BACKGROUND. From our earliest hunter-gatherer ancestors, to our current fast-paced, industrialized lives, at least one factor has held true: we humans are immensely preoccupied with the transmission of knowledge. While most of us will never teach our young the best way to hunt mastodons, or to chisel weapons from flint, we pass down skills that are just as crucial for our modern lives. Although researchers have long studied learning and teaching, only recently have we begun investigating the *cognitive* capacities underlying these abilities. This work is revealing the extent to which learners require specific, individualized information to efficiently learn – information that addresses learners' *current* knowledge gaps.[1] To provide this information, teachers must possess an accurate, continually updated representation of learners' minds. **How do we as teachers infer the contents of others' minds?** Are we swayed by our own knowledge to overestimate others', or are we able to able to accurately infer what others know? I believe my experiences, both with children, as well as in the interdisciplinary field of cognitive science, leave me uniquely and ideally suited to investigate these questions.

INTELLECTUAL MERIT. My interest in cognitive development first sprang from my volunteer experiences supervising children in preschool and kindergarten classes. I was awed by these children's rapid acquisition of knowledge. Early childhood is precisely the time we modern, industrialized humans engage in the *least* amount of structured education. Nobody was sitting these children down in a classroom and lecturing to them, or assigning them homework. And yet the speed with which they learned skills, mundane and complex alike, seemed unparalleled across the lifespan. How could children come into the world knowing so little, and learn so *much* over just a few short years, especially in the absence of structured schooling?

As an undergraduate at UC Berkeley, I was determined to learn more about these questions. In my first year, I joined Dr. Alison Gopnik's Cognitive Development Lab as a research assistant working with graduate student Caren Walker. Drs. Gopnik and Walker were working on precisely those questions I had found so fascinating and important: how do children interact with, and thus learn from, the world around them? Can children discover and learn the world's causal structures through play and pretend – i.e., just by doing "kid things?" Throughout my time in the lab, I contributed to several distinct lines of work, investigating the ways in which children learned from literature,[2] the roots of children's relational reasoning,[3] and the effects of self-explanations on the inferences children draw from data.[4] In the course of my extensive data collection activities, I interacted with and explained our research to hundreds of families. In addition, the cross-discipline collaborations common to the lab instilled within me a **deep appreciation for the interdisciplinary nature of cognitive science**. These experiences not only laid down my scientific foundations, but also **taught me how to frame science for the public**.

Inspired by my experiences with children, as well as the work being conducted in the lab exploring the relation between pretense (i.e., imaginative play) and counterfactual abilities (i.e., the ability to imagine alternatives to reality),[e.g., 5] I pursued an honors thesis project under the mentorship of Drs. Gopnik and Walker. In pretense as in counterfactual reasoning, children must hold the *actual* world and the *counterfactual/pretend* world simultaneously in mind; therefore, we investigated whether engaging in pretense might prompt children to reason counterfactually. We manipulated whether or not children (3-5y) engaged in imaginary play about a toy with probabilistic outcomes, and examined whether children who engaged in pretense about the toy were better able to explicitly demonstrate their understanding of its probabilistic nature.

While this project, and a later follow-up conducted with Drs. Gopnik, Walker and Bonawitz, yielded inconclusive results, I gained enormously valuable experiences in the course

of my work on this project. I secured an undergraduate research fellowship to fund my research the summer before my third year, and presented a talk detailing my results at the end-of-summer fellowship conference.[6] I was later given the opportunity to work on the fellowship's Editorial Board with several other students to edit the conference proceedings, and coordinate their publication in a special issue of the Berkeley Undergraduate Journal.[7] Throughout my third year, I ran more than two hundred children on different iterations of the project. The skills gained from modifying and troubleshooting the project, and the lessons learned in persistence, were invaluable. At the end of the year, I presented a poster of my results at the Berkeley Interdisciplinary Research Conference,[8] as well as the California Cognitive Science Conference.[9] For my work on my honors thesis, I received highest honors in Psychology, and was also selected to receive the Warner Brown Memorial Prize in Psychology for excellence in research.

After I graduated, I spent a year in Israel, working with Dr. Dana Shai at the Infant Studies Center at the Interdisciplinary Center Herzliya. There I assisted in collecting the prenatal time-point of a longitudinal study examining how parents' abilities to accurately infer and appropriately respond to infants' mental states (i.e., parents' Theory of Mind, or mind-mindedness abilities) affect later infant outcomes. Previous work has demonstrated that lower maternal mind-mindedness correlates with less secure infant attachment,[10] as well as a higher likelihood of children developing later psychopathology.[11] Thus, in Dr. Shai's lab, we worked to further investigate the far-reaching consequences of parental mind-mindedness abilities, in order to design interventions that might more effectively improve parents' abilities (thus impacting children's well-being in turn). Under Dr. Shai, I helped troubleshoot methods, run participants, and research tasks that could be integrated into the study in order to assess infants' nascent Theory of Mind, broadening my research interests.

After working with Dr. Shai for a year, I returned to UC Berkeley to work as Dr. Gopnik's lab manager. At this post, I coordinate multiple interdisciplinary studies investigating the nature of children and adults' causal reasoning, assisting with data collection and analysis. I have initiated partnerships with several new research sites, including major local museums, and have been given the opportunity to hire, train, and mentor undergraduate research assistants.

BROADER IMPACTS. Having benefited immensely from the supportive and intellectually stimulating environment these research experiences provided, **I have a deep commitment to paying these experiences forward, both in terms of mentorship, and in terms of outreach**. As an undergraduate, I served as a mentor to two female, minority group students through the UC Berkeley Association of Psychology Undergraduates. In addition, I volunteered with underserved communities throughout my time at Berkeley. For example, I volunteered with The Music Connection Club to tutor a diverse group of elementary school children in flute and voice training, and through the Berkeley YWCA's Pre-Kindergarten Enrichment Program, I volunteered at Franklin Preschool, a Head Start preschool serving underserved populations. As Dr. Gopnik's lab manager, I have continued working with the Head Start program, helping to manage our research partnership with four different Head Start centers. I have also mentored 12 undergraduate students, almost all of whom have been women from diverse populations underrepresented in STEM fields, with little to no previous research experience. In order to foster a deeper understanding of our work and the scientific process, I assign readings to all of my research assistants, which we review and discuss in our bi-weekly meetings.

While we do mentor many undergraduates in our lab, there are so many more children and young adults who could benefit from mentorship experiences. **I am deeply committed to**

providing enrichment opportunities that might kindle a love for science in disadvantaged youth. I also think it's crucial for disadvantaged children to have chances to interact with scientists from underrepresented groups. In order to pursue these goals, I will be continuing my strong history of service by participating in the Bay Area Scientists in Schools program. Participants in this program design a one-hour lesson plan on a scientific topic of their choosing, and visit local schools (most of which are comprised of very underserved populations) to present the lesson to elementary school children. I am eager to continue engaging with my community, both through outreach programs, as well as through the impacts of my research.

In my current position, I have gained substantial experience in all aspects of **disseminating data to the broader community**. I have helped Dr. Gopnik prepare her talks, both for research conferences, and for the general public. I wrote our first-ever lab newsletter, which I distributed to our broader community and partnered research sites. Additionally, throughout the course of my research, I have interacted extensively with hundreds of families, providing them with more information about our research. I have helped maintain our lab's National Living Laboratory relationship with the Bay Area Discovery Museum, working with museum personnel to spread our findings to an even wider community. I have also coordinated journalists' requests, facilitating publication of our findings in the popular press.

Throughout my time as a researcher, one thing has become incredibly clear: **cutting edge research does no good if it languishes in ivory towers**. While outreach on an individual level is one method of tackling this issue, if we do not work to implement policy changes informed by our research, we have missed an opportunity to impact lives on a grander scale. My research proposal has been designed with real-world implications in mind – the United States is inarguably in the midst of a STEM education crisis. Rather than being world leaders in these fields, our schoolchildren sit squarely in the middle of the pack.[12] The difficulties we have in efficiently educating our children are robbing us of future brilliant scientific minds (not to mention a well-educated, competitive populace). I fervently believe that scientists have an obligation to publicize and utilize their results, and I believe that my research findings and previous experience will leave me uniquely poised to spearhead sorely-needed policy changes.

FUTURE GOALS. Because substantial gaps remain in our understanding of teaching, scientists are constrained in the kinds of policy recommendations we can offer to lawmakers, parents, and educators. I aspire to work as a professor in Psychology, heading a lab that not only investigates how we teach and learn, but also engages in this work on a broader scale, translating basic research into applied. I wish to collaborate with researchers in fields such as Education, Philosophy, and Computer Science, in order to conduct a research program with sufficient scope to offer **comprehensive policy recommendations**, rather than just the results of a few specific studies. The NSF GRFP would allow me to begin immediately pursuing this research goal in graduate school, rather than being subject to the constraints of topic- or advisor-specific funding.

1) Markant, Settles & Gureckis (2015). *Cog Sci,* 1-21. **2)** Walker, Gopnik & Ganea (2015). *Child Dev, 86*(1), 310-318. **3)** Walker & Gopnik (2014). *Psych Sci, 25*(1), 161-169. **4)** Walker, Lombrozo, Legare & Gopnik (2014). *Cog, 133*(2), 343-357. **5)** Walker & Gopnik (2013). *Psych Bull, 139*(1), 40-44. **6)** Aboody (2012). Talk presented at *Summer Undergraduate Research Fellowship Conference*. **7)** Aboody (2012). *Berkeley Undergraduate Journal, 25*(3), 4-11. **8)** Aboody (2013). Poster, *Berkeley Interdisciplinary Research Conference*. **9)** Aboody (2013). Poster, *Calif Cog Sci Conference*. **10)** Meins et. al., (2002). *Child Dev, 73*(6), 1715-1726. **11)** Meins, Centifanti, Fernyhough & Fishburn (2013). *Journ of Abn Child Psych, 41*(4), 543-553. **12)** Programme for International Student Assessment 2012 Results, OECD.