher led a working group on "Methods for analyzing eye-tracking data", which was cited by multiple trainees as essential for making progress on their research.

In addition, trainees requested a more intensive 10-week statistics course on multilevel modeling, which took place in the evening. The course was co-funded by the NRT grant and a T32 grant, and 7 NRT trainees participated. The materials will be made available online for all trainees.

(ii) To promote trainees' career preparation, we have emphasized individual exploration and goal-setting rather than group trainings (although we've done some workshops and panel discussions too). There are abundant professional development resources available online and on campus, but students can only take advantage of them if they have a personal framework for understanding their goals and needs. We help them create that framework by requiring them to address both short-term (academic) and long-term (career) goals in their applications to the program and in annual updates to an IDP. Although the UMD Graduate School has been recommending IDPs for several years now, they still have not been widely adopted, at least among language science departments. Trainees vary in how they use the IDP: some jot down a few high level goals; others map out a detailed timeline for the year. (Anecdotally, the handful of students who do use IDPs with their primary advisor show much more sophisticated use of the tool and greater benefits.) Regardless, they almost universally report that the process is useful for understanding their actual pace of progress and recognizing areas they tend to neglect. The process also creates a "safe space" for discussing career goals which may not align with their primary advisor's hopes, and reducing the shame or anxiety sometimes associated with exploring a variety of options. While we have not yet changed the culture of the entire community, trainees do understand that they are best served by aligning their priorities and time management with their long-term goals.

EVALUATION

The Final Report from our evaluation team summarizes findings from the first five years of the NRT project, organized around seven goals in three categories (cf. the Logic Model included as a supporting document). For each goal, the team identified the main features of the program that facilitated progress, and aspects of the program or environment that constrained progress. Here we summarize findings related to graduate student development. Findings on sharing best practices and institutional change are summarized in the sections on "Impacts."

(i) Enhance doctoral student agency as interdisciplinary researchers

The most effective aspects of the NRT program in facilitating student agency as interdisciplinary researchers were (1) interdisciplinary courses, or courses outside the student's home department, (2) low-risk opportunities to experiment and collaborate on interdisciplinary projects, and (3) committee leadership and opportunities to shape NRT program offerings. The main challenges were ambiguity in program requirements, and workload tensions between the NRT program and home departments.

(ii) Change the nature of student professional networks

Many trainees initiate interdisciplinary connections by attending interdisciplinary seminars or other courses outside their home department. Those connections are developed and maintained through regular participation in formal and informal meetings of students and faculty from different departments. The Language Science Center hosts such meetings throughout the year: weekly Language Science Lunch talks and writing groups, regular meetings of student committees and reading/discussion groups, and major annual events like Language Science Day and Winter Storm.

(iii) Enhance student understanding of particular research problems and the relationship between research problems and contexts, and (iv) enhance student ability to communicate about research problems and their contexts, and adjust their communication according to the audience, channel, and goals.

Trainees learn to understand and communicate the context of their research through regular opportunities to present and receive feedback from different audiences, including the interdisciplinary audience of Language Science Lunch Talks, Language Science Day, and Winter Storm, as well as non-scientists encountered at outreach events. Nevertheless, trainees still expressed lower confidence in their ability to communicate with non-academic audiences. There were differences between students in fields that are more applied (e.g. Hearing & Speech Sciences, Education, Computer Science) vs. more theoretical (e.g. Linguistics, Philosophy) fields. Those in more theoretical fields are more hesitant to connect their work to broader social impact.

(v) Enhance student ability to choose and successfully pursue a career within and outside of academia

The NRT program has been particularly helpful for trainees interested in pursuing non-academic careers, by (1) working to normalize those options, and (2) helping trainees contact language scientists outside academia to better understand how their skills would be relevant. (More discussion below, in the section on training and professional development.)

Key outcomes or Other achievements:	RESEARCH (i) An unexpected cross-disciplinary connection has proven to be fruitful. Computer scientist Philip Resnik brought NRT student and psycholinguist Hanna Muller into a cybersecurity project focused on automatic generation of 'decoy' documents (also involving NRT PI Colin Phillips). Muller has been

investigating linguistic illusions where comprehenders struggle to notice blatant errors, as in ("What is the name of the raised bumps on paper that enable deaf people to read?"; blind → deaf). This phenomenon has been known for a long time, but it remains poorly understood. Muller has made breakthroughs by identifying substantial item-wise variation in the strength of the illusion, and using a mix of cognitive and computational measures to better understand the source of the variability. In a nutshell: the illusions are most powerful when a context gives the listener a strong expectations about upcoming words, leading the listener to selectively reduce attention to incoming words. Muller could not have made this progress without the training that she is receiving in natural language processing. The work has generated much interest in presentations to psycholinguists and computer scientists alike.

(ii) A multi-year project that combines formal semantics and psychophysics continues to bear fruit, especially in the hands of trainee Tyler Knowlton. At first sight, the meaning of logical words like "every" and "most" seems fairly obvious. But as linguists, logicians, and computer scientists have long known, there are many different ways of formally expressing that meaning, all of them logically equivalent in terms of the situations where they can be used. However, Knowlton has shown that the different accounts of the meaning of these words make different predictions about how speakers mentally process the words, and that the predictions can be tested using psychophysical measures that probe how logical words draw comprehenders' attention to different properties of rich visual arrays of dots. This is a highly innovative line of research into linguistic meaning, and it would not be possible without Knowlton's cross-disciplinary advising team comprised of a linguist, a philosopher, and a psychologist.

(iii) Trainee Mina Hirzel devised an ingenious new way of measuring the time course of sentence comprehension in young children aged under 2 years. Recent years have seen rapid progress in understanding the moment-by-moment processes of sentence comprehension in preschoolers and kindergarteners, i.e., ages 4-6 years, but similar questions are very hard to explore in infants. Evidence about the timing of interpretive processes is generally too noisy and too ambiguous. Hirzel showed that she could use 20-month olds' interpretation of unfamiliar words, e.g., "the tig", to provide clues on the time course of sentence parsing. This makes it possible to ask questions about infant language comprehension that we did not think possible a few years ago. This work has now been presented at leading conferences in early language development and (mostly adult) psycholinguistics.

EDUCATION AND TRAINING

(i) Our 2-week "Winter Storm" workshop marked its 12th year in January 2020, and we saw further indications that this signature part of our program is re-invigorated and sustainable beyond the end of NRT funding. By Year 10 we were concerned about possible burnout and declining enthusiasm for

Winter Storm, which has always consisted of a mix of student led tutorials, workshops, and research development groups, scheduled to fill 2 weeks of UMD's January term. In 2019 the event was successfully redesigned by a team of younger faculty. The event was shortened, and gave more time for unstructured or semi-structured discussing and writing. We were very pleased that the success of the model was replicated with a new organizing team in 2020. There is now broad agreement in the community that Winter Storm is something that must be sustained somehow.

(ii) Several trainees have taken a creative approach to their policy experience through a collaborative project called "Bias in Linguistics." The project was originally started by two undergraduate students at Michigan State University who came to UMD in 2017 (including one current trainee, Adam Liter). It gained new life in Winter Storm 2018, when a number of UMD linguistics students joined the project. It is now a thriving inter-institutional collaboration involving students and faculty at UMD, Michigan State, UMass Amherst, the CUNY Graduate Center, Harvard, and NYU.

The goal of the project is to document and ultimately explain gender representation in the field of linguistics in the US. We were initially skeptical that the project would provide sufficient "policy" experience to fit the goals of the NRT, but the students did eventually connect their social science research to a deeper understanding of university policy. They have developed connections with the Linguistics Society of America and its Committee on the Status of Women in Linguistics, as well as UMD's ADVANCE program. They have also worked to disseminate their findings through multiple channels. Trainees involved in the project have universally reported that it was one of the most impactful experiences of their graduate training.

Trainees Phoebe Gaston and Hanna Muller are leading a project on the effect of gender bias on publication rates. They have found that, "while the severity of the problem varies across sub-fields, … women do publish less than would be expected given their representation in the field." The work has been presented as a talk at the Linguistic Society of America 2019 Annual Meeting, and is now under review at *Language*, the flagship journal in linguistics.

Trainees Paulina Lyskawa and Laurel Perkins worked with a student in the College of Education to develop a survey for current linguistics graduate students, investigating "whether the factors known to affect gender representation and advancement at the faculty level may have their roots in the graduate student experience." That research is still ongoing.

* What opportunities for training and professional development has the project provided?

PROGRAM ELEMENTS
i. Applications.
Students apply to the NRT program after they are already enrolled at UMD and typically after they have already been active in a number of program activities. They submit a 5-page proposal detailing an integrated research and training plan, as well as various supporting documents. Early-stage students find this proposal somewhat intimidating, so we have added additional steps to the application process to provide more

scaffolding. To scaffold the process, we ask applicants to submit a letter of intent and meet with the program coordinator before submitting their full proposal. By working with students directly as they write their proposals, we increase the chances that students' plans fit their needs and interests, and reduce the need for extensive revisions later. This approach has been successful: students report that the meeting is helpful for thinking through their research and training plan, and makes the process less intimidating.

ii. Mentoring.

We strongly encourage students to seek out multiple mentors. Of the 34 current and former trainees, 17 have worked with more than one faculty advisor, some in different departments. The NRT program coordinator also provides mentorship that complements that of the faculty advisors. Once per year, trainees complete a report on their research and training activities over the past year, and write an IDP for the next year. Then they meet individually with the program coordinator to discuss how their previous and planned activities align with their long term goals. This process helps students zoom out from their day-to-day concerns and think about the broader picture.

iii. Career development.

Discussions about career plans have become routine in meetings with trainees: when they apply to become a Language Science Apprentice, when they are working on their research and training proposal to join the program, and in annual progress meetings. Students describe their career goals and identify skills to work on in their IDP, updated annually for the progress meeting. It is a notable step that this has shifted from a slightly taboo topic to a routine topic.

iv. Professional and research skills training

Trainees organized a number of workshops and working groups during Winter Storm this year, aimed at both professional and research skills. (Professional development sessions are detailed in the table included as supplementary material; research skills sessions are listed in the "Significant Results" section.) They continued to run writing accountability groups that met weekly throughout the year. Trainees also requested a more formal 10-week course on multilevel modeling, which was co-funded by the NRT grant and an NIH T32 grant.

v. Policy experience

Trainees are expected to complete a policy experience of their choosing. The goal of this part of the program is for trainees to connect science with societal issues, apply their research skills outside an academic context, and communicate with stakeholders with different backgrounds and expertise. Students tend to find the process of imagining and designing the policy experience to be intimidating, but they report afterwards that it was among the most interesting and rewarding parts of their graduate training.

COMMUNICATION

Trainees in our program have many opportunities to practice and improve their skills communicating to broad audiences.

- Speaking to a multidisciplinary audience: Each trainee presents at least one Language Science Lunch Talk (LSLT) per year, to an audience of students and faculty from different departments. To increase the training benefit of this experience, trainees are assigned to a peer group of 3-4 students at the beginning of the year, which meets to give feedback to each trainee the week before they present at LSLT.
- Outreach activities: Each trainee participates in at least one outreach activity each year. Students explain core principles and facts from language science through interactive demos, usually aimed at elementary, middle, and high school students and their families. In February we led a team of students and faculty from UMD and other universities for a "Language Science for Everyone" booth at AAAS Family Science Days in Seattle. We also organized a science communication workshop for the group that took place at the Pacific Science Center, led by museum staff.

- Policy experience: For the policy experience, trainees often produce presentations or written reports aimed at a non-academic audience.
- Writing (productivity): Students have launched writing support groups and write-on-site sessions that have been very effective at improving students' writing productivity.

EVALUATION

Professional development topics are included in all program evaluation activities, including the survey, student interviews, and focus groups with students and faculty.

Survey results from 2018-2019 suggest that, compared to students at peer institutions, our trainees have more opportunities to learn about academic and non-academic career options, more encouragement and advice related to career planning, and more leadership opportunities. They also have more opportunities to learn about the impact of research on clinical practice or public policy, to learn and practice strategies for communicating with diverse audiences, and to actually communicate with non-academics.

Trainees who have pursued or plan to pursue non-academic careers have been particularly helped by the NRT program's effort to normalize such careers. They have had more exposure to a variety of options, and more mentorship around developing their career plans than they would have otherwise.

Trainees planning to pursue academic careers have felt less well-served by NRT program offerings. Nearly all of our workshops are intended to serve all trainees, regardless of their preferred career: everyone needs communication, management, and leadership skills--even professors. However, since these skills are less explicitly valued in a university setting, training in these skills is unfortunately often perceived as less relevant for future faculty.

* How have the results been disseminated to communities of interest?

Our team has been doing many different things to get the word out about what we are doing, reaching different audiences via multiple channels. There is no clear line between NRT-specific activities and the broader range of activities of the Maryland Language Science Center, and our communications strategy reflects this.

(i) Websites. We have deliberately avoided creating an NRT-specific website, as we believe that it is hard to get broad buy-in to a short-term grant with an obscure acronym. As we did with our earlier IGERT program, we embed NRT materials as a section within the broader Language Science Center website. These materials are primarily aimed at prospective NRT students and their mentors.

We created websites for the NRT Teams' Meeting and Future STEM Leaders meeting in Maryland and Washington DC in May 2016. These sites now include materials from those meetings, making them a valuable resource on the activities of the first two NRT cohorts. These should, in principle, be of interest to prospective NRT applicants, an important and receptive audience.

(ii) Social media. LSC's Facebook following grew to over 900 people this year. Our posts reach 200-300 people on average, and some as many as a thousand. These are not huge numbers, but our activities have high visibility among language scientists, which increases the impact of our NRT program in our field(s). The primary goal of these posts is highlighting the culture of our interdisciplinary community to scientific peers.

(iii) Meetings with (inter)disciplinary groups. Our team's activities were highlighted in a special session at the January 2018 meeting of the Linguistic Society of America, as well as a symposium organized by Phillips for the 2017 National Humanities Conference in Boston. Phillips gave a presentation about the development of the UMD Language Science community to a multi-university group in Taipei in October 2018.

(iv) Dissemination to other (prospective) NRT teams. Aspiring NRT teams at UMD and elsewhere regularly seek out Phillips for advice on developing interdisciplinary programs. We make all of our program's materials, including the proposal and reviews, available online. Our team met with the PIs of the other NRT programs at UMD and the language science NRT program at UConn while they were preparing applications, as well as a

handful of other NRT hopefuls at UMD and other universities. At the 2018 and 2019 NSF NRT meetings we met a number of people who we had never met before who thanked us for the materials about our program that we had shared online. Our group contributed 3 talks and a poster to the 2019 meeting.

The three NRT teams at UMD are beginning to meet more regularly. The coordinators met several times this year to share ideas and best practices for program activities. In January 2020, all the PIs and coordinators, as well as the external evaluator of the two other teams (Shirley Vincent), met to discuss common challenges and institutional barriers, and how to spread our practices more widely at UMD.

(v) Dissemination of evaluation results. Our evaluation team has presented their findings at three academic conferences, and developed two journal articles out of the data collected from evaluation activities. The first of these, focusing on how students develop identities as interdisciplinary scientists, was published in the *International Journal of Doctoral Studies* (Culpepper, O'Meara, & Ramirez, 2020). The second, on the theme of "creative collisions" in science, is currently under review with *Studies in Graduate and Postdoctoral Education* (O'Meara & Culpepper, under review).

* What do you plan to do during the next reporting period to accomplish the goals?

(i) Trainees and faculty are currently developing two interdisciplinary workshops for the coming year. We hope that these events will spark new interdisciplinary collaborations that will continue after the end of the NRT program.

The first, planned for fall 2020, focuses on Developmental Language Disorder (DLD). It is being organized by three trainees (Exton, Garbarino, and Oppenheimer) who are interested in integrating research on typical and atypical language development--fields which are usually siloed in different departments. The second, planned for January 2021, focuses on what type of speech representations are most useful for recognizing accented speech. It combines engineers' interest in improving automatic speech recognition with cognitive scientists' interest in understanding the neural and cognitive representations that support robust accent adaptation in humans. This workshop is being organized by Naomi Feldman with a team of students from linguistics, computer science, and engineering, including 2 trainees (Joshi and Thorburn).

(ii) To assess the long-term impact of our NSF-funded training programs on graduates, we will conduct a survey of alumni of both the IGERT and NRT programs. Survey development is nearly complete, and we should be ready to send it out to around 70 alumni in summer 2020. In addition to gathering more detailed information about graduates' career trajectories, we hope to gain more insight into the specific training experiences that are most helpful to graduates in different types of careers.

We also aim to disseminate the lessons from our extended period of NSF support to different audiences. Our evaluation team has shared their extensive findings with our team, and they are publishing findings in the higher education research literature. Our team hopes to reach communities of language scientists, University of Maryland influencers, and general academic audiences, through a mix of formal (peer-reviewed) and informal channels, e.g., blogs. We have found that reaching prospective NRT teams is an especially fruitful approach, as these are a highly motivated and receptive audience.

(iii) Our most pressing concern in the coming year is to ensure the sustainability of the most impactful aspects of our IGERT and NRT programs after the end of NSF funding. As discussed below under "problems or delays", institutional support for the Language Science Center (LSC) has been uneven, and its future is currently uncertain. The broader language science community is strongly committed to graduate training, but efforts would be much more difficult to coordinate without the infrastructure provided by the LSC. In the best case scenario, the LSC will continue to exist with a small management team but reduced funding. In the worst case scenario, funding for essential staff will also be eliminated, and the LSC will cease to exist. In that case, cross-departmental training and research efforts would have to be sustained by a group of dedicated faculty

and students willing to volunteer their time. With both these possibilities in mind, we are pursuing several strategies to ensure the continuation of our most essential activities.

First, it is a high priority for more faculty to feel ownership of the cross-departmental community and take a more active role in activities and leadership. Regardless of the LSC's financial situation, our community is at its best when a broad and diverse group of members are strongly interconnected and take an interest in long-term strategic planning. If LSC's infrastructure is drastically reduced, volunteer contributions from faculty will be essential. We plan to invite more faculty to participate in the official leadership of the LSC by joining its Executive Committee, and continue our efforts to communicate more broadly about decision-making processes (e.g. through regular "town halls").

Second, we are developing a graduate certificate program that will help to make our role in graduate training more transparent to students, faculty, and university leaders in future years. Until now we have resisted the idea of turning our program into a formal credential, for fear of undermining the creativity and initiative that has been so important for our students' success. But this will not be sustainable once the NSF support is behind us. The graduate certificate curriculum cannot cover all that has helped trainees in our program, but we are designing it such that it gives students enough of a taste that they will want to do more in order to achieve real results, particularly in developing interdisciplinary research and preparing for diverse careers. For example, the level of sustained engagement that we have found to be needed for students to work across two fields is not possible within the scope of a graduate certificate. But we hope that the certificate will get students engaged enough that they will want to do more.

Third, we are exploring how we could incentivize students' participation in the cross-departmental community with significantly reduced resources. One idea that we have explored with students is to create a "Language Science Student Cooperative", a group of students who would control a fund to support research and training activities for both individuals and the broader community. Giving students responsibility for allocating funding would accomplish several goals: in addition to providing the financial resources students need to pursue their research and training goals, it would push students to collaborate across departments, give them a strong sense of ownership of the community, and provide unique opportunities for personal and professional development (e.g. managing a budget within university constraints, evaluating funding requests across fields, working out compromises among diverse priorities). However, in the few months since we worked out this plan with students during Winter Storm, the LSC's financial outlook has changed so much that we no longer know if it will be viable.

Supporting Files

Filename	Description	Uploaded By	Uploaded On
TraineeTable2020.pdf	Trainee table	Colin Phillips	04/29/2020
PDTable-2020.pdf	Professional development activities	Colin Phillips	04/29/2020
UM NRT Goals Final.pdf	Logic model	Colin Phillips	04/29/2020
2020 Final Internal Evaluation Report.pdf	Internal evaluation report	Colin Phillips	04/29/2020

Products

Books

Book Chapters

Colin Phillips, Phoebe Gaston, Nick Huang, Hanna Muller (). Theories all the way down: remarks on "theoretical" and "experimental" linguistics. *Cambridge Handbook of Experimental Syntax* . Status = AWAITING_PUBLICATION; Acknowledgement of Federal Support = Yes ; Peer Reviewed = Yes

Inventions

Journals or Juried Conference Papers

Adam Fishbein and Bill Idsardi and Greg Ball and Bob Dooling (2019). Sound sequences in birdsong: how much do birds really care? . *Philosophical Transactions of the Royal Society B.* . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Adam Fishbein and Jonathan Fritz and Bill Idsardi and Jerry Wilkinson (2019). What can animal communication teach us about human language? . *Philosophical Transactions of the Royal Society B.* . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = No

Adam Liter and {Naomi H.} Feldman (2020). Modeling the learning of the Person Case Constraint. *Proceedings of the Society for Computation in Linguistics*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Craig Thorburn and Naomi Feldman and Thomas Schatz (2019). A quantitative model of the language familiarity effect in infancy.. *Proceedings of the Conference on Cognitive Computational Neuroscience*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Erskine, M., Munson, B., and Edwards, J. (2020). Relationship between explicit and implicit phonological awareness: Evidence from a longitudinal study of preschool children.. *Applied Psycholinguistics*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Laurel Perkins and Jeffrey Lidz (2020). Filler-gap dependency comprehension at 15 months: The role of vocabulary. *Language Acquisition*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Tyler Knowlton and Paul Pietroski and Alexander Williams and Justin Halberda and Jeffrey Lidz (2020). Conservativity is not a filter on possible meanings. *SALT proceedings*. . Status = AWAITING_PUBLICATION; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Yixun Li and Xi Chen and Hong Li and Xiaotian Sheng and Liu Chen and Ulla Richardson and Heikki Lyytinen (2020). A computer-based Pinyin intervention for disadvantaged children in China: Effects on Pinyin skills, phonological awareness, and character reading. *Dyslexia*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Yu'an Yang (2020). Commitment issues: a unified analysis of Mandarin discourse par- ticle ba. *SALT proceedings*. . Status = AWAITING_PUBLICATION; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Yu'an Yang and Daniel Goodhue and Valentine Hacquard and Jeffrey Lidz (2020). Do children know whanything? Acquisition of wh-ambiguity in Mandarin. *Proceedings of the West Coast Conference in Formal Linguistics*. . Status = AWAITING_PUBLICATION; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Licenses

Other Conference Presentations / Papers

Mina Hirzel and Jeff Lidz (2019). *3 year-old children respect the complex-NP constraint*. Boston University Conference on Language Development. Boston, MA. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Maher, Z., Erskine, M., Byrd, A., and Edwards, J. (2020). *A lexical advantage in four-year-old children's word repetition*. Variation in Language Acquisition. . Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Eun-Kyoung Rosa Lee (2020). *Agreement attraction in native and nonnative language processing: The effect of sentence complexity*. The 33rd Annual CUNY Human Sentence Processing Conference. UMass Amherst (online format). Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Marisa Fried, Paulina Lyskawa and Rodrigo Ranero (2020). *Agreement in K'iche' (Mayan): Reflections on microvariation*. The 44th Penn Linguistics Conference. . Philadephia, PA. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Nicolò Cesana-Arlotti and Tyler Knowlton and Jeffrey Lidz and Justin Halberda (2020). *An Investigation of the Origins of Logical Quantification: Infants' (and Adults') Representations of Exhaustivity in Collective or Individual Complex Actions*. Society for Philosophy and Psychology. Princeton University. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Nicolò Cesana-Arlotti and Tyler Knowlton and Jeffrey Lidz and Justin Halberda (2020). *An investigation of the origins of logical quantification: infants' (and adults') representations of exhaustivity in collective or individual complex actions*. The International Congress of Infant Studies Biennial Meeting. Glasgow, Scotland. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Zachary Maher and Jan Edwards (2019). *Changes in attitudes toward variation in teachers of a code-switching curriculum*. New Ways of Analyzing Variation. Eugene, Oregon. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Yixun Li and Min Wang and Daniel Sherlock (2019). *Children learn new words during independent reading: the case of learners of English as a second language.* . the 31st Association for Psychological Science Annual Convention . Washington, DC, USA.. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Allison Johnson (2019). *Children with CIs' Word Intelligibility: Do spectral features of word-initial /t/ and /k/ predict intelligibility?* . 10th annual Midwest Mini-Conference on Cochlear Implants (CI CRASH). Madison, Wisconsin. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Yixun Li and Min Wang and Daniel Sherlock (2020). *Chinese children self-teach English written words via reading aloud.* . American Association for the Advancement of Science 2020 Annual Meeting . Seattle, USA.. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Nicolò Cesana-Arlotti and Tyler Knowlton and Jeffrey Lidz and Paul Pietroski and Justin Halberda (2019). *Concepts of universal quantification (each and all) may support infant and adult understanding of collective and distributive actions*. The Cognitive Development Society Biennial Meeting. Louisville, Kentucky. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Tyler Knowlton and Paul Pietroski and Alexander Williams and Justin Halberda and Jeffrey Lidz (2020). *Conservative meanings with only one set: evidence from verification*. CUNY Conference on Human Sentence Processing. University of Massachusetts at Amherst. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Christina Blomquist and Rochelle Newman and Jan Edwards (2019). *Development of Bottom-up and Top-down Competition in Sentence Processing*. Boston University Conference on Language Development. Boston, MA. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Michelle Erskine and Zachary Maher and Jan Edwards (2019). *Dialect mismatch influences sentence not lexical comprehension in young children*. Symposium for Research in Child Language Disorders. Madison, Wisconsin. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Sarah Elazar and Julianne Garbarino and Nan {Bernstein Ratner} (2019). *Does late language emergence impact the frequency of parental recasting?* . American Speech-Language-Hearing Association. Orlando, FL. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Zoe Ovans, Jared Novick, {Yi Ting} Huang (2020). *Engaging cognitive control helps children ignore unreliable sentence processing cues (conference poster)*. CUNY 2020 33rd Annual CUNY Conference on Human Sentence Processing. Online. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Arynn Byrd, Michelle Erskine, Zachary Maher, Kathleen Oppenheimer, and Jan Edwards (2019). *Expanding your toolbox: Strategies to support linguistically diverse learners*. American Speech-Language-Hearing Association Convention. Orlando, Florida. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Hanna Muller and Philip Resnik and Colin Phillips (2020). *Explaining item-wise variability in Moses illusions*. CUNY Conference on Sentence Processing. UMass Amherst (held online). Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Pamela Dominguez and Julianne Garbarino and Nan {Bernstein Ratner} (2019). *Expressive language outcomes of an RCT comparing DIR/Floortime with treatment-as-usual for preschoolers with autism*. American Speech-Language-Hearing Association. Orlando, FL. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Phoebe Gaston and Ellen Lau and Colin Phillips (2019). *Facilitation vs. inhibition as mechanisms for syntactic constraints on word recognition*. Psycholinguistics in Iceland – Parsing and Prediction. Reykjavik, Iceland. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Einat Korman and Julianne Garbarino and Nan {Bernstein Ratner} (2019). *I'm not convinced: SLPs need logic-based analysis to assess persuasive writing of individuals with autism*. American Speech-Language-Hearing Association. Orlando, FL. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Erika Exton and Rochelle Newman (2019). *Identification of Code Switches in Unfamiliar Languages*. Psychonomic Society. Montreal, Canada. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Allison Johnson (2019). *It's not just about finishing as fast as possible! Developing students' professional skills to ensure future success*. 2019 National Science Foundation Research Traineeship (NRT) Annual Meeting. Evanston, IL. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Adam Fishbein and Nora Prior and Greg Ball and Bob Dooling (2020). *Limitations in Avian Perception of Vocal Sequences: Implications for Language Evolution*. EvoLang. Brussels, Belgium. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Julianne Garbarino and Nan {Bernstein Ratner} (2019). *Making evaluations easier: Combined child fluency & language assessment using free FluCalc & KidEval software*. American Speech-Language-Hearing Association . Orlando, FL. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Tyler Knowlton and Paul Pietroski and Alexander Williams and Justin Halberda and Jeffrey Lidz (2020). *Memory for cardinality supports a one-set account of conservativity*. Experiments on Linguistic Meaning. University of Pennsylvania. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Adam Liter and {Naomi H.} Feldman (2020). *Modeling the learning of the Person Case Constraint*. Society for Computation in Linguistics (SCiL). New Orleans, LA. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Zachary Maher and Jan Edwards (2019). *Non-linguistic inhibition predicts lexical inhibition in 6-7 year-old children*. Boston University Conference on Language Development. Boston, Massachusetts. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Hanna Muller and Iria de Dios Flores and Colin Phillips (2019). *Not (just) any licensors cause negative polarity illusions*. Psycholinguistics in Iceland – Parsing and Prediction. University of Iceland, Reykyavik. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Yixun Li and Min Wang and Daniel Sherlock (2019). *Orthographic learning via self-teaching among English language learners.* . the 60th Psychonomic Society Annual Meeting. Montreal, Canada.. Status = PUBLISHED; Acknowledgement

of Federal Support = Yes

Neha Joshi and Daniel Duque and Jonathan Fritz and Shihab Shamma (2020). *Responses of Auditory and Frontal Cortices during Sound Source Segregation*. Association for Research in Otolaryngology, 2020. San Jose, CA. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Yixun Li and Hong Li and Xuelian Zhou (2020). *Self-teaching among Chinese college students: The roles of phonetic and semantic radicals. .* the 27th Society for the Scientific Study of Reading Annual Meeting . Newport Beach, USA.. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Yixun Li and Hong Li and Linqing Xiao (2020). *Self-teaching in Chinese: The independent roles of phonetic and semantic radicals in orthographic and vocabulary learning*. at the 32nd Association for Psychological Science Annual Convention . Chicago, USA.. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Yixun Li and Min Wang and Daniel Sherlock (2019). *Self-teaching in orthographic learning among learners of English as a second language. .* the 26th Society for the Scientific Study of Reading Annual Meeting . Toronto, Canada.. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Allison Johnson (2020). *Speech production skills in children with CIs: is there a relationship between word intelligibility, spectral features, and perceptual judgments of /t/ and /k/?*. Mid-Atlantic Seminar on Hearing. College Park, Maryland. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Allison Johnson and Shevaun Lewis and Colin Phillips (2019). *Students develop communication skills by explaining their work in interdisciplinary and public-facing settings*. 2019 National Science Foundation Research Traineeship (NRT) Annual Meeting. Evanston, IL. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Adam Fishbein and Kai Lu and Wanyi Liu and Bill Idsardi and Jonathan Fritz and Shihab Shamma and Bob Dooling (2020). *Temporal Integration of Sequences in Secondary Auditory Region of the Zebra Finch Forebrain*. Association for Research in Otolaryngology. San Jose, CA. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Zoe Ovans, Jared Novick, Albert Kim (2019). *The P600 ERP reflects cognitive control's influence on real-time sentence comprehension (conference poster)*. Psychonomic Society 60th annual meeting. Montreal, Canada. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Tyler Knowlton (2019). *The psychological treatment of (universal) quantification*. University of Pennsylvania Integrated Language Sciences and Technology Seminar. Philadelphia, PA. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Yixun Li and Hong Li and Xuelian Zhou (2020). *The roles of phonetic and semantic radicals on orthographic learning via self-teaching among Chinese college students. .* American Psychology Association 2020 Annual Convention . Washington, DC, USA.. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Julianne Garbarino and Nan {Bernstein Ratner} (2019). *Um... I'll explain: Filled pause and discourse marker use by speakers with and without autism*. American Speech-Language-Hearing Association. Orlando, FL. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Allison Johnson and Benjamin Munson and Danielle Revai and Jan Edwards (2019). *What can speech acquisition data tell us about cochlear implant device limitations? Analyzing accuracy, error patterns, and spectral features of children's /t/ and /k/ productions*. Conference on Implantable Auditory Prostheses. Lake Tahoe, California. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Other Products

Other Publications

Patents

Technologies or Techniques

Thesis/Dissertations

Laurel Perkins. *How Grammars Grow: Argument Structure and the Acquisition of Non-Basic Syntax*. (2019). University of Maryland. Acknowledgement of Federal Support = Yes

Kasia Hitczenko. *How to use context for phonetic learning and perception from naturalistic speech*. (2019). University of Maryland. Acknowledgement of Federal Support = Yes

Nur Basak Karatas. *The Comparison of L1 and L2 Case Processing: ERP Evidence from Turkish*. (2019). University of Maryland. Acknowledgement of Federal Support = Yes

Nick Huang. *Variation and learnability in constraints on wh-movement*. (2019). University of Maryland. Acknowledgement of Federal Support = Yes

Websites

Participants/Organizations

What individuals have worked on the project?

Name	Most Senior Project Role	Nearest Person Month Worked
Phillips, Colin	PD/PI	1
Daume, Hal	Co PD/PI	0
DeKeyser, Robert	Co PD/PI	0
Idsardi, William	Co PD/PI	0
Newman, Rochelle	Co PD/PI	0
Boyd-Graber, Jordan	Faculty	0
Dooling, Robert	Faculty	0
Edwards, Jan	Faculty	0
Feldman, Naomi	Faculty	0
Gor, Kira	Faculty	0
Huang, Yi Ting	Faculty	0
Lasnik, Howard	Faculty	0
Lau, Ellen	Faculty	0

Name	Most Senior Project Role	Nearest Person Month Worked
Lewis, Shevaun	Faculty	9
Lidz, Jeffrey	Faculty	0
MacSwan, Jeff	Faculty	0
Novick, Jared	Faculty	0
O'Meara, KerryAnn	Faculty	1
Polinsky, Maria	Faculty	0
Preminger, Omer	Faculty	0
Ratner, Nan	Faculty	0
Resnik, Philip	Faculty	0
Uriagereka, Juan	Faculty	0
Wang, Min	Faculty	0
Williams, Alexander	Faculty	0
Wood, Tess	Faculty	1
Adler, Rachel	Graduate Student (research assistant)	0
Blomquist, Christina	Graduate Student (research assistant)	4
Buntrock, Madison	Graduate Student (research assistant)	2
Byrd, Arynn	Graduate Student (research assistant)	4
Culpepper, Dawn	Graduate Student (research assistant)	2
Ehrenhofer, Lara	Graduate Student (research assistant)	0
Erskine, Michelle	Graduate Student (research assistant)	6
Ettinger, Allyson	Graduate Student (research assistant)	0
Exton, Erika	Graduate Student (research assistant)	4
Fishbein, Adam	Graduate Student (research assistant)	6

Name	Most Senior Project Role	Nearest Person Month Worked
Garbarino, Julianne	Graduate Student (research assistant)	6
Gaston, Phoebe	Graduate Student (research assistant)	6
Glanbock, Katharine	Graduate Student (research assistant)	2
Green, Jeffrey	Graduate Student (research assistant)	0
Hirzel, Mina	Graduate Student (research assistant)	6
Hitczenko, Kasia	Graduate Student (research assistant)	1
Huang, Nick	Graduate Student (research assistant)	1
Johnson, Allison	Graduate Student (research assistant)	6
Karatas, Nur Basak	Graduate Student (research assistant)	1
Knowlton, Tyler	Graduate Student (research assistant)	6
Lee, Eun Kyoung (Rosa)	Graduate Student (research assistant)	6
Li, Yixun Annie	Graduate Student (research assistant)	6
Liter, Adam	Graduate Student (research assistant)	6
Lyskawa, Paulina	Graduate Student (research assistant)	6
Maher, Zachary	Graduate Student (research assistant)	6
Malko, Anton	Graduate Student (research assistant)	0
Muller, Hanna	Graduate Student (research assistant)	6
Oppenheimer, Kathleen	Graduate Student (research assistant)	4
Ovans, Zoe	Graduate Student (research assistant)	6
Perkins, Laurel	Graduate Student (research assistant)	1
Rao, Sudha	Graduate Student (research assistant)	0
Shoemaker, Joanna	Graduate Student (research assistant)	6
Thorburn, Craig	Graduate Student (research assistant)	4

Name	Most Senior Project Role	Nearest Person Month Worked
Yang, Yu'an	Graduate Student (research assistant)	6
Eaves, Caitlin	Other	1

Full details of individuals who have worked on the project:

Colin Phillips
Email: colin@umd.edu
Most Senior Project Role: PD/PI
Nearest Person Month Worked: 1

Contribution to the Project: PI, mentor, member of LSC committee on graduate programs

Funding Support: NRT, University

International Collaboration: No
International Travel: No

Hal Daume
Email: hal@umiacs.umd.edu
Most Senior Project Role: Co PD/PI
Nearest Person Month Worked: 0

Contribution to the Project: Co-PI, member of LSC committee on graduate programs

Funding Support: University

International Collaboration: No
International Travel: No

Robert M DeKeyser
Email: rdk@umd.edu
Most Senior Project Role: Co PD/PI
Nearest Person Month Worked: 0

Contribution to the Project: Co-PI, mentor

Funding Support: University

International Collaboration: No
International Travel: No

William J Idsardi
Email: idsardi@umd.edu
Most Senior Project Role: Co PD/PI
Nearest Person Month Worked: 0

Contribution to the Project: Co-PI, mentor

Funding Support: University

International Collaboration: No
International Travel: No

Rochelle Newman
Email: rnewman1@umd.edu
Most Senior Project Role: Co PD/PI
Nearest Person Month Worked: 0

Contribution to the Project: Co-PI, mentor

Funding Support: University

International Collaboration: No
International Travel: No

Jordan Boyd-Graber
Email: ying@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Mentor

Funding Support: University

International Collaboration: No
International Travel: No

Robert Dooling
Email: rdooling@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Mentor

Funding Support: University

International Collaboration: No
International Travel: No

Jan Edwards
Email: edwards@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Mentor

Funding Support: University

International Collaboration: No
International Travel: No

Naomi Feldman
Email: nhf@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Mentor, key faculty in cognition-computation bridge

Funding Support: University

International Collaboration: No
International Travel: No

Kira Gor
Email: kiragor@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Mentor, member of LSC committee on graduate programs

Funding Support: University

International Collaboration: No
International Travel: No

Yi Ting Huang
Email: ythuang1@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Mentor, key psycholinguistics faculty, co-organizer of Winter Storm 2019, member of LSC committee on graduate programs

Funding Support: University

International Collaboration: Yes, Germany
International Travel: No

Howard Lasnik
Email: lasnik@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Mentor

Funding Support: University

International Collaboration: No
International Travel: No

Ellen Lau

Email: ellenlau@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Mentor, key cognitive neuroscience faculty, co-organizer of Winter Storm 2019, member of LSC committee on graduate programs

Funding Support: University

International Collaboration: No
International Travel: No

Shevaun Lewis
Email: shevaun@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 9

Contribution to the Project: NRT program coordinator

Funding Support: NRT, University

International Collaboration: No
International Travel: No

Jeffrey Lidz
Email: jlidz@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Mentor, key language learning faculty, faculty advisor for outreach

Funding Support: University

International Collaboration: Yes, Germany
International Travel: No

Jeff MacSwan
Email: macswan@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Mentor

Funding Support: University

International Collaboration: No
International Travel: No

Jared Novick
Email: jnovick1@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Mentor

Funding Support: University

International Collaboration: No
International Travel: No

KerryAnn O'Meara
Email: komeara@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Lead evaluator

Funding Support: NRT

International Collaboration: No
International Travel: No

Maria Polinsky
Email: polinsky@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Mentor, key language diversity faculty

Funding Support: University

International Collaboration: Yes, Guatemala
International Travel: No

Omer Preminger
Email: omerp@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Mentor

Funding Support: University

International Collaboration: Yes, Guatemala
International Travel: No

Nan Ratner
Email: nratner@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Mentor

Funding Support: University

International Collaboration: No
International Travel: No

Philip Resnik
Email: resnik@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Mentor

Funding Support: University

International Collaboration: No
International Travel: No

Juan Uriagereka
Email: juan@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Mentor

Funding Support: University

International Collaboration: No
International Travel: No

Min Wang
Email: minwang@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Mentor

Funding Support: University

International Collaboration: No
International Travel: No

Alexander Williams
Email: alxndrw@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 0

Contribution to the Project: Mentor, co-organizer of Winter Storm 2019, member of LSC committee on graduate programs

Funding Support: University

International Collaboration: No
International Travel: No

Tess Wood
Email: ewood1@umd.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Helped organize and manage NRT-related events, including Language Science Day and Winter Storm

Funding Support: University

International Collaboration: Yes, Guatemala
International Travel: No

Rachel Adler
Email: radler1@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 0

Contribution to the Project: Trainee (graduated summer 2018)

Funding Support: University

International Collaboration: No
International Travel: No

Christina Blomquist
Email: cblomq@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 4

Contribution to the Project: Trainee

Funding Support: University, NRT

International Collaboration: No
International Travel: No

Madison Buntrock
Email: mbuntroc@terpmail.umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 2

Contribution to the Project: Trainee

Funding Support: University, NRT

International Collaboration: No
International Travel: No

Arynn Byrd
Email: asbyrd@terpmail.umd.edu

Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 4

Contribution to the Project: Trainee

Funding Support: University, NRT

International Collaboration: No
International Travel: No

Dawn Culpepper
Email: dkculpep@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 2

Contribution to the Project: research assistant for program evaluation

Funding Support: NRT

International Collaboration: No
International Travel: No

Lara Ehrenhofer
Email: ehrenhof@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 0

Contribution to the Project: Trainee (graduated summer 2018)

Funding Support: University

International Collaboration: Yes, Germany
International Travel: No

Michelle Erskine
Email: merskine@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Trainee

Funding Support: University

International Collaboration: No
International Travel: No

Allyson Ettinger
Email: aetting@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 0

Contribution to the Project: Trainee (graduated summer 2018)

Funding Support: NSF GRF

International Collaboration: No
International Travel: No

Erika Exton
Email: eexton@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 4

Contribution to the Project: Trainee, co-chair of Outreach committee

Funding Support: University, NRT

International Collaboration: No
International Travel: No

Adam Fishbein
Email: afishbei@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Trainee

Funding Support: NIH T32, NIH F31

International Collaboration: No
International Travel: No

Julianne Garbarino
Email: jgarbari@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Trainee

Funding Support: University

International Collaboration: No
International Travel: No

Phoebe Gaston
Email: pgaston@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Trainee

Funding Support: University

International Collaboration: No
International Travel: No

Katharine Glanbock
Email: glanbock@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 2

Contribution to the Project: Trainee

Funding Support: University, NRT

International Collaboration: No
International Travel: No

Jeffrey Green
Email: jgreen88@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 0

Contribution to the Project: Trainee (graduated summer 2018)

Funding Support: University

International Collaboration: No
International Travel: No

Mina Hirzel
Email: mhirzel@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Trainee

Funding Support: University

International Collaboration: No
International Travel: No

Kasia Hitczenko
Email: khit@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: Trainee (graduated summer 2019)

Funding Support: University

International Collaboration: Yes, Japan
International Travel: No

Nick Huang
Email: znhuang@umd.edu

Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: Trainee (graduated summer 2019)

Funding Support: University

International Collaboration: No
International Travel: No

Allison Johnson
Email: ajohns51@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Trainee, chair of Professional Development committee

Funding Support: NIH T32

International Collaboration: No
International Travel: No

Nur Basak Karatas
Email: nkaratas@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: Trainee (graduated summer 2019)

Funding Support: University

International Collaboration: Yes, Turkey
International Travel: No

Tyler Knowlton
Email: tknowlt@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Trainee

Funding Support: University

International Collaboration: No
International Travel: No

Eun Kyoung (Rosa) Lee
Email: ekleesla@terpmail.umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Trainee

Funding Support: University

International Collaboration: Yes, Korea, Republic Of
International Travel: Yes, Korea, Republic Of - 0 years, 3 months, 7 days

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Yixun Annie Li
Email: yixunli@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Trainee, leader of student writing group

Funding Support: University, Spencer Foundation

International Collaboration: Yes, China
International Travel: No

Adam Liter
Email: liter@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Trainee

Funding Support: University

International Collaboration: No
International Travel: No

Paulina Lyskawa
Email: lyskawa@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Trainee

Funding Support: University, SSHRC (Canada)

International Collaboration: Yes, Canada, Poland
International Travel: Yes, Guatemala - 0 years, 0 months, 15 days; Poland - 0 years, 0 months, 7 days

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Zachary Maher
Email: zach@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Trainee

Funding Support: University

International Collaboration: No
International Travel: No

Anton Malko
Email: amalko@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 0

Contribution to the Project: Trainee (graduated December 2018)

Funding Support: University

International Collaboration: Yes, Russian Federation
International Travel: No

Hanna Muller
Email: hmuller@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Trainee

Funding Support: University

International Collaboration: No
International Travel: No

Kathleen Oppenheimer
Email: koppen@terpmail.umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 4

Contribution to the Project: Trainee

Funding Support: University, NRT

International Collaboration: No
International Travel: No

Zoe Ovans
Email: zovans@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Trainee, chair of Research Skills & Collaboration committee

Funding Support: NSF GRF

International Collaboration: No
International Travel: No

Laurel Perkins
Email: perkinsl@umd.edu

Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: Trainee (graduated summer 2019)

Funding Support: University, NSF DDRI (Linguistics)

International Collaboration: No
International Travel: No

Sudha Rao
Email: raosudha@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 0

Contribution to the Project: Trainee (graduated December 2018)

Funding Support: University

International Collaboration: No
International Travel: No

Joanna Shoemaker
Email: joshoe@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Trainee

Funding Support: University

International Collaboration: No
International Travel: No

Craig Thorburn
Email: craigtho@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 4

Contribution to the Project: Trainee

Funding Support: University

International Collaboration: No
International Travel: No

Yu'an Yang
Email: yuanyang@umd.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Trainee

Funding Support: University

International Collaboration: No
International Travel: Yes, China - 0 years, 2 months, 18 days

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Caitlin Eaves
Email: ceaves@umd.edu
Most Senior Project Role: Other
Nearest Person Month Worked: 1

Contribution to the Project: LSC Business Manager

Funding Support: University

International Collaboration: No
International Travel: No

What other organizations have been involved as partners?

Name	Type of Partner Organization	Location
American Association for the Advancement of Science	Other Nonprofits	Washington, DC
American Council on the Teaching of Foreign Languages	Other Nonprofits	Alexandria, VA
Paint Branch High School	School or School Systems	Burtonsville, MD
Paul Public Charter School	School or School Systems	Washington DC
Planet Word Museum	Other Nonprofits	Washington DC
Prince George's County Schools	School or School Systems	Maryland
US Dept of Defense	Other Organizations (foreign or domestic)	Washington DC
Wuqu Kawoq Maya Health Alliance	Other Nonprofits	Boston, MA & Guatemala
DC Language Immersion Project	Other Nonprofits	Washington, DC
Expert Systems	Industrial or Commercial Firms	Rockville, MD
Helmholtz Association	Other Nonprofits	Germany
Linguistic Society of America	Other Nonprofits	Washington DC

Name	Type of Partner Organization	Location
Montgomery-Blair High School	School or School Systems	Silver Spring, MD
North American Computational Linguistics Olympiad	Other Nonprofits	Pittsburgh, PA
Northwood High School	School or School Systems	Silver Spring, MD
Ohio State University	Academic Institution	Columbus, OH

Full details of organizations that have been involved as partners:

American Association for the Advancement of Science

Organization Type: Other Nonprofits
Organization Location: Washington, DC

Partner's Contribution to the Project:
Financial support
Other: Staff expertise, outreach support

More Detail on Partner and Contribution: Erin Heath (Associate Director for Govt Relations) participated in our science policy forum, and the Future STEM Leaders meeting. AAAS hosted Family Science Days, where our team was a key contributor to the Language Science for Everyone exhibit. AAAS Section Z (Linguistics) also co-sponsored our science communication workshop at the Pacific Science Center.

American Council on the Teaching of Foreign Languages

Organization Type: Other Nonprofits
Organization Location: Alexandria, VA

Partner's Contribution to the Project:
Other: Host for student policy internship

More Detail on Partner and Contribution: Hosted Jeff Green for a policy internship in summer 2017

DC Language Immersion Project

Organization Type: Other Nonprofits
Organization Location: Washington, DC

Partner's Contribution to the Project:
Other: Host for trainee policy internship

More Detail on Partner and Contribution: Hosted trainee Nick Huang for policy internship in summer 2018.

Expert Systems

Organization Type: Industrial or Commercial Firms
Organization Location: Rockville, MD

Partner's Contribution to the Project:
Other: Career development support

More Detail on Partner and Contribution: Dr Scott Fults participated in Winter Storm careers forum

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Helmholtz Association

Organization Type: Other Nonprofits
Organization Location: Germany

Partner's Contribution to the Project:
Other: Host for trainee policy internship

More Detail on Partner and Contribution: Hosted Lara Ehrenhofer for a policy internship in summer 2017

Linguistic Society of America

Organization Type: Other Nonprofits
Organization Location: Washington DC

Partner's Contribution to the Project:
Other: Science policy partner

More Detail on Partner and Contribution: Collaborate on science policy and public engagement, consultant to Future STEM Leaders meeting

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Montgomery-Blair High School

Organization Type: School or School Systems
Organization Location: Silver Spring, MD

Partner's Contribution to the Project:
Other: Outreach partner

More Detail on Partner and Contribution: Bilateral visits for language science outreach

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North American Computational Linguistics Olympiad

Organization Type: Other Nonprofits
Organization Location: Pittsburgh, PA

Partner's Contribution to the Project:
Other: Outreach partner

More Detail on Partner and Contribution: NACLO is the umbrella organization for a language-focused olympiad. We served as a host site, and also contributed logistical support to the organization.

Northwood High School

Organization Type: School or School Systems
Organization Location: Silver Spring, MD

Partner's Contribution to the Project:
Other: Outreach partner

More Detail on Partner and Contribution: Bilateral visits for language science outreach

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Ohio State University

Organization Type: Academic Institution
Organization Location: Columbus, OH

Partner's Contribution to the Project:
Financial support
Other: Collaboration on public outreach

More Detail on Partner and Contribution: Laura Wagner helps lead the "Language Science for Everyone" consortium, and helped organize our participation in AAAS Family Science Days and the science communication workshop at the Pacific Science Center in 2020.

Paint Branch High School

Organization Type: School or School Systems
Organization Location: Burtonsville, MD

Partner's Contribution to the Project:
Other: Outreach partner

More Detail on Partner and Contribution: Bilateral visits for language science outreach

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Paul Public Charter School

Organization Type: School or School Systems
Organization Location: Washington DC

Partner's Contribution to the Project:
Other: Outreach Partner

More Detail on Partner and Contribution: Bilateral visits for language science outreach

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Planet Word Museum

Organization Type: Other Nonprofits
Organization Location: Washington DC

Partner's Contribution to the Project:
Other: Joint planning of museum activities

More Detail on Partner and Contribution: Planet Word is the first major US museum dedicated to language. It is due to open in 2019 in downtown Washington DC.

Prince George's County Schools

Organization Type: School or School Systems
Organization Location: Maryland

Partner's Contribution to the Project:
Other: Science Fair sponsor

More Detail on Partner and Contribution: Sponsored ATLAS STEM fair

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US Dept of Defense

Organization Type: Other Organizations (foreign or domestic)
Organization Location: Washington DC

Partner's Contribution to the Project:
Other: Science policy panel

More Detail on Partner and Contribution: Erin Fitzgerald participated in Winter Storm science policy panel

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Wuqu Kawoq Maya Health Alliance

Organization Type: Other Nonprofits
Organization Location: Boston, MA & Guatemala

Partner's Contribution to the Project:
Collaborative Research
Personnel Exchanges

More Detail on Partner and Contribution: Partner on our field station in Sololá, Guatemala, connecting minority languages to health.

What other collaborators or contacts have been involved?
Nothing to report

Impacts

What is the impact on the development of the principal discipline(s) of the project?

It is difficult to draw a clear line between the grassroots community that hosted an IGERT program (2008-2015), the university-wide center that grew out of that program (2013-) and the NRT program that the center now hosts (2015-2020). They are part of a continuous effort, which has had interdisciplinary graduate training at its heart. These efforts have had clear impacts on the development of language science as an integrated field.
Nationally, the success of Maryland's language science group and its graduates has drawn attention, especially in the field of linguistics. Departments have diversified their hiring, and graduate curricula are starting to evolve to reflect this, and the pace of change is accelerating. Phillips frequently serves as a consultant on graduate program reform, and new programs and initiatives are being formed at other institutions that are modeled on what our team has done.

Nationally, our NRT program has contributed to a growth in faculty hires at the intersection of computation and cognition/linguistics. Departments have long wanted to recruit faculty who are equally conversant in both areas, but have struggled to identify qualified candidates. They now regard this as more feasible, and graduates like Allyson Ettinger (now at U of Chicago) and Laurel Perkins (soon at UCLA) are good examples of this. We expect to continue to contribute to this growth area.

Nationally, the success of our outreach programs contributed to the creation of the multi-institution Language Science for Everyone network, which is expanding disciplinary interest in public engagement. This network has coordinated activities that serve thousands of children and families, and it has created an online resource guide for language science outreach.

What is the impact on other disciplines?

Our training practices and results influence programs in other disciplines at UMD, to a greater degree now that we are more integrated into university-level graduate training initiatives. Nevertheless, these impacts remain limited, as student training models are so strongly influenced by disciplinary peers.

Our training model has some impact on other disciplines via other NRT programs (as discussed in the section on dissemination). In the last year, we have met somewhat regularly with the PIs and coordinators of the two other NRT programs at UMD, and Phillips traveled to the University of Minnesota to visit an NRT program in assistive technologies. Furthermore, by making all of our materials publicly available, including our proposal and reviews, our practices are readily visible to teams that are preparing NRT proposals. That is probably the time at which teams are the most receptive to outside suggestions, as they are the most motivated. Also, we were able to influence other disciplines via our hosting of the 2016 NRT Teams meeting at UMD. Both our organization of the meeting and the thematic focus reflect our findings about best practices in graduate training.

What is the impact on the development of human resources?

GRADUATE STUDENTS BENEFITED
There were 26 trainees enrolled in our NRT program during this reporting period; 3 of them graduated in summer 2019. 18 of these have received NRT stipends (including 11 during this reporting period).
We serve a much broader group of graduate students through our various events, workshops, and meetings. In the last year, at least 85 graduate students have participated in NRT-associated events, such as Language Science Lunch Talks, Winter Storm, Language Science Day, and outreach activities.
TRAINEE ACHIEVEMENTS/OUTCOMES
(i) Laurel Perkins, who graduated in summer 2019, recently accepted a tenure-track faculty position at UCLA with a computational focus. For someone with primary expertise in behavioral experiments with infants and toddlers, this is a remarkable testament to her broad training. Her PhD research combined modeling with infant experimentation to understand how early learners figure out the word order patterns of their language. Perkins was also recently awarded the prestigious Glushko Dissertation Prize from the Cognitive Science Society.
(ii) Zach Maher joined the NRT program with the goal of creating a research program focused on the experience of "dialect mismatch" for children who speak a non-mainstream dialect of English at home but encounter Mainstream American English in the classroom. His interests bridge psycholinguistics, sociolinguistics, hearing and speech sciences, and education policy and practice. This year (his second in the NRT program) he has demonstrated his continued commitment to those disparate fields by presenting at the top conference on language acquisition (BUCLD), the top conference on sociolinguistics (NWAV), and the top conference on hearing and speech sciences (ASHA). His research was initially more education oriented, but

he has now added a second advisor and pivoted to a focus on the role of cognitive control in language processing with dialect mismatch.

(iii) Allison Johnson is a good example of a student who was able to run with the individual agency and leadership opportunities offered by the NRT program. As a leader of the student Professional Development & Communication committee since 2018, she has organized numerous workshops and discussion sessions, in addition to the popular and successful writing accountability groups. In her talk at the 2019 NRT meeting (*It's not just about finishing as fast as possible! Developing students' professional skills to ensure future success*), she explained that the flexibility and student agency built into the NRT program allows students to act nimbly to connect with resources when the need arises. Johnson, Michelle Erskine, and Julianne Garbarino were the first trainees from the Hearing and Speech Sciences (HESP) department when they joined in 2017. All three have set a strong example of leadership and helped to create a community of HESP students active at the Language Science Center and in the NRT program.

BROADENING PARTICIPATION

In our current group of 24 NRT students, 18 are women, 5 are international, and 2 are African American. The demographics of our trainee group are similar to those of our participating units (although women are perhaps overrepresented).

(i) Women are underrepresented in computer science in general, but they are not a minority in our computational group. It certainly helps that we can offer strong mentorship from successful female faculty, but male faculty also help through their words and deeds. For example, co-PI Hal Daumé published a series of blog articles celebrating the work of female computer scientists and how they influenced his research. The linguistics-CS bridge contributes, as a number of female students from linguistics have joined the computational linguistics research group. And the fact of having strong female students doing computational research becomes a self-fulfilling prophecy, as it helps to attract more female students.

(ii) In our community there is now a greater emphasis on and respect for research with direct applications for underserved populations in the US (ToggleTalk, Language Poverty) and internationally (Guatemala). Also, in the current political climate more students are trying to connect their work with social justice issues. These have led to a subtle but noticeable shift in attitudes toward applied research in general, and have contributed to our ability to recruit a more diverse student population.

(iii) We continue to make contact with minority students in local high schools through our outreach activities. We do not expect this to lead to direct impact on the diversity of our graduate program, but it is nevertheless valuable to engage with large numbers of minority students and to contribute to interest in college and science careers.

What is the impact on physical resources that form infrastructure?

In January 2017 the Language Science Center relocated to new space in the fully renovated HJ Patterson Building, in the center of the U of Maryland campus. The 4500 sq. ft. facility had been in development for 2 years, and it would not have been possible without the success of our graduate training efforts and our internationalization plans. This facility, with ample space for large and small events and group activities, has become a hub for language science community activities at UMD, including the NRT program. We have hosted large events like Winter Storm and the workshop on Language and Poverty, as well as the regularly scheduled meetings like the weekly Language Science Lunch Talks, cross-listed courses, lab meetings, reading groups, and committee meetings. Some students utilize the space regularly to meet with collaborators or as a quiet space for writing. It is an also an ideal place for meetings with external partners, such as our quarterly briefings with government agencies, or our partners at the soon to open Planet Word museum in downtown Washington DC.

What is the impact on institutional resources that form infrastructure?

Our graduate training efforts have had a major impact on institutional resources that create infrastructure. They have led to new hires across multiple departments, at the junior and senior levels. They have led to staff who provide high level support for interdisciplinary research. And they have fostered diverse new partnerships, locally, nationally, and globally.

In focus groups for program evaluation, faculty attribute significant benefits and progress to the NRT program and related efforts by the Language Science Center. The NRT program has facilitated opportunities for language science faculty to become familiar with each other and identify potential areas for collaboration. Faculty have, for example, co-taught courses with faculty from other departments, and have frequent opportunities to present their research to a multi-disciplinary community. In some departments, the NRT program and Language Science Center have helped shift expectations about faculty service roles and the value of interdisciplinary research. However, the progress has been uneven across departments, and some faculty still perceive institutional constraints on their time that undermine their ability to participate in Language Science Center activities.

Last year our evaluation team conducted interviews with six institutional informants--key UMD administrators, graduate school staff, and faculty involved in the NRT program. They believe that the Language Science Center (LSC) and its NRT program (and IGERT before that) have strategically capitalized on pre-existing inclinations towards interdisciplinary research in the language science community. The LSC and NRT/IGERT have strengthened pre-existing connections, increased the visibility of units doing interdisciplinary work, and have provided central administrative support that facilitates collaborations that may not have happened otherwise. The university administrators also noted the impact of the language science programs on developing other successful interdisciplinary programs at UMD. However, they note that at the university level, any movement towards interdisciplinary research has been driven by funding, rather than responsive to actual change in institutional culture. There is still a lack of centralized, institutional support for interdisciplinary graduate training. There is a real concern that once grants like the NRT come to an end, the university will fail to provide more permanent funding, and the LSC (and other similar centers on campus) will lose their ability to provide quality programs.

What is the impact on information resources that form infrastructure?

The primary information resources from our program are the materials that we publicly share about our training efforts and our outreach programs, and the Langscape online portal that aggregates expertise on the world's 6000 languages (langscape.umd.edu).

What is the impact on technology transfer?
Nothing to report.

What is the impact on society beyond science and technology?

We approach language from a science and technology perspective, but language is important for many different aspects of society. Our trainees are engaged in various ways in connecting the science of language to broader societal concerns. They do this via K-12 and public outreach programs, via more targeted efforts to contribute to literacy and other educational efforts, and via research that has direct societal implications. For example, some of our trainees are involved in research on dialect mismatch training in the schools, testing ways to help African American K-1 children navigate the different varieties of language that they need to succeed in different spheres of life.

Changes/Problems

Changes in approach and reason for change
Nothing to report.

Actual or Anticipated problems or delays and actions or plans to resolve them

(i) Sustainability and institutional challenges. An important goal for our program at this point is ensuring sustainability beyond the end of NSF support. We have been preparing for this in multiple ways over many years. Currently one of our greatest assets for sustainability is also proving to be a significant challenge. The success of our interdisciplinary graduate programs (supported by NSF since 2008) led to the creation in 2013 of the Maryland Language Science Center (LSC), a formal unit of the university with a broader mission. The existence of LSC, with graduate training as a core part of its mission, made continuation of our IGERT/NRT initiatives the default assumption. However, uncertainty over the sustainability of LSC is undermining plans for graduate program sustainability.

Institutional support for LSC has been uncertain for a couple of years. The disciplinary breadth and the integrative mission (not solely focused on grants and contracts) is both a strength and a weakness. High level leadership changes at the university and disruption in one related center led to destabilization. LSC conducted a comprehensive and informative review of all of its activities, including graduate programming, with the aim of creating greater clarity and transparency around its mission and achievements. This process has overshadowed the past year and it remains unresolved. The process was on an encouraging trajectory until the COVID-19 crisis hit.

Our team has been working on multiple fronts towards sustainability. We have convened working groups, we have designed a new graduate certificate program, we have engaged extensively with stakeholders from students to faculty to university leaders. We are encouraged by the broad support for the importance of our graduate training efforts. But it remains unclear what this will mean in practice. We are working hard to try to ensure positive student and faculty engagement despite this uncertainty.

(ii) Diversity of faculty perspectives. Student engagement in our program's efforts is strongly affected by their mentors' engagement and buy-in. Overall, we have always benefited from a high level of faculty support, and correspondingly high student engagement. But as the community has expanded we have faced increasing challenges in sustaining faculty buy-in. At a broad level, the pillars of our training are interdisciplinary research and broad professional development. Skepticism on one or both of these dimensions from some quarters creates challenges for student engagement. Some faculty regard interdisciplinarity as a questionable value or even a threat. Others have reservations about professional development, including preparing students for diverse career pathways. Notably, these challenges do not reflect a stubborn older generation of faculty. If anything, it may be the opposite.

We have been working to improve faculty engagement via improved communications, diversification of committees, and by trying to ensure that plans for sustainability accommodate diverse objectives. We have also been trying to facilitate more open discussion between students and faculty, whose perspectives do not always align.

(iii) The COVID-19 pandemic has disrupted most of our activities since early March 2020, leading to more changes in the span of a few weeks than we have seen in the past 10 years. This impacts our program especially strongly in a couple of domains. First, we depend strongly on human subjects research, which has been mostly suspended. Second, our activities are strongly built around the existence of a well-integrated intellectual community. Many of our students and faculty are now separated not only by social distancing but by many time zones.

We have attempted to address the challenges in multiple ways. Like everybody else, we have moved a lot of our activities online. Unsurprisingly, this is yielding mixed results. Many classes and meetings are working out better than expected, but they are rarely a substitute for in-person interaction. We are taking some additional steps to try to address specific challenges. We are developing infrastructure to move more of our human subjects research online. We also hope to use this as a time to direct more attention to opportunities for computational modeling that does not depend as strongly on human subject testing. We are exploring new ways of using electronic tools to foster intellectual community.

In addition to the immediate adjustments that we are making in response to the pandemic, as language scientists we are also developing research plans relating to successful online communication. Co-PI Rochelle Newman, together with a team of faculty mostly involved in the NRT program, has developed an interdisciplinary research proposal on ways of combining cognitive science and computer science to improve the effectiveness of online communication.

Our students are understandably concerned about career prospects in a global depression. We plan to offer additional professional development programming to address this need.

Changes that have a significant impact on expenditures
Nothing to report.

Significant changes in use or care of human subjects
Nothing to report.

Significant changes in use or care of vertebrate animals
Nothing to report.

Significant changes in use or care of biohazards
Nothing to report.