

There is a perplexing gap between the research findings in cognitive neuroscience and curriculum implementation in the education system. It is my aim to bridge this gap between cognitive neuroscience findings (language development, acquisition, bilingualism) and curriculum, specifically in terms of bilingual education and dyslexia. To reach this end, my research interests focus on cognitive development and language acquisition. Specifically, I am interested in second language acquisition, bilingual and bicultural education programs, biliteracy, dyslexia, and the neural circuitry of reading. My research interests developed through both working with children in the community and through extensive work in research laboratories.

When I was a child, I experienced developmental delays in my reading and writing ability. To my dismay I was placed in extra tutoring and individual work until I was deemed “normalized.” After the one-on-one attention I received from great tutors, I began to excel in my classes. Years later, I wanted to repay the great debt I had to the tutors that had helped me along the way. My first exposure to the teaching side of education system came when I began working as a literacy intervention intern for the non-profit organization, Reading Partners, at the Alvarado Elementary School Center.

As an intern, my main responsibility was to tutor students who were at least one grade level behind. The students were all enrolled in the dual immersion language program, in which the curriculum gradually transitions from a partner language, such as Spanish, dominant instruction program, to an equal distribution of English and the partner language within instruction. As one of the first tutors at the program site, I trained most of the other tutors and taught the most students. During the countless hours I spent tutoring and refining the Reading Partners Program at Alvarado, I realized that I could only help a handful of students at a time. The program did prove effective at supporting reading development, but the fact that so many students had to be a part of the program was concerning. Therefore, my interest in cognitive development and language acquisition became focused on effects of bilingualism and multilingualism on cognitive processes. I became very interested in the long lasting effects that the dual immersion process and bilingualism in general had on English language processing and executive function.

To expand my knowledge on the basic theories regarding language acquisition and language development, I became a research assistant in the Language, Attention, and Cognitive Engineering Laboratory (LACE) with Dr. Kenneth Paap. In the LACE lab, we focus on the bilingual advantage in central executive processing. Our results yield no differences between monolinguals and bilinguals in the inhibitory control, conflict monitoring, or switching modules of executive function. Further, we analyzed the correlation between scores within these measures that purportedly tap into modules of executive function in order to examine the convergent validity of these measures. We also used stepwise linear regression to create regression models using several demographic predictors.

In order to further expand my knowledge regarding language acquisition and examine language from a neuroscience perspective, I became interested in Haskins Laboratories and the Yale Reading Center. As a research assistant under Dr. Kenneth Pugh and Dr. Stephen Frost at Haskins Laboratories, I worked on two major projects: One project examines the effect of L1 on L2 language acquisition within Hebrew and English populations. This project examines the neurocognitive markers of reading development in individuals learning to read in languages with differing levels of transparency (English, Hebrew, Spanish) using behavioral and neuroimaging techniques. In addition I was involved in a large scale, longitudinal study examining typical and atypical literacy acquisition in reading disabled and typically developing children using anatomical and functional MRI, EEG, ERP, NIRS, MRS, genetics, eyetracking, and behavioral data.

From these projects I learned fMRI data collection and analysis using AFNI and structural MRI analysis techniques using Freesurfer. In addition, I learned how to use the scripting language BASH and I was able to develop the data analysis pipeline. Further, I gained valuable experience with eyetracking and cognitive and reading assessments for school age children, including the TOWRE Word Reading Efficiency Task.

While at Haskins, I was immersed in a rich interdisciplinary research environment, which was a very important factor in my accelerated development. I was able to learn many different research perspectives and experimental methodologies and how to use them in conjunction with one another. The idea of combining research paradigms within a single research study to examine a phenomenon from many different perspectives is evident in the development of my honors thesis project. In addition, my mentors introduced me to the Haskins Training Institute (HTI), which seeks to bring information gleaned from neurolinguistic research to educators and parents. An additional function of HTI is to disseminate information to the scientific community and help facilitate a dialogue between the two groups. As an active member in both education and cognitive neuroscience research, HTI fit my interests perfectly in continuing to bridge the gap between psychological research and curriculum.

With the support of both the LACE lab and Haskins Laboratories, I developed a project stemming from my year as a reading tutor for Alvarado Elementary School through the Reading Partners after school program. This research project explores the differences between dual immersion programs such as used by Alvarado Elementary, and the more traditional English immersion programs. I will examine how these programs impact proficiency in reading English and the processes the students utilize when reading. Consistent with my interest in the HTI, this project combines both basic cognitive and psycholinguistic research with an applied educational research and seeks to continue to bridge the gap. From this project, I gained valuable experience in dealing with the complex and challenging process of gaining access to recruiting students from elementary schools.

In order to further engage in research that bridges the gap between cognitive neuroscience research and education, I am currently pursuing a PhD in Psychology at the University of Connecticut, formality affiliated with Haskins Laboratories, and two graduate certificates: Neurobiology of Language and Cognitive Science. Under my primary advisors, Jay Rueckl and Kenneth Pugh, I am examining individual differences in the neurocognitive bases of reading.

In particular, we examine individual differences in learning mechanisms employed in skilled reading. In addition, we explore the processes by which skilled adults read in terms of the relative co-operative division of labor between phonology (sounds) and semantics (meaning). Once the neurocognitive bases of individual differences in the reading networks of skilled adult readers are elucidated, we can apply these findings to educational practice in order to help developing readers reach the same “normal” activation patterns and automaticity of reading displayed in adult readers. A parallel and integrated set of inquiry continues the work I began with Haskins Labs as a research intern regarding typical and atypical literacy acquisition in reading disabled and typically developing children. This project explores the development of the neural circuitry for reading, a sometimes-difficult process, as the system for spoken language is adapted for written language (i.e., “reading is hard, because speech is easy”).

In addition, in a recent and related collaboration with Haskins Laboratories, I became involved in an international collaboration involving several research sites. The project is a cross language examination of the neural circuitry of reading and investigates the similarities and differences in neurocognitive mechanisms used in language and reading networks in many different languages and writing systems (e.g. English, Spanish, Chinese, Hebrew, Japanese, Polish). This project has the potential to produce both interesting findings from a neuroplasticity perspective and broad implications especially for bilingual and biliterate education. Similar to exploring individual differences in typical and atypical language development, once the possible differential reading networks used in other languages are elucidated, more targeted interventions and evidence based practice may be employed.

Additionally, to supplement my vision for cognitive neuroscience evidence based practice, I started collaborations with two research laboratories: BrainLENS – Laboratory for Educational Neuroscience at the University of California, San Francisco and the Center for Behavioral Education and Research (CBER) in the School of Education, University of Connecticut. BrainLENS combines cutting-edge, cross-disciplinary research methods with a deep passion for maximizing children’s potential in life, particularly stemming from the academic domain. With a firm belief in interdisciplinary research, the goal is to integrate the latest brain imaging techniques, genetic analysis, and computational approaches to examine processes of learning, including acquisition of skills, such as reading, socio-emotional processing, motivation and resilience. Neuroscience research may help dissect these into better-defined socio-emotional and cognitive constructs and assess their impact on learning, which may in turn lead to more targeted curricula, instructional approaches, and interventions. CBER explores K-3 Reading Reform and vocabulary intervention. This lab focuses application and development of interventions and educational curricula and policy.

In line with these goals, as previously stated, my current research proposal is in collaboration with Haskins, BrainLENS, and CBER and is an extension of previous work. The project has great relevance on both a basic neuroscience research level and an applied educational neuroscience level by: 1) exploring the neurocognitive mechanisms in developing bilingual/biliterate minds and individual differences in developing literacy and 2) by contributing important foundational knowledge in the following areas: **i)** English literacy development in native English speakers learning a second language, **ii)** literacy development in over 10% of the Nation’s minority students learning English (e.g., ELL), and **iii)** influence of foreign language learning in the 12-18% of the Nation’s children at-risk for developing reading disabilities. Ultimately, research such as ours may help optimize reading and second language learning instructions, raise literacy levels and lead to the economic growth of the U.S. In addition, consistent with my involvement in cross language studies, I plan to extend findings from this study to other language environments in different countries, using connections with the Basque Center on Cognition, Brain, and Language (Spain) and National Central University (Taiwan).

Further, with the experience gained from extensive research experience in basic and applied research paradigms and in line with my vision of development of a bridge between cognitive neuroscience and educational policy, I founded a Research Digest through the Brain, Cognition, and Language Institute at the University of Connecticut. The vision of this initiative is to connect legislators, teachers, and parents with the innovative, integrative, and interdisciplinary research approach at the University of Connecticut regarding a variety of issues such as atypical language development, bilingual/biliterate education, and autism.

Lastly, I am committed to mentoring the next generation of scholars especially within the Asian American Cultural Center (AsACC), the Filipino American Student Association (FASA), and the Puerto Rican Latin American Cultural Center. For example, as a member of the Advisory Board, I am committed to the continued development of the Asiantation Mentoring Program (AMP) and METAS Programs. Also consistent with my mentoring responsibilities in supporting underrepresented populations in STEM fields, I am currently the Graduate Mentor for the McNair Scholars Program and the Louis Stokes Alliance for Minority Participation (LSAMP).

My early exposure to bilingualism, second language acquisition, and learning disabilities as a literacy intervention intern at Alvarado Elementary School and in my formal research training in neurolinguistics investigating the same phenomena, has granted me a unique viewpoint skill set. These experiences in both teaching and research have culminated in a deep interest in and understanding of education and psycholinguistics. Further, my involvement in the Filipino Community and Asian American Community and pilot immersion programs, grants me access to different, new, and interesting research questions and populations.