How to Enhance Curiosity in Early Childhood: A Curiosity Toy Kit

Michelle Kwan

*University of Pennsylvania, michelle.kwan210@gmail.com*

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Abstract
Curiosity is a universal and malleable positive character strength. It has been linked to physical, social, emotional, and psychological well-being, academic success, and success in adulthood. Curiosity is especially important in early childhood because this is a critical stage of development when children's curiosity is still abundant and organic. But for all its value, curiosity remains under-recognized and understudied. There is no universally agreed upon definition of curiosity in adults or children. As a result, the research community has varying opinions on how to define, measure, and enhance curiosity. And in many current day classrooms, an overly rigid top-down structure contributes to a disconcerting trend of diminishing curiosity as children grow older. Reviewing the scientific research across various fields, I describe seven psychological constructs (attention, novelty, solitude, inquiry, exploration, surprise, and awe) that can foster curiosity behaviors. I designed a Curiosity Toy Kit incorporating these seven curiosity components to be used as positive interventions for enhancing curiosity in early childhood, when children are 5-6 years old and entering formal education. Adults can use the Curiosity Toy Kit to encourage children to develop positive curiosity behaviors, helping them to flourish in school and beyond.

Keywords
curiosity, childhood curiosity, well-being, positive psychology, positive education, character strengths, attention, novelty, solitude, inquiry, exploration, surprise, awe

Disciplines
Developmental Psychology | Early Childhood Education | Other Psychology

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Michelle Kwan

Master of Applied Positive Psychology Program, University of Pennsylvania

MAPP 800: Capstone Project

Advisor: Allyson P. Mackey, PhD

August 1, 2021
Abstract

Curiosity is a universal and malleable positive character strength. It has been linked to physical, social, emotional, and psychological well-being, academic success, and success in adulthood. Curiosity is especially important in early childhood because this is a critical stage of development when children’s curiosity is still abundant and organic. But for all its value, curiosity remains under-recognized and under-studied. There is no universally agreed upon definition of curiosity in adults or children. As a result, the research community has varying opinions on how to define, measure, and enhance curiosity. And in many current day classrooms, an overly rigid top-down structure contributes to a disconcerting trend of diminishing curiosity as children grow older. Reviewing the scientific research across various fields, I describe seven psychological constructs (attention, novelty, solitude, inquiry, exploration, surprise, and awe) that can foster curiosity behaviors. I designed a Curiosity Toy Kit incorporating these seven curiosity components to be used as positive interventions for enhancing curiosity in early childhood, when children are 5-6 years old and entering formal education. Adults can use the Curiosity Toy Kit to encourage children to develop positive curiosity behaviors, helping them to flourish in school and beyond.

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Acknowledgements

To Allyson Mackey: My amazing advisor. Thank you for your guidance, kindness, and unwavering optimism in helping me find clarity, brevity, and a sense of achievement. I am so fortunate to have your wisdom to refine my ideas. Thank you for also nurturing my curiosity about curiosity and sharing inspiration with Clara’s friendship toolkit. I hope one day, every child has access to an Investigator Cap to match their Optimism Sunglasses.

To Masa Gong: Thank you for being the best cheerleader, sherpa, journal reader, and ride-or-die girlfriend. From reviewing my (5 AM inspired) MAPPstone decision matrix to the many quick check-ins, this would not have been possible without your continued positivity and kindness.

To Cindy Shove: Thank you for your support and recommendation letter which made my MAPP dream come true. This would not have been possible without you.

To Jessica Amortegui: Thank you for the many lunchtime conversations about MAPP, and the positive nudge to chase this dream. My life has changed forever for the better because of your encouragement. You are the MAPPIest person I know. Thank you, Jess, for being an inspirational human in every way.

To Marc Prager: Thank you for nurturing my curiosity every day. You are a paragon of a curious leader, and you know exactly how to coach me to help me be my best self at LinkedIn. Thank you, Marc, for always encouraging me to dream big, and always lifting me up to reach those big dreams.

To Kevin John Delaney: Thank you for being the most curious human being I have ever met. The way you live your one wild and precious life inspires me. I remain forever grateful for your leadership that allowed me to nurture my curiosity and passion for learning in others.
To Marty Seligman, James Pawelski, Leona Brandwene, Laura Taylor, Nicole Stottlemyer, Aaron Boczkowski, Instructors, and Assistant Instructors: Thank you for MAPP16, the adventure of a lifetime. You not only taught us but showed us that positive psychology can thrive even in the toughest of times. And that we are needed more than ever. Thank you for your tireless efforts in reinventing MAPP into a new, and yet just as special experience for our Sweet16 class. Thank you for loving oranges as much as apples.

To MAPP.16: You all have breathed new meaning into the words friendship and family for me. I am so grateful to have met, shared, laughed, cried and learned with you all as part of the Orange class. Thank You. While we have been on a year-long journey together, this is just the beginning. Sharing an anonymous quote that I hope inspires each of you, with admiration and love: “And our dreams, while they may seem gargantuan at the time, are worth fighting for.”

To my A1 Fall Cohort, Wes Hitchcock, Sogol Karkouti, and Anton Ledesma: My first friends in MAPP, thank you for the gift of belonging. We had the best conversation tangents, virtual food sharing, and more. I friendship love each of you so, so much.

To Tanyee Cheung, my dear MAPP partner: Thank you for always being there to chat, and for providing perspective on everything. You are so wise and so kind – a powerful combo.

To my Spice Girls Spring Cohort, Mecquel, Grace Zhao Baugh, Katie Williams, and Maggie Zhao (and our honorary Spice Girl/advisor Virginia Millar): What can I say, Spicy Blues? Thank you for the incredible laughs, chats, and more. I am so proud of the work we did together, and how our friendship grew along the way. We’ll make it last forever, because friendship never ends…

To Grace Zhao Baugh: How lucky I am to have met you and developed a bond of sisterhood through MAPP. You are truly one of a kind, my dear - exquisite and passionate. Thank you.
To Caia Baugh and Emil Baugh: Thank you for being two delightful inspirations for me to learn firsthand about curiosity in early childhood. I cherish the memory of reading Curious George to you and hope that your curiosity blossoms as you grow older. With your incredible parents Grace and Chris Baugh, I have no doubt that you will develop both intelligence and character, and flourish as you grow.

To Anita Bin Xie, Christine Ma, Ze Lin Xiao, Natassia Kwan, and Alyssa Li: Thank you for always being there for me, encouraging me to chase my dreams, and loving me for who I am. You each make me a better and more curious human being in different ways, and I am so grateful that you are my dearest friends.

To Adrian Wong: Thank you for your love, your kindness, and your willingness to share your world with me. Together, our shared curiosity has enriched my life in more ways than I can count. And thank you for reading my papers, feeding me during MAPP onsite Zoom marathons, and the countless Google Search-offs. You are the reigning Search King, but only by a smidgen.

To my family: Mom, Dad, and Dickson - thank you for nurturing my curiosity from day one and modelling it so wonderfully as I grew up. It is this curiosity that led me to MAPP, to delve into the field of positive psychology with eyes wide open and to find clarity in my purpose. I hope I can make a meaningful dent in the world sparking curiosity and wonder in others, just as you did so lovingly for me.
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Preface

Curiosity has been a cornerstone of my life for as long as I can remember. My childhood home brimmed with opportunities to foster curiosity. I grew up in a home environment where I could safely and happily roam, explore and discover my kingdom. Even the smallest of speck of dust was fascinating. I also remember experiencing the painful consequences when too much curiosity goes awry. When I was 6 years old, I had an intense desire to know what would happen if I stapled my thumb. To this day, I remember deliberating for hours with my finger between the stapler, and then giving in despite my fear. By that time, I already had been in a Montessori kindergarten program for several years and had just entered first grade.

This curious apple did not fall far from the tree. To this day, my mother asks more interesting questions when discussing a new topic than anyone else I know. My brother was my personal walking encyclopedia. He answered more of my questions than anyone else, knew about an incredibly broad swath of topics, and shared his books so we could read together. We explored our neighborhood with a combination of wondrous fascination and endless amounts of time that only children seem to have. My dad shared his love of the outdoors with me, where we would wander in the nearby woods or along a creek, in awe of nature and finding joy in contemplative solitude.

My curiosity in adulthood is best described as an analogy. Each time I added each new leaf of information, I found a branch to hang it on to and built out an increasingly rich world as part of my life’s knowledge tree. With the advent of the internet, both my desire and ability to search for information skyrocketed. One of my favorite “games” is competing with someone to see who can find an accurate answer on Google first. Search queries from “name of woman selling fur coats at Burning Man” to “gold metal earring manufacturer name from farmer’s market in Hilo”
led me to answers that seemed otherwise impossible to find. I still cannot identify the stunning gold and white striped fish I saw while scuba diving in the Philippines but have no photographic evidence of. The mystery intrigues me to this day.

My desire to study curiosity came full circle two years ago. Wandering through a bookstore, a cover caught my eye — *The Montessori Toddler: A Parent's Guide to Raising a Curious and Responsible Human Being* (Davies & Imai, 2019). As I flipped through the pages, I noticed a diagram demonstrating the Montessori Coat Flip. I experienced a jolt of surprise: Was this not how all children learned how to put on their coats? Is this not common knowledge? Did other people not learn this? Fascinated, I had to learn more. I purchased the book, read it cover to cover, and shared it with friends, parents or not. It never occurred to me that in these formative years of my life, curiosity was *intentionally* fostered in me as a child and was fundamental to the human I have become, and the life I have lived so far. The privilege of being educated in a curious classroom was a building block to my success in adulthood, and gave me the best gift of all. Curiosity helped me discover my purpose in life: to spark moments of curiosity and wonder in others. For this fortunate series of events, I am forever grateful.

My hope is that this work inspires current and future generations to rekindle a newfound love for studying and nurturing curiosity: not only in children, but in everyone. Curiosity is our ultimate superpower. It is the fuel that drives the engine of all human learning and progress, from the most technologically advanced achievements to the most imaginative expressions of humanity in arts and culture. And best of all, curiosity is a gift that each of us possess from day one. Nurturing these precious seeds will help us blossom our trees of knowledge throughout life and alongside it, all the joys and rewards that come with a lifetime of curiosity.
Introduction: Why Curiosity?

“*I have no special talents. I am only passionately curious.*” – Albert Einstein, 1952

Human beings are curious by nature. Curiosity has been a motivating force in some of society’s greatest inventions and accomplishments, from Newton’s laws of motion to Darwin’s theory of evolution, yet it is under-recognized and under-studied. What curiosity is and how to measure it still leaves much to discover. Curiosity is complex to define, so while the last few decades have led to some curiosity scales for different populations in various domains, research and attempts to quantify and measure it have led to no universal conclusions. Recently, studies in positive psychology have shed promising light on how curiosity contributes to well-being. And lastly, how curiosity develops in our childhood has also been studied but concrete findings are few and far between. I believe the intersection of these three areas — what curiosity is and how it develops, how curiosity impacts well-being, and how to enhance curiosity in early childhood — holds key discoveries to understanding curiosity’s benefits for a life well lived. With this area ripe for exploration, I will investigate the following areas in this paper:

1) Describe how curiosity is key to a flourishing life as a positive character strength;
2) Summarize the existing research on how curiosity has been defined and measured to date;
3) Discuss why curiosity matters in early-age children, particularly as it relates to their well-being and early success in the classroom;
4) Detail seven components of epistemic curiosity in children that can enhance curiosity-specific behaviors; and
5) Design a positive intervention in the form of a toy kit that can encourage children in developing specific behaviors to form curiosity habits, and guide adults in the best way to support, model and nurture these behaviors in children.
By the end of this paper, I hope to provide more insight into what curiosity entails and paint a convincing picture of why curiosity is critical to well-being, especially in children. There is an urgent need to study curiosity, as interventions that nurture this important character strength will enable our future generations to thrive.

**Positive Psychology**

Since time immemorial, humanity has sought the answers to the most elementary yet elusive questions of being alive: What is the meaning of life? How do we achieve lasting happiness and success? What does a life of happiness and meaning even entail? The eternal desire to answer these questions matches the complexity of this area of study: the science of “the good life”. Aristotle in *Nicomachean Ethics* (1926) distinguishes between two classes of happiness: “hedonia”, defined as the presence of pleasure and absence of distress, and “eudaimonia”, defined as living “the good life” in pursuit of virtue, excellence, and that which is worthwhile, allowing us to live in a deeply satisfying and fulfilling way (Deci & Ryan, 2008). To Aristotle, life was not only about “feeling good”. Only a eudaimonic life of “living well” was how individuals could achieve true well-being. Thus, *positive psychology is a field devoted to the scientific study of well-being and how people can live their best lives*. Martin Seligman, a founding figure of positive psychology, dedicated the second act of his career to creating the field of positive psychology and paving the way for others to study the science of well-being and what makes life most worth living.

In a seminal issue of *American Psychologist*, Martin Seligman and Mihalyi Csikszentmihalyi (2000) called for the scientific study of the building of positive qualities, strengths, and virtues. Specifically, they sought a science of positive subjective experience, positive individual traits, and positive institutions (Seligman & Csikszentmihalyi, 2000). This
heralded the beginning of a new era in psychology. In his presidential address to the American Psychological Association, Seligman (1999) previously asserted that traditional psychology focused too much attention on the disease model: “relieving the negative” to repair individuals diagnosed with clinical conditions. There needed to be more attention towards “enhancing the positive”, developing frameworks and interventions to maximize well-being and human potential (Seligman, 1999). Additionally, where traditional psychology focused on healing clinical populations, positive psychology benefits everyone. And beyond the individual level, positive psychology also aims to increase well-being and flourishing at group and community levels. We need to not be satisfied with only surviving, but instead seek out what enables thriving.

Well-being is not easily defined. Seligman (2011) developed the PERMA model incorporating five elements for well-being: Positive Emotion, Engagement, Relationships, Meaning and Accomplishment. Ed Diener, a pioneer of well-being research known to the world as Dr. Happiness, defined well-being as having three key components: high positive affect (or a high frequency of positive emotions), low negative affect (or low frequency of negative emotions) and high life satisfaction (Diener, 1984). Dr. Diener unfortunately passed away earlier this year, yet his legacy as a founder of positive psychology and well-being research continues to live on as he paved the way for so many researchers and scholar-practitioners in this field. Prilleltensky et al. (2015) described a well-being model known as I COPPE encompassing Interpersonal, Community, Occupational, Physical, Psychological and Economic well-being. Peterson (2006) wisely noted that the whole of positive psychology could be summarized into three words: “Other people matter”.

In the last 20 years, interest and research in positive psychology has skyrocketed (Kim et al., 2018). Topics as broad and complex as optimism, gratitude, resilience, awe and meaning
have been empirically studied to better understand how these positive psychology phenomena, or psychological constructs, enrich our existence. Additionally, new subfields have taken shape with researchers focused on applying positive psychology to educational systems (positive education), organizations (positive organizational scholarship), government policies, and more (Seligman, 2011). In short, there remains endless opportunities to apply positive psychology towards collective eudaimonia, both in the short and long term. Seligman (2011) set his sights on an audacious and worthwhile vision to aim for 51% of the global human population to be thriving by 2051. With this onset of positive psychology, one of the biggest contributions towards shifting humanity’s baseline towards the positive domain was the creation of the Character Strengths and Virtues Handbook.

**An Overview of Character Strengths**

The possibility of identifying universal positive virtues that allow humans to flourish has been an eternal quest for curious laypeople and scholars alike. Positive psychology made significant contributions in this area with its foundational work on positive character strengths. In contrast to the American Psychiatric Association’s widely accepted and well-researched Diagnostic and Statistical Manual of Mental Disorders (DSM) that detailed all mental illnesses and ailments, Character Strengths and Virtues was born out of the motivation to create a “positive handbook” version and classification system supporting the study of positive psychology (Peterson, 2006). In a comprehensive study of all major religions and philosophical traditions via structured interviews, behavioral experiments, observation questionnaires and information reports, Peterson and Seligman (2004) found that the same six virtues and 24 strengths thematically emerged across virtually all cultures spanning three millennia. These 24 character strengths are positive traits existing in degrees that are reflected in our thoughts,
feelings, and behaviors, and are predispositions toward moral excellence (Park et al., 2004). This seminal body of work became a popular area of scientific study, leading to significant research and applications on how enhancing positive character strengths can enhance well-being.

Additionally, while everyone has a unique constellation of character strengths as part of their personality, studies show that character strengths are not fixed traits, but are actually malleable and can be enhanced over time with deliberate practice (Niemiec, 2019). This malleability of character strengths is key to unlocking our potential to flourish.

Because character strengths are malleable, it is possible to underdevelop or overdevelop them (Niemiec, 2019). Aristotle spoke of a “golden mean” for each strength, the optimal form in which it should be used; when strengths are underused or overused, they may no longer appear as strengths (Niemiec, 2019). For instance, an individual who regularly underuses curiosity may be described as bored, uninterested, or apathetic (Niemiec, 2019). Conversely, when overused, too much curiosity can be considered nosy, intrusive, or self-serving (Niemiec, 2019). Indeed, over-indexing on curiosity is so commonplace that it has evolved into a common adage: “Curiosity killed the cat”. This juxtaposition of curiosity being a positive strength also heeds an important warning of curiosity as a double-edged sword. When unchecked, it can be inherently dangerous and lead to harmful consequences. For example, curiosity may be harmful not only because it can lead to dangerous discoveries, but because it can lead to unhealthy obsessions with information seeking in a way that distracts from other goals, i.e., doomscrolling on Twitter. As this paper focuses on the development of young children who are at a stage of high neuroplasticity and still forming curiosity (and other strengths) as a foundation of their character, it is important to be thoughtful about nurturing childhood curiosity to its golden mean without overextending its importance vis-a-vis other character strengths.
Curiosity and Love of Learning as Related Character Strengths

Another character strength discussed in *Character Strengths and Virtues* that is similar to curiosity is love of learning (Peterson & Seligman, 2004). In fact, curiosity and love of learning are among the most closely related strengths under the virtue pillar of Wisdom, the collection of strengths that help you gather and use knowledge (VIA Institute, 2021). According to the VIA Institute on Character (2021), curious individuals are novelty-seeking, interested in exploring new ideas, open to new activities and experiences, and they also have a strong desire to increase their own personal knowledge. On the contrary, love of learning is a desire to learn just for learning’s sake. So, while curiosity may be the initial motivating desire that leads one to seek out new information, love of learning refers to the desire to hold on to and deepen that information (VIA Institute, 2021). Notably, both strengths share an intrinsic motivational component: a curious individual is motivated by the pursuit of knowledge and an individual who loves learning is motivated by the systematic and comprehensive expansion of their knowledge (VIA Institute, 2021).

Curiosity has received attention for decades of research from developmental psychologists and more recently, in the field of cognitive neuroscience. However, curiosity when viewed through the lens of positive psychology offers another valuable perspective, as a positive character strength that underpins many aspects of a life well-lived.

**Curiosity and its Role in Well-being**

Although the research around curiosity is complex and dispersed, the most common theme underlying the scientific research defines curiosity as simply “the intrinsic urge to know more”. Curiosity is linked to many aspects of well-being and developing and maintaining a healthy sense of curiosity throughout life can be the key to meaningful personal growth and a
fulfilling life (Gallagher & Lopez, 2007; Kashdan, 2010). For children and adults alike, studies show how curiosity has been linked with psychological, emotional, social, and even health benefits. **Curiosity is one of the five character strengths that show a positive and robust relationship with life satisfaction, meaning in life, and overall subjective well-being** (Park et al., 2004; Peterson et al., 2007) and **negatively associated with depression** (Kaczmarek et al., 2014; Kaczmarek et al., 2013). Curiosity has also been linked to creativity, satisfying intimate relationships, and increased personal growth after traumatic experiences (Kaufman, 2017). How frequently we experience curiosity also matters. Kashdan et al. (2018) found that greater consistency in curiosity is associated with overall well-being. In other words, developing curiosity as a regular habit can lead to positive outcomes. In short, research suggests that curiosity as a character strength is correlated with all five aspects of Seligman’s (2011) PERMA model for well-being – positive emotions, engagement, relationships, meaning, and achievement.

People who are more curious have higher levels of positive emotions and lower levels of anxiety (Kashdan et al., 2004). Specifically, interest is an emotional state that spurs curiosity, which leads to the harnessing of psychological resources for well-being. Barb Fredrickson, a leading researcher on positive emotions, and Thomas Joiner note that curiosity via interest can be conceptualized as a motivating positive emotion that may encourage new and exploratory thoughts and behaviors, which in turn can result in the building of abilities and resources (Fredrickson & Joiner, 2018). This supports Fredrickson’s broader view on how positive emotions promote well-being through the Broaden and Build theory: 1) they broaden our mind and hearts and 2) through this broadening, they help us build psychological and social resources (Fredrickson, 2009).

When someone is curious about something, they are often described as being utterly...
fascinated, absorbed or drawn in. They are completely engaged. Mihalyi Csikszentmihalyi, another founding figure of positive psychology and a renowned psychologist best known for his research on flow, describes engagement or flow as a state of operating at full psychic energy when immersed in an activity (Csikszentmihalyi, 1990). In this way, absorption is a key component of curiosity. When we are curious, we are often in flow, absorbed in seeking new information. Additionally, curiosity promotes focused engagement in novel and challenging situations, also resulting in the accrueement of knowledge, social, and lasting psychological resources (Frederickson, 2001).

Curiosity can also contribute to well-being in the form of relationships. A study by Huang et al. (2017) has shown that people who exhibit social curiosity and are curious about others are also more well-liked. In several studies of one-on-one conversations, Huang et al. (2017) discovered a consistent relationship between question-asking, especially follow-up questions, and liking. People who asked more questions (and perceived as more curious about other people’s lives) were better liked by their conversation partners. In one study in a speed-dating setting, they were more likely to agree to a second date. When we show a sense of genuine curiosity about others, there are tangible benefits to forming stronger relationships.

Curiosity and meaning are also related. For people with greater trait curiosity, greater daily curiosity was more likely to persist into the next day and in turn, greater daily curiosity led to persistent elevations in perceived meaning and purpose in life (Kashdan & Steger, 2007). This important link between curiosity and meaning sheds light on a key idea: curiosity, when practiced as a habit, can help us achieve what often feels elusive and unattainable, yet critical for a fulfilling life: meaning and purpose.

Lastly, evidence suggests a promising link between curiosity and achievement.
Researchers have studied the connection between curiosity and more tangible definitions of success, such as academic achievement for children and adolescents, and workplace success for adults in the professional world. One study was conducted by Shah et al. (2018), demonstrating a connection between higher childhood curiosity and higher academic achievement in kindergarten reading and math. They concluded that curiosity may be an important, yet under-recognized contributor to academic achievement, and that fostering curiosity may optimize academic achievement in kindergarten, especially for children from low socioeconomic status (SES) backgrounds (Shah et al., 2018). In another study of Chinese high school students, curiosity was linked to higher academic performance on standardized tests (Wavo, 2004). And research on curiosity as a personality trait has demonstrated that academic performance varies across different learning environments depending on students’ level of curiosity (Arnone & Grabowsky, 1994, Kashdan & Yuen, 2007). Curiosity has also been positively associated with academic persistence (Neblett et al., 2006, Smalls et al., 2007).

Studies also show a link between curiosity and intelligence. In a longitudinal study, Raine and colleagues (2002) identified a group of 3-year-olds who were extra curious (defined as high stimulation-seeking individuals) and followed their development throughout their childhood and school experiences. At 11 years of age, these children were earning significantly higher grades than their peers, were superior readers and had IQ scores that averaged 12 points higher than their less curious counterparts (Raine et al., 2002).

Beyond academic achievement, curiosity in the workplace has also been studied. It seems intuitive that a curious employee is more inclined to accumulate knowledge because of their desire to learn, be more engaged in their work, develop better relationships with others in the organization, and overall perform better on the job. Indeed, Mussel (2013) showed that epistemic
curiosity is an important variable for the prediction and explanation of work-related behavior, and is a positive predictor of job performance (Mussel, 2013).

**Curiosity Aids Learning**

*Curiosity is the wick in the candle of learning.*” - William Arthur Ward (Xplore, n.d.)

If there were one overarching purpose for curiosity, it might well be the most popular theory proposed by George Loewenstein (1994): that curiosity’s primary function is to motivate and facilitate learning. Loewenstein’s (1994) information-gap theory described curiosity as a drive to seek information; similar to hunger which motivates eating, curiosity motivates the information gathering and retention. This theory also remains popular in the cognitive science field (Gureckis & Markant, 2012).

Research supports this notion that when people are curious about something, they learn more and they learn better (Engel, 2015). Curiosity is linked to enhanced memory; we have better memory for anything we stumble upon when in a state of high curiosity (Gruber et al., 2014). When we are curious, our brains release a surge of dopamine which allows us to take in and remember the entire landscape of experience and information more deeply, thereby increasing memory retention (Gruber et al., 2014). Kang et al. (2009)’s findings corroborate Gruber et al.’s (2014) research that memory-related and reward-related regions of the brain are activated when people are curious. These two studies lead to a powerful insight: that the expression of curiosity is often a rewarding experience and results in longer term learning.

Developing curiosity via interest also promotes deeper processing and learning (Silvia, 2006). In a study of adolescents, the more interested students were in a topic, the more they persisted in finding out more, and the more they persisted, the more they learned (Ainley et al., 2002).

**Beyond learning**, curious people exhibit other enhanced cognitive skills. Research shows
that people who nurture the tendency to seek new information and experiences show lasting brain effects. Scientists discovered that older adults who were genetically predisposed to develop Alzheimer's disease, but who kept curiosity as a daily part of their lives via an intellectually enriched lifestyle, warded off the disease for more than a decade (Vemuri et al., 2014).

Curiosity has been considered the primary motivating force behind cognitive development, education, and scientific discovery (Loewenstein, 1994). Indeed, research has found that curiosity is one of the most valued virtues of exemplary U.S. scientists (Pennock et al., 2016). Anecdotal accounts support this claim. One poignant example is of Charles Darwin in his youth, and how a moment of intense interest can lead to a lifetime of curiosity and prolific studies about the mysteries of nature. Csikszentmihalyi (1996) details this encounter in his book, *Creativity*:

One day as he was walking in the woods near his home [,] he noticed a large beetle scurrying to hide under the bark of a tree. Young Charles collected beetles, and this was one he didn’t have in his collection. So he ran to the tree, peeled off the bark, and grabbed the insect. But as he did so he saw that there were two more specimens hiding there. The bugs were so large that he couldn’t hold more than one in each hand, so he popped the third in his mouth and ran all the way home with the three beetles, one of which was trying to escape down his throat. (pp. 156-157)

What about curiosity’s potential relationship in bolstering other character strengths? In particular, the relationship between curiosity and creativity has received increased attention in the past few years. In a meta-analysis of 10 studies across 2,692 individuals, Schutte and Malouff found there was a significant association between greater curiosity and greater creativity, which entails generating new or useful ideas or products (Schutte & Malouff, 2020a; Schutte &
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Malouff, 2020b). Hagtvedt et al. (2019) assert that being curious can fuel creativity, possibly because it encourages exploration and linking of ideas during the creative process. Additionally, the intense concentration and absorption that characterizes the phenomenon of flow may also connect curiosity with creativity (Schutte & Malouff, 2020a).

This wide array of benefits in how curiosity contributes to an individual’s well-being suggests that curiosity indeed has a critical and exciting role to play in the pursuit of flourishing. However, despite myriad ways in which curiosity positively impacts our lives, less is known about how we can accurately define, measure, and enhance it.

**Defining Curiosity: What is Curiosity?**

Despite curiosity’s pervasiveness in our everyday lives, we lack a basic foundational integrative theory of the basis, mechanisms, and purpose of curiosity (Kidd & Hayden, 2015, p. 449). Like many psychological constructs, it is challenging for the academic and broader community to align on a definition for a complex construct like curiosity. In fact, there is significant debate around whether curiosity should be concretely defined at all or if the scope should be intentionally kept broad to advance research around curiosity and its related constructs (Kidd & Hayden, 2015). Curiosity has seen increasing attention and interest in educational literature, positive psychology, and developmental psychology (Grossnickle, 2016; Silvia & Kashdan, 2017), but because of its broad taxonomy, empirical studies to further understand curiosity have been limited by inconsistent definitions and measurement scales. Additionally, curiosity is often intricately intertwined with related constructs such as interest, exploration, absorption, play, and learning. I believe there is a benefit to breadth and depth in the pursuit of studying curiosity, because there is still so much to discover. For the purposes of this paper, I will cover a brief overview of the various dimensions of curiosity before focusing specifically on
epistemic curiosity as it pertains to young children.

Philosopher and founder of modern psychology William James called curiosity “the impulse towards better cognition”, meaning the desire to understand that which you do not (James, 1899). Jerome Kagan (2002), a pioneer of developmental psychology, described it as the human impulse to resolve uncertainty by probing a source of unfamiliarity or surprise. Jean Piaget (1964), renowned for his work on child cognitive development, defined curiosity as “the urge to explain the unexpected”, as humans sought to make sense of their experiences. Daniel Berlyne characterized curiosity as “drive” to satisfy the feeling by seeking information (Berlyne, 1960). According to Berlyne (1960), whose research centered on curiosity and arousal, you can measure people’s feelings of curiosity by observing their efforts to reduce that curiosity; understand the itch by measuring the scratch (Engel, 2015). George Loewenstein’s (1994) seminal paper combined ideas from Gestalt psychology, social psychology, and behavioral decision theory to form an “information-gap theory” about curiosity: curiosity arises when attention becomes focused on a gap in one’s knowledge. In studying childhood curiosity, Prachi Shah et al. (2018) characterized curiosity as “the joy of discovery and the motivation to seek information”. Is there one conclusive answer? In fact, all of these definitions address curiosity from various angles, highlighting components that make up this multi-dimensional construct: attention, novelty, intrinsic motivation, the desire for more knowledge, the joy of discovery, exploration and more. Collectively, curiosity is a tapestry that weaves together many important components to drive our cognitive development and well-being. To de-construct curiosity in more detail, we can look across its various dimensions.

**Curiosity Dimensions based on Object of Curiosity**

First, there are dimensions of curiosity based on the object of curiosity. **Physical curiosity**
How to Enhance Curiosity in Early Childhood

is the exploration and manipulation of oneself and surroundings (Dewey, 1910). *Perceptual curiosity* is exploration through sensory stimulation in order to acquire new information (Berlyne, 1954; Litman and Spielberger, 2003). *Social curiosity* is the use of language to appeal to others for information (Dewey, 1910) or a desire to know about other people (Renner, 2006). Lastly, *epistemic curiosity*, otherwise known as intellectual, cognitive, or information-seeking curiosity is a need or desire for knowledge, information, or the exploration of academic environments (Kang et al., 2009; Litman, 2010). Given its application and value in educational settings, this dimension of epistemic curiosity has received the majority of curiosity researchers’ attention and is the most commonly studied based on the number of articles published.

**Epistemic Curiosity**

Epistemic curiosity was further refined by Jordan Litman, who along with his colleagues developed psychometric scales to assess epistemic curiosity (Litman & Spielberger, 2003). Litman noted that the desire to obtain new knowledge (concepts, ideas and facts) can fall into two categories: to positively stimulate intellectual interest (I-type curiosity) or to reduce undesirable conditions of informational deprivation (D-type curiosity) (Litman, 2008; Piotrowski et al., 2014). By this definition, and consistent with Lydon-Staley et al.’s (2020) definition, both I-type and D-type curiosity are characterized by intrinsically motivated information seeking: an epistemically curious person has an innate urge to seek more knowledge on a topic.

There is some debate around whether epistemic curiosity stems solely from a typically positive emotion like interest vs. a negative emotion like the feeling of deprivation. Emily Grossnickle (2016) notes that across researchers’ definitions, curiosity tends to be defined in terms of positive emotions, and it also as a central construct in positive psychology (Kashdan,
Most researchers’ definitions of curiosity suggest that it is a pleasurable path, even when leading to negative outcomes (Grossnickle, 2016).

**Interest: A Curious Emotion**

There is also debate about whether interest itself should be labelled a positive emotion at all. Paul Silvia (2008), a psychologist who researches interest and its relationship to curiosity, groups interest into a family of emotional states termed knowledge emotions. Knowledge emotions foster learning, exploring, and reflecting (Silvia, 2021). Together with interest, the other knowledge emotions include surprise, confusion, and awe. Additionally, all four of these emotions can be, but are not always, positive emotions. Specifically, interest motivates exploration and learning (Silvia, 2012), and is one of the most commonly experienced emotions in everyday life (Izard, 1977). Interest can also be a momentary feeling, but when interest is sustained, whether aroused from a positive or negative feeling, it can lead to curiosity. Frederickson and Joiner (2018) take a different approach, describing interest as one of the ten positive emotions, and aligning interest closer to the positive emotion when one feels I-type intellectual interest. According to Frederickson (2001), interest functions as a positive emotion to intrinsically motivate learning and exploration, ensuring that people will develop a broad set of knowledge, skills, and experience. The debate continues, but what can be agreed upon is that interest (aroused from a positive or negative emotion) is an important precursor to curiosity.

**Additional Dimensions of Curiosity: Trait/State, Depth/Breadth, Specific/Diverse**

Other dimensions of curiosity are defined by time period or topic. When an individual has a regular desire to know more as a result of their disposition or character, it is known as *trait curiosity*, whereas a momentary state of curiosity expressed in response to an environmental trigger is known as *state curiosity* (Kashdan et al., 2004; Litman & Silvia, 2006; Loewenstein,
Further, different people are curious about different things, and the level intensity of their curiosity may be different (Livio, 2017). If one is curious about many topics, ideas, or experiences in a constant search for variation, they are displaying *breadth curiosity* (Loewenstein, 1994). On the other hand, an individual with curiosity for ideas and experiences directed in a more sustained manner towards a single topic or area exhibits *depth curiosity* (Loewenstein, 1994), like the character strength of love of learning. Finally, similar to breadth and depth curiosity, curiosity can also be distinguished along the axis of *specific versus diverersive curiosity* (Engel, 2015; Grossnickle, 2016). Someone motivated to increase arousal and reduce boredom by seeking uncertainty and new experiences exhibits *diversive curiosity* whereas someone motivated to reduce uncertainty through directed exploration of a stimuli is exhibiting *specific curiosity* (Arnone & Grabowsky, 1992; Spielberger & Starr, 1994).

Ultimately, while curiosity is a multidimensional construct that is complex to disentangle, there are common themes around curiosity that can be synthesized. Broadly speaking, *curiosity is an expression, in words or behaviors, driven by the intrinsic motivation, desire or urge to know more* (Engel, 2015; Grossnickle, 2016).

**Inhibitors of Curiosity**

Just as there are catalysts that positively support the development of curiosity, there are also inhibitors that can suppress or negatively affect the development of curiosity, particularly in young children.

Anxiety plays a subtle but powerful role in curiosity (Engel, 2015, p. 32). Children vary in how timid they are and how they manage their anxiety when exploring the world around them. Thus, a child’s temperament not only affects their emotional and social development, but also their cognitive development, including their curiosity. Kagan et al. (1994) found in a
groundbreaking study that a baby’s temperament has long-term implications for all aspects of their behavior, including her willingness to venture into the unknown. Anxious children who tend to shrink back from new experiences will seek fewer experiences to satiate their curiosity. They may also feel curiosity less frequently or less intensely because their sense of curiosity is competing with a sense of tension or fear (Engel, 2015). In other words, our appetite for the new and interesting is only balanced by our fear of the unknown.

Stress also negatively impacts early cognitive development, potentially hampering curiosity. In a study of young children by Park et al., (2021), researchers found that stress breaks down the connections of the ventral tegmental area (VTA) loop in the brain such that events do not make it into attention and memory-related areas. This stress exposure in early childhood may disrupt the typical developmental trajectory of the dopamine system, which is essential for reward processing and goal-directed behavior (Park et al., 2021). These findings provide further support to Gruber et al.’s (2014) Kang et al.’s (2009) research of the connection between curiosity and memory-related and reward-related regions of the brain. In another study, Clearfield et al. (2014) found that children from lower socioeconomic status (SES) backgrounds, who experience more stress, explore less than their more advantaged peers, even in infancy. To help buffer against the negative effects of early stress on reward neurocircuity and resulting development of curiosity in children, it is critical to design early childhood interventions to help them develop effective strategies for coping with chronic stress and instead focus on positive development of behavior (Park et al., 2021).

A lack of safety can also inhibit curiosity, as expressed in a child’s early exploratory behavior. The quality of a child’s attachment has a powerful influence on the vigor and depth of her exploration of the world around her (Engel, 2015, pp. 39-40). This idea was originally
inspired by John Bowlby’s theory that children require an attachment with one consistent person, and that without a secure attachment, babies failed to develop properly (Bowlby, 1969). His student Mary Ainsworth delved further into this research with her colleagues. In a now famous study, they demonstrated that babies display three types of attachment styles: 1) secure attachment, 2) insecure attachment and 3) anxious attachment (Ainsworth & Bell, 1970). Babies who developed a secure attachment style to an adult tended to explore more of their physical surroundings (Ainsworth & Bell, 1970). The adult effectively becomes the child’s safe harbor, providing a stable foundation for them to develop their curiosity. Without a secure attachment, a child may feel less comfortable exploring their surroundings and their expressions of curiosity may be hindered in future stages of development (Ainsworth & Bell, 1970; Bowlby, 1969).

Curiosity develops differently for children who grow up in different cultures, and exploratory behavior is not the only expression of curiosity that may be inhibited. Inquiry may also be affected by cultural differences, because question asking as a behavior is not treated similarly by adults across cultures and this can have developmental repercussions (Engel, 2015). Gauvain et al. (2013) found that children from non-Western cultures display inquiry and ask as many questions as their Western counterparts; however, fewer of those questions were focused on seeking explanations. Depending on whether question asking toward information seeking is lauded or frowned upon by important adult figures in a child’s early age, this may inhibit their ability to use inquiry comfortably and confidently as a tool to develop curiosity. Further research is needed here to better understand how differing cultural contexts may benefit or hinder a child’s development of curiosity.

The quality and stability of human relationships and safety of a physical environment are key ingredients in a child’s desire and subsequent ability to be curious. This potentially holds
true in later stages of development, as there is evidence that children with greater emotional and self-governing resources exhibit more curiosity as they get older (Arend et al., 1979; Hutt, 1970).

**Measuring Curiosity and its Challenges**

Despite substantial research on theoretical and empirical constructs of curiosity, reliably measuring curiosity is still challenging. Only a handful of psychometric scales have been developed and validated to measure curiosity in adults, and the research on scales to measure curiosity in children is even sparser. While this gap in measurement is partly due to the challenges around aligning on a common taxonomy for curiosity, it is further compounded due to the challenges in actually measuring curiosity itself. Self-report measures, observing behaviors as expressions of curiosity, and secondary source data from parental reports (when studying children’s curiosity) all have their respective limitations.

In the last two decades, there has been positive progress in developing psychometric scales to measure curiosity for adults. One popular scale created by prominent psychologist and curiosity researcher Todd Kashdan and his colleagues in 2004 is the Curiosity and Exploration Inventory Scale for adults (CEI-I), a 10-item scale that focuses on Exploration, appetite strivings for novel and challenging information and experiences, and Absorption, the propensity to be deeply engaged in activities (Kashdan et al., 2004). In 2009, Kashdan and colleagues refined the curiosity scale to develop a second, more reliable version with two different curiosity dimensions: Stretching, the motivation to seek out knowledge and new experiences, and Embracing, a willingness to embrace the uncertain and unpredictable nature of everyday life (Kashdan et al., 2009). In 2020, Kashdan et al. again created a revised, multi-dimensional measure of curiosity to further capture adult curiosity in all its complexity across five dimensions: Joyous Exploration, Deprivation Sensitivity, Stress Tolerance, Social Curiosity, and Thrill Seeking (Kashdan et al.,
As it relates to measuring adults’ curiosity in the workplace, Mussel et al. (2012) created a separate German work-related curiosity scale to study how curiosity may enhance a work performance.

When measuring curiosity in children, even more challenges apply. Most research on curiosity has been focused on adults via self-report measures that are inappropriate and inapplicable for studying children. Nevertheless, curiosity scales have been developed by education researchers in attempts to quantify children’s degree of learning both generally and in specific learning materials. Harty and Beall (1984) designed and tested a “Children's Science Curiosity Scale” (CSCS), a 30-item Likert scale for use with elementary school children in fifth grade. Jirout & Klahr (2012) described a new paradigm for measuring exploratory curiosity in preschool children, defining curiosity as the threshold of desired uncertainty in the environment that leads to exploratory behavior. Pelz et al.’s (2015) study quantified curiosity through exploratory behavior on touchscreen tables for children aged 18 months to 12 years old. Penney & McCann (1964) focused on measuring reactive curiosity, emphasizing the seeking of stimulus variation across different situations, in children within grades 4-6. These scales offer multiple ways in which children’s curiosity can be operationalized and measured, but it also indicates that a universally accepted way to empirically measure curiosity in children does not yet exist.

Because young children are unlikely to provide reliable self-report data on their curiosity, if curiosity is not measured through independently observable behaviors, parents or teachers have to respond based on their observations of the child’s behavior. Further complications arise in that curiosity typically manifests in a momentary emotional state, so not only is it hard for adults to identify and determine the onset of this feeling, it is even harder to have children
accurately identify it themselves. One promising parental self-report scale developed in recent years was a 10-item scale that measures the Interest and Deprivation types of epistemic curiosity in young children, as shown in Figure 1 (Piotrowski et al., 2014). Even though researchers acknowledge that there are individual differences in young children’s epistemic curiosity, this type of scale previously did not exist (Piotrowski et al., 2014). Thus, Piotrowski et al. (2014) developed and validated this scale (using confirmatory factor analysis) to reliably assess early expressions of I- and D- type epistemic curiosity in young children.

Figure 1

<table>
<thead>
<tr>
<th>I-Type Items</th>
<th>D-Type Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. My child has fun learning about new topics or subjects.</td>
<td>6. When presented with a tough problem, my child focuses all of his/her attention on how to solve it.</td>
</tr>
<tr>
<td>2. My child is attracted to new things in his/her environment.</td>
<td>7. My child devotes considerable effort trying to figure out things that are confusing or unclear.</td>
</tr>
<tr>
<td>3. My child enjoys talking about topics that are new to him/her.</td>
<td>8. My child is bothered when he/she does not understand something, and tries hard to make sense of it.</td>
</tr>
<tr>
<td>4. My child shows visible enjoyment when discovering something new.</td>
<td>9. My child will work for a long time to solve a problem because he/she wants to know the answer.</td>
</tr>
<tr>
<td>5. When my child is learning something new, he/she asks many questions about it.</td>
<td>10. My child carefully examines things by turning them around or looking at them from all sides.</td>
</tr>
</tbody>
</table>


It is promising that researchers continue to refine and operationalize new measures to comprehensively capture how curiosity is expressed in individuals. As the research around
curiosity grows, it will be even more transformative if we can develop innovative methods to collect primary source data, particularly in children.

Curiosity is compelling. It pulls us in emotionally, changes our cognition and alters our behavior. Driven by the intrinsic desire to explore, inquire and investigate, curiosity is a powerful force that pulls us to learn more about the world. The remainder of this paper focuses on epistemic curiosity in children, which translates to thriving in the classroom and adulthood.

**Curiosity in Children**

There is no universally accepted definition for curiosity in children (Wikipedia, 2021). This may seem surprising, especially because it is so easy to identify a curious child when we see one. Every parent or teacher can casually observe a young child and describe their sense of curiosity about one thing or another. When parents in the United States were interviewed, most spontaneously mentioned their kindergartener’s eagerness to learn and often used the word “curiosity” to describe their child (Engel, 2015). Yet we accept the notion that as we get older, it is inevitable that our propensity for curiosity diminishes. But is this truly the case? Despite recognizing the value of curiosity, relatively few researchers have asked why curiosity appears to decline as children get older and tried to understand the ways in which we can boost curiosity throughout our lives. So, to better understand curiosity, we need to investigate curiosity when it is at its most organic and abundant: in our early childhood years.

It is not too surprising that childhood curiosity research mirrors the broader curiosity research: broadly defined and studied in fragments. When it comes to defining curiosity in children, James (1890) and Dewey (1910) distinguished between curiosity for intangibles, such as ideas, and curiosity for tangibles, such as the physical environment around us (Grossnickle, 2016). This may be a particularly important distinction towards developing childhood curiosity,
as Harris (2012) has proposed that there are many things that children want to learn about in the intangible space: things that are hard to see (germs), have no straightforward physical presence (love), are unseeable (the past), or exist only due to human imagination (Santa Claus, Tooth Fairy). Additionally, Dewey (1910) asserted that children developed curiosity sequentially in the following order: physical curiosity, social curiosity, and intellectual curiosity. Children’s physical curiosity focuses on exploration and physical manipulation of oneself and surroundings. Social curiosity in children builds when they develop the use of language in order to engage in inquiry-based behaviors to satisfy their curiosity for information. Lastly, intellectual or epistemic curiosity develops when the child begins to seek explanations for particular questions of interest. Engel’s (2015) research supports Dewey’s (1910) theory that children develop curiosity throughout their infant, toddler, and early childhood years first through physically understanding the environment around them in active physical exploration, followed by social curiosity in inquiry based behavior. And as epistemic curiosity is often the domain of the classroom, how robustly curiosity is developed rests on how conducive the classroom environment is and how competent its educators are in fostering it.

Raising curious children is beneficial for their development. Children have various stages of cognitive development, which becomes the foundation for how they can interact with the world around them. At around 3 years old, preschool-age children develop one of the most common examples of cognitive development in their ability to ask questions, thereby burgeoning curiosity (Chouinard, 2007). Preschool-age children love to inquire and ask “why” as they practice question generation. Between 4 to 5 years old, children develop theory-of-mind (TOM) as they come to understand that people have thoughts, feelings, and beliefs that are different from their own (Wellman, 2014). By 5 and 6 years old, children are overflowing with curiosity,
expressing it in multiple ways. They pay attention to the tiniest insect on the sidewalk and turn it into a science experiment (Scholastic, 2021). They experience awe as they learn more about the world and wonder about how things happen or how they work. At this age, children have developed such effective inquiry behaviors that they can ask the most amazing questions to inspire adults’ own curiosity. In the first few months of kindergarten, children are also undergoing the me-centered, egocentric stage of development (Piaget, 1952). Their curiosity is mostly about the observations they make in their own lives and that which is closest to them. They wonder about what they see at school and at home, about nature, about their own growing bodies, and their family and friends (Scholastic, 2021). Importantly, a 5- or 6-year-old is developing their fledgling literacy skills of reading and writing. This particular inflection point is crucial when we consider the role of curiosity in these formative years of development, as they make the important transition into kindergarten and their first years of formal schooling.

**Introducing Positive Education**

“Inelligence plus character. That is the goal of true education.” – Martin Luther King Jr., 1947

If curiosity is so integral to a child’s development and success, it should be incorporated as an integral cornerstone of education more broadly. But what is the purpose of education? Plato’s philosophy of education was that education was a means to achieve justice, where individual justice means excellence in virtues and can be obtained when each individual develops his or her ability to the fullest (Lee, 1994). Dewey (1934/2010) believed that the purpose of education was to give the young the things they need to develop in an orderly, sequential way into members of society, and that education is, in its forms and methods, an outgrowth of the needs of the society in which it exists. In 1957, the Association for Supervision and Curriculum Development (ASCD) committee stated that the main purpose of the American
school is to provide for the fullest possible development of each learner for living morally, creatively, and productively in a democratic society (ASCD, 2012). By 1991, Arthur W. Foshay, educator and former president of the Association for Supervision and Curriculum Development, stated that “since ancient times, the one continuing purpose of education has been to bring people to as full a realization as possible of what it is to be a human being” (Foshay, 1991, p. 277). Clearly, as society has evolved, so has our desire for education to be of more noble purpose: to imbue in our younger generations the ability, knowledge, and capabilities to flourish. The considerable overlap between the purpose of education and the aim of positive psychology suggest that we should expect the intersection of these two fields to be burgeoning with new applications and success stories. Yet the data on whether our education systems have actually achieved this high bar of excellence tells a different story.

In 1998, Dr. Seligman polled thousands of parents asking in one or two words, what they would most want for their children (Seligman, 2011). The responses ranged from “happiness”, “confidence”, “fulfillment”, “kindness,”, “love” “satisfaction”, “meaning” among others. Well-being was the utmost desired outcome for parents to bestow to their children. At the same time, according to parents, the word list for what schools teach was quite different: “achievement”, “success”, “Test taking”, “discipline”, “Thinking skills”, conformity, and others (Seligman, 2011). There is next to no overlap between these two lists. What schools teach is narrowly focused on academic achievement towards success in the workplace and falls short of what our future generations require to thrive. In an ideal world, schools would teach both the skills of well-being and the skills of achievement. Or as Dr. King (1947) wisely said: intelligence and character. This is the vision for positive education.
Curiosity in the Classroom

“It is a miracle that curiosity survives formal education.” – Albert Einstein, 1949

All humans are curious creatures, and children even more so. As Dr. Alison Gopnik, a prominent developmental psychologist and professor (2011) wisely noted, babies and young children are like the research and development division of the human species. If they are permitted to do that research, to raise and explore their own questions, through various forms of experimentation, and without being burdened with instructions, they exhibit signs of more curiosity (Gopnik, 2011).

Fostering curiosity enhances our well-being, but it also holds a power that goes beyond merely feeling good — curiosity is critical to doing well. For children, curiosity is a big part of academic performance and an early hallmark of success in school. In fact, curiosity as a trait seems to be as important as intelligence in determining how well students do in school. In a meta-analysis by von Stumm et al. (2011), data from about 200 studies across approximately 50,000 students supported this notion that curiosity did, indeed, correlate with academic performance, with about the same effect size as conscientiousness. When combined, conscientiousness and curiosity had as big an effect size on academic performance as intelligence (von Stumm et al., 2011).

Moreover, how we learn in and outside of school continues to change. Access to a world of infinite information has fundamentally shifted how we communicate, process information, think, and learn (Davis, 2013). But the evolution of the existing education system, at least in the US, has not caught up. It lacks the flexibility and agility to meet today’s societal needs: to provide a holistic, positive education experience for our younger generations. One potential reason for this is that today’s classroom environments are not naturally conducive to fostering
curiosity. Despite research showing that it is one of the strongest markers of academic success, curiosity is still an underemphasized and under-recognized contributor to the classroom (Kaufman, 2017). Instead, today’s traditional, top-down classroom is full of rote memorization, instructions, and order, becoming an environment where curiosity does not flourish but instead languishes and in some cases, is practically extinguished. There is little to no opportunity for children to nurture their curiosity (Engel, 2015). Engel further details in *The Hungry Mind* several reasons why curiosity appears to decline so rapidly in schools:

1) Most people, including teachers, implicitly believe that some children are curious and others are not. They don’t think of curiosity as something they can actively nurture or instill in their students.

2) Though most people say that curiosity is a good thing, when it comes to choosing between curiosity and compliance, the educational system pitches towards compliance.

3) Many people think that nice teachers encourage curiosity and mean teachers do not.

   But in fact, encouraging curiosity has little to do with how nice a teacher is. (p. 2)

Nowhere is this worrisome trajectory of declining curiosity more evident than when a child begins their first foray into formal schooling with kindergarten at age 5. Studies suggest that when children are between the ages of 5 and 12, their curiosity diminishes (Engel, 2015). Using curious inquiry as an example, research shows that a child asks about 40,000 questions between the ages of 2 and 5. But after the age of 5, the number of questions that children ask decreases dramatically. Figure B details how the percentage of children actively using inquiry shows a steep drop (Berger, 2014). Interestingly, this coincides with the inflection points for
when children are in the classroom learning basic literacy skills: reading and writing (Berger, 2014).

**Figure 2**

Note: Graph detailing the decline of questioning as children age provided by the Right Question Institute, based on data gathered by the National Center for Education Statistics for the 2009 “Nation’s Report Card”. Reprinted from *A More Beautiful Question* (p. 43), by W. Berger, 2014, Bloomsbury USA. Copyright 2009 by Right Question Institute.

This steep decline in asking questions may not be alarming in and of itself. However, according to a poll by American research firm Gallup, this drop-off simultaneously coincides with children who report less motivation and engagement in school (Berger, 2014; Gallup, 2013). Whether children stop asking questions because they lose interest, or they lose interest because their natural curiosity is subdued by the inability to ask questions, this is a highly disconcerting trend. Neil Postman (1996, p. 70) captures this sentiment well: “Children enter school as question marks and leave as periods.”
Shouldn’t school be a place for curiosity to thrive since children have exposure to so many novel ideas, objects, spaces, and other people? This is a call to action if we want future generations to live more fulfilling and meaningful lives bolstered by their natural curiosity. As a result, nurturing curiosity as children enter formal schooling at age 5 and onward as they develop literacy skills is critically important and has lasting effects into adulthood.

Additionally, nurturing curiosity in the classroom can provide an extra boost to the students who need it the most. Shah et al.’s (2018) study showed that for children with low socioeconomic status (SES), curiosity had the strongest associations with greater reading and math achievement at kindergarten. These findings suggest that curiosity is important not only for all children, but perhaps even more important for those at an economic disadvantage. Unfortunately, these students (of whom society often expects the least) are most likely to have their curiosity dulled by rote learning, high restrictions, and classrooms focused on compliance (Ostroff, 2016). For all students, the path forward is clear. We need to re-instate curiosity in our schools by moving away from a standardized, top-down education system to instead focus on designing educational opportunities and classrooms that allow children to grow, learn and explore as they develop (Shonstrom, 2014). The current state of classrooms falls short in providing effective positive education opportunities for children. There is a need to create a curious classroom, and teachers play an especially important part in this.

Zion & Slezak (2005) note how teachers can play a critical role in helping students transform their curiosity into learning via open inquiry, by facilitating, focusing, challenging, and encouraging students in active engagement. When teachers themselves are curious, excited, involved, self-directed, and trying new things, this is when children’s curiosity has the best opportunity to flourish in the classroom (Deci & Ryan, 1985; Engel, 2011; Ostroff, 2012).
When children are curious and have curious teachers, they learn more and do better in school. Experimental evidence for the past half century supports the notion that children’s intrinsic interest is the most powerful ingredient to success in the classroom (Engel, 2015). Perhaps this claim is so obvious that it has led to a gap in the empirical research to understand exactly why or how this happens. Why does curiosity decline so rapidly once a child goes to school? How can teachers and educators create a curious classroom? And most importantly, if today’s classrooms cannot meet this standard of character education, what *can* we do to nurture children’s curiosity at this critical stage?

**Positive Interventions**

A positive intervention is an evidence-based, intentional activity that is designed to increase well-being in our emotions, cognition, or behaviors in a non-clinical population. Positive interventions work to increase well-being through a change in your emotions, cognition, or behaviors by focusing on a targeted outcome via a structured activity. Effective positive interventions are repeatable to form positive habits, are personalized to the individual, and are continuously modified and refined to achieve sustainable positive benefits.

Repetition is necessary to form a habit, and forming positive habits is instrumental to how positive interventions can effectively increase well-being. William James (1892/1984) reinforces this idea of building a positive habit through repeated actions, defining habits as new pathways formed when the brain is in a state of plasticity, reshaping the mind towards a new state of equilibrium (James, 1892/1984). When we enforce repeated, focused actions via positive interventions, these actions can lead to healthy habits, bringing us closer to sustained flourishing (James, 1892/1984). Adults should take every opportunity to encourage their child to practice curiosity habits, and also consistently model these behaviors for their children.
Positive interventions must also be personalized to the individual receiving the intervention to be most effective. When designing positive interventions, we should consider how various traits and characteristics intersect to create a rich tapestry of an individual’s cultural background and worldview (Pedrotti & Edwards, 2017). As curiosity is not expressed or even valued the same way across cultures, it is important to keep in mind how curiosity interventions for children may apply differently across various home environments.

We must also apply the principle of person-activity fit to personalize interventions because individual differences matter in terms of effect on happiness, and no single activity will help make everyone become happier (Schueller, 2014). Schueller (2014) describes two groups of person-activity fit theories: a strengths-based approach and a weaknesses-based approach. In a strengths-based approach, people may be more engaged and motivated to complete the activity (Schueller, 2014). In a weaknesses-based approach, the intervention focuses on participants experiencing a new behavior or cognitive strategy to develop into a more well-rounded individual, but the process may feel more like work (Schueller, 2014). In introducing curiosity interventions to children, adults should observe what expressions of curiosity their child is naturally strong in, and what areas may need to be further developed.

Finally, while personalized interventions may be effective in the short term (Schueller, 2014), a significant barrier to longer term happiness is hedonic adaptation, where boosts in happiness naturally decline over time. Mitigating hedonic adaptation requires increasing positive events and positive emotions when applying interventions, as well as increasing variety and appreciation of the intervention itself (Bao & Lyubomirsky, 2014). This is essential in nurturing early childhood curiosity, particularly around using novelty to incite curiosity. How frequently adults savor moments and positively reward an expression of their child’s curiosity should be
considered. Another method to slow adaptation is to add variety by completing multiple activities, modifying how activities are performed and alternating which types of activities to perform (Bao & Lyubomirsky, 2014). In short, there is a need for ongoing personalization in positive interventions to best develop a child’s curiosity and well-being.

**Positive Interventions to Enhance Childhood Curiosity**

Leveraging the existing scientific literature on curiosity, I propose a positive intervention that focuses on developing childhood curiosity via seven specific components. By using these curiosity toys as tools, children can develop curiosity habits in a positive manner and adults can nurture, model, and encourage this development.

Before delving into specific behaviors that can be enhanced, it is important to note that temperament, or one’s disposition is a powerful source of individual difference in curiosity (Engel, 2015; McCrae, 1996; McCrae & Sutin, 2009) and cannot be easily enhanced. Curiosity is most related to high Openness to Experience in Goldberg’s (1990) Big Five Factor Model of Personality (Engel, 2015), which as a personality factor is predictable and stable (Engel, 2015). From birth, some children are more inclined to explore novel spaces, objects, and people. Therefore, the following components were determined to specifically develop curiosity behaviors through emotion, cognitive and behavioral elements that can be enhanced.

**Attention**

“*My experience is what I agree to attend to. Only those items which I notice shape my mind.*” - William James, 1890

As James (1890) wisely stated, in order to experience something, we need to notice it first. In order to be curious about something, we need to pay attention to it. An individual can only be curious about things they notice and pay attention to. Mindful attention is a precursor to curiosity (Grossnickle, 2016).
Attention is a state in which cognitive resources are focused on certain aspects of the environment rather than on others (American Psychological Association, n.d.). According to William James (1890), focalization, concentration, of consciousness are of its essence. Attention is mindful immersion, leading to an experience where your child is fully focused and engaged in the present moment. Attention at its maximum capacity may also be described as flow, absorption, or engagement: a state of operating at full psychic energy when immersed in an activity (Csikszentmihalyi, 1990). When a child is paying attention to different stimuli in their environment, they are likely to notice more and probe deeper, leading to potential opportunities to develop interest as a spark towards the drive to seek more information, or deprivation in recognizing that there is an existing information gap that they seek to resolve.

Decades of research has also shown that attention is a central mechanism in the process of learning (Engel, 2015). In order to learn something, one must pay attention to it, and the more engaged a child is in something, the easier they are able to focus their attention on it and remove attention from other distractions. More recently, Wojtowicz and Loewenstein (2020) proposed another relationship between attention and curiosity: that curiosity evolved to help us efficiently allocate this scarce cognitive resource. When someone is curious, they are able to allocate attention in a way that does not consume attention. There is clearly a link between paying full attention to noticing what is happening in the world around us, and curiosity. Thus, one mechanism to enhance curiosity in children is to encourage a habit of paying attention.

**Novelty**

“*Where there is no novelty, there can be no curiosity.*” – Aphra Behn, 1688

Novelty is a key component of curiosity because when we focus on new things, we broaden our knowledge and skills (Silvia & Kashdan, 2017). Novelty is defined as the
discrepancy between what is known and what is discovered and can elicit activity and exploration of the environment (Mather, 2013). This desire to seek out novelty begins as soon as we are born. A seminal study by Fantz (1964) demonstrated that infants' visual attention to a familiar, repeated image will decrease relative to their attention to a novel image. Other early studies of infant habituation also reveal that newborns will habituate and direct their attention to novelty (Cohen and Gelber, 1975; Friedman, 1972; Slater et al., 1982, 1984). Furthermore, children not only pay attention to, but point more often to novel objects and events than they do to familiar ones (Engel, 2015). While babies and young children do not always prefer a novel stimulus (Rose et al., 1982; Hunter et al., 1983; Roder et al., 2000) and there may be an optimal level of familiarity-novelty preferences, there is strong evidence that novelty plays an important part in developing curiosity.

The reliability of the adult figure also plays a critical role in how children expressed desire for novelty. Children can distinguish between knowledgeable informants and non-knowledgeable “naïve” informants (Engel, 2015; Yu et al., 2018), and even babies were more likely to point to the new objects and look at the experimenter when she had proven herself to be reliable and knowledgeable versus incompetent (Begus & Southgate, 2012). These findings suggest that in childhood, newborns can display and alter their information seeking behavior in fairly sophisticated ways to satisfy their curiosity even before they acquire language skills to form questions.

While much of this research focuses on babies and their desire for novelty, we continue to display this desire for novelty throughout our lives. Novelty incites interest, motivating people to try new things, explore complex ideas, meeting intriguing people, and do novel actions (Silvia
In summary, the presence of novelty in our everyday lives can incite interest, which enhances a child’s curiosity towards new ideas, objects, or spaces.

**Solitude**

“Be a loner. That gives you time to wonder, to search for the truth.” — Albert Einstein (Hermanns & Einstein, 1983)

Solitude plays an important and often under-recognized role in a child’s development to pursue their questions and interests (Engel, 2015, p. 157). Children need uninterrupted time alone to develop their sense of curiosity. Piaget (1964) emphasized the intellectual mileage children get when following their own hunches, questions, and urges, especially when it comes to interacting with objects. Solitude also plays a critical part in subsequent beneficial behaviors for personal development, learning, and academic success. Several important curiosity behaviors that can benefit from solitude include unstructured play and reading, because solitude allows a child the opportunity to seek what is most curious to them. Jerome Brumer (1996) and Anne Brown (1997) refer to this as agency: the child’s ability to act upon the world, and guide and monitor their own learning and make decisions about what and how to learn.

Solitude promotes curiosity when children are given time for free or unstructured play (Engel, 2015). While play is not necessary for children to feel curious, curiosity benefits from the same conditions that seem to also nurture play, which is a critical activity in the development of young children for other key intellectual accomplishments (Engel, 2015). A study conducted by Hofferth and Sandberg (2001) revealed startling trends in how unstructured free time nearly disappeared from children’s daily routines: 3- to 5-year-olds spent approximately 17 hours a week in free play, most of them spent less than an hour outside, and less than two hours a week reading. By the time children were 9 years old, they spent no time outside, half the time in free play (just under 9 hours a week) and just over an hour a week reading alone (Hofferth &
Sandberg, 2001). Yet developmental research has consistently shown that solitude and free play are both extremely valuable to intellectual development (Engel, 2015, pp. 160-161).

Lastly, reading is arguably one of the most accessible and enriching way for people to satisfy all types of curiosity. But books require solitude and time alone. Further, the kind of reading that deeply satisfies curiosity is again tied to a child’s agency when they are alone, dependent on their ability to choose what they want to read (Engel, 2015). In summary, when children are allowed time on their own, they begin to act on their own. Given the opportunity for solitude, young children will express curiosity towards what uniquely interests and drives them, thereby customizing their ability to acquire new information (Dewey 1911; Cuffaro, 1995).

Inquiry

“Knowing the answers will help you in school. Knowing how to question will help you in life.” - Warren Berger, 2014

Children ask a lot of questions. Why? Because they are constantly curious. Question-asking is a central part of what it means to be a child (Chouinard, 2007, p. 25). In fact, inquiry is so critical to childhood development that developing children’s question-asking skills is an important educational goal (Common Core State Standards, National Governors’ Association, 2010; National Research Council, 2012). Questions can be considered verbal expressions of curiosity, and an individual’s proficiency in question-asking has consequences for academic performance and learning (Berlyne, 1954; Kidd & Hayden, 2015; Dewey, 1910; Chouinard, 2007). There is a step-function transformation from when infants point towards objects to understand their environment to when children acquire the use of language to seek more information about the world around them. Around age 2, children work hard to master the question form, the basis of inquiry (Engel, 2015, p. 46). Observational studies of very young children’s conversations with their parents reveal a high frequency and broad range of questions,
in some cases exceeding 100 questions per hour (Chouinard, 2007). Chouinard (2007) found that children seek information from adults not only to help them navigate the immediate world around them, but also to help satisfy their epistemic curiosity. In other words, children use questions to gain information about things that direct experience cannot help them with (Chouinard, 2007). Additionally, what a child is curious about differs from individual to individual. Children’s curiosity is not content-free, but rather they are most curious when they can inquire about the specific things that mystify or attract them (Engel, 2015, p. 12).

Effective question asking can promote high-quality language interactions that produce positive developmental outcomes (Kurkul & Corriveau, 2018; Ronfard et al., 2018). In pre-kindergarten age children, Tizard and Hughes (1984) sought to capture the way children seek to expand their intellectual horizons by studying these “episodes of cognitive search”. They recorded 3- and 4-year olds’ conversations for seven and a half hours, analyzing their types of questions, and found that more than half of the questions (60%) were phrased to acquire new information or learn about something, showing a clear link between inquiry as a specific curiosity behavior driven by their intrinsic desire to know more (Tizard & Hughes, 1984). Additionally, Frazier et al. (2009) found that children who received satisfactory explanations to their questions responded differently from when they did not.

Inquiry as an expression of curiosity may vary across children, possibly due to their environment. In a study of how families differ in their use of questions, Susan Engel, a developmental psychologist who studies curiosity in children, and her student, Laura Corona, found that children who asked a lot of questions had mothers who asked a lot of questions (Engel, 2015). While there is no definitive causal link between mothers modeling this inquiry behavior and children’s predisposition towards inquiry, this correlation suggests that question
asking may be part of a family style (Engel, 2015; Yu et al., 2019). The use of inquiry can also be affected by cultural norms (Harris, 2012). In particular, Harris (2012) has pointed out that cultures where children are discouraged from seeking explanations are also the cultures where there is least access to formal education. More research needs to be done in this area.

Nevertheless, encouraging question-asking allows parents to get a better understanding of what topics a child is curious about, and how they can help their children formulate better questions towards the goal of information acquisition and learning.

Children practice inquiry to get information about the world. And inquiry also provides an important feedback loop: children whose questions get answered are more likely to keep asking questions. These early experiences, according to Berlyne’s (1954) theory, are self-perpetuating and formative. If the result of inquiry behavior is rewarding when a child is young, this will become part of their foundation as they grow older. A child will either find curiosity satisfied through inquiry to be a positive experience and continue to practice this behavior, or like in many classrooms, stop asking questions.

**Exploration**

“We shall not cease from exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time.”

- T.S. Eliot, 1943

Exploratory behavior is a defining behavior of curiosity (Grossnickle, 2016), and children are driven by natural curiosity to explore their environments from a very young age (Piaget, 1952). Through their early stages of developing physical curiosity, children are constantly forming and testing hypotheses about how different people and things in their environment
function in relation to each other. Exploration is this manifestation of physical curiosity. Exploration is about probing deeper and going beyond the evident, and it signals to adults that a child has noticed and is interested in learning more about something. Research also suggests that parents’ behavior affects the way their child engages with the world around them, especially as it relates to exploratory behavior. In a study of parent-child interactions in a children’s museum, parents’ exploration predicted an increase in exploration by their children (Willard et al., 2019).

One study around measuring curiosity via exploratory behavior was Henderson and Moore’s (1980) research using the curiosity box. This box had several drawers on each of its four sides, and each drawer contained unfamiliar toys and objects that children could examine, if they discovered them. Essentially, Henderson and Moore asserted that curiosity could be objectively measured by the depth and breadth of the child’s exploration with respect to the box: the time it took for a child to open the box, the number of drawers opened, or the amount of time a child spent examining each object. However, this study raises interesting questions about the limitations of using a curiosity box to measure exploration: not all children are curious about the same things. And not only are we curious about different things, but research shows that we all also have different methods of exploration to satiate our curiosity. Thus, measuring exploration via a curiosity box may be limited in its effectiveness.

In a more recent study, Lydon-Staley et al. (2020) looked at exploratory behavior from a different perspective as it relates to building knowledge associated with Deprivation-type epistemic curiosity. Lydon-Staley and colleagues (2020) identified that given the open-ended and intrinsic nature of curiosity, it would be difficult to measure. Instead, they looked at how individuals created “knowledge networks” by studying their Wikipedia search patterns as a method for describing curiosity styles. Using a branch of mathematics known as graph theory,
Lydon-Staley et al. discovered multiple styles of deprivation-type epistemic curiosity, including two dominant styles: the ‘hunter’ seeks closely related information by diving deeply into a certain topic, while the ‘busybody’ jumps from topic to topic, collecting loosely connected information (Lydon-Staley et al., 2020). One of the reasons this study is particularly interesting is that it quantified and distilled individual expressions of curious exploration through knowledge network building rather than through engagement in activities like exploring drawers in a box, asking questions, or playing trivia games as previous studies have done. This work suggests that we can continue to find new, interdisciplinary ways to better understand how exploration contributes to each individual’s unique signature of expressing curiosity and how it can enhance their well-being.

Exploration is one of the earliest behaviors that a child displays as a means of satisfying its curiosity about its environment. The more exploration can be nurtured in a personalized way for a child, the more likely curiosity can be fostered as well – not only through a better understanding of the physical world around them, but to discover more about the unknown.

**Surprise**

“To be surprised...is to begin to understand.” – José Ortega Y Gasset, 1932

Our curiosity is aroused when we are surprised (Bonawitz et al., 2012; Doan et al., 2020). Jerome Kagan in his book *Surprise, Uncertainty and Mental Structures* argues that surprise shapes our mental life (Kagan, 2002). When something breaches our sense of familiarity, we remember it better (Engel, 2015, Kang et al., 2009). Surprise is one of the four knowledge emotions that leads us to probe deeper and develop a sense of curiosity about the unexpected (Keltner & Shiota, 2003). Specifically, when an event is “high contrast” and sticks out against the background of what people expected to perceive or experience, people become surprised
(Berlyne, 1960; Teigen & Keren, 2003). When our expectations are violated in this way, an overwhelming urge to know more follows. It is this urge that leads to curiosity.

Surprise leads to positive emotions of pleasure and also enhances our memory of the unexpected, because we seek to understand what we do not anticipate. Both of these can benefit a child’s development of curiosity and subsequent desire to learn. A study done on college students used fMRI techniques and found that curiosity increased activity in memory areas when subjects guess incorrectly, which suggests that curiosity may enhance memory for surprising new information (Kang et al., 2009). Notably, Kang et al.’s study looked at curiosity through asking trivia questions and found that curiosity about the answer to a trivia question is a U-shaped function of confidence. Students were most curious when they were moderately certain about their answers, but less curious when individuals had no idea or were fully confident of their answers. Research on infants also supported these accounts as it relates to their attentional strategy (Kidd et al., 2012). Kidd et al. (2012) found that infants’ probability of looking away from a visual event sequence were greatest when there was very low information content (highly predictable) or very high information content (very surprising). This suggests that infants implicitly decide to direct their attention towards events that are “optimally surprising” so they can optimize their available cognitive resources on absorbing an optimal intermediate amount of information and maximize their learning potential (Kidd & Hayden, 2015). In other words, there may be an optimal level of surprise that leads to maximum curiosity.

Surprise as a driver for curiosity in the form of exploration has also been studied. Research shows that unexpected success influences children’s subsequent exploration. Bonawitz et al. (2012) found that children prefer to play with toys that violate their expectations. And a more recent study by Doan et al. (2020) found that unexpected success on one task motivates 4
year old children to explore longer and with more breadth on another task. This feeling of “Wow, I did it!” and the behavior change that follows is a promising discovery about the relationship between an unexpected event and our desire to further understand.

The studies above from infants to young adults suggest interesting implications for children whose brains are developing rapidly in early childhood and how introducing more surprise into their daily activities can spur exploratory behavior to build curiosity.

**Awe**

“There are no seven wonders of the world in the eyes of a child. There are seven million.” – Walt Streightiff (Goodreads, n.d.)

Experiences of awe stimulate wonder and thus curiosity, and young children especially are often in a perpetual state of awe. Awe is considered a knowledge emotion because in this emotional state, we develop the need to take in novel, complex information (Shiota et al., 2017). Keltner and Haidt define awe as a “perceived sense of vastness” and a “need for accommodation”, where one needs to adjust their mental structures of how they understand the world (Keltner & Haidt, 2003). Like surprise, interest and confusion, awe is associated with learning and thinking (Keltner & Shiota, 2003).

Being in awe often starts with fascination followed by a sustained curiosity about life and nature’s mysteries. Oftentimes, these moments occur when we are children and most open to new and inspiring events around us. One anecdote in Csikszentmihalyi’s (1996) book, *Creativity*, describes Vera Rubin, astronomer extraordinaire, in her first encounter with the cosmos:

Vera Rubin looked out of her bedroom window and saw the starry skies for the first time outside of her bedroom window when she was seven years old, after her family had moved to the edge of the city. The experience was overwhelming. From that moment on, she says, she could not imagine not
spending her life studying the stars. (p. 157)

One study speaks to the promise of daily awe and how it can lead to sustained curiosity. Researchers at UC Berkeley collected individuals’ daily reports of awe for two weeks and found that it is surprisingly common in everyday life. Additionally, each burst of daily awe predicted greater well-being and curiosity weeks later (Stellar et al., 2018). In another recent study of high school adolescents, Anderson et al. (2020)’s findings suggest that awe-prone people are more curious, and that inspiring awe to develop curiosity may improve academic outcomes. In one early childhood study, research suggests that awe increases preschooler’s exploration and discovery, because awe may be linked to drives that increase uncertainty and also the motivation to resolve it (Colantonio & Bonawitz, 2018).

The research on awe is still fairly new, with many studies focused on adults. While more research is needed to understand the specific link between awe and curiosity in young children, the anecdotal and empirical accounts around adolescents and adults suggest that activities inspiring awe can encourage children to become more curious, and potentially improve early academic outcomes.

**How to Use the Curiosity Toy Kit at Home**

Adults have a vital role to play in developing curiosity in children. This is true both in the classroom and at home. By the time children are three years old, they spend at least two-thirds of their time with non-parents, even in cultures focused on the nuclear family (Engel, 2015). And multiple studies show that one adult can influence a child’s expression of curiosity, so it is important that adults understand how to nurture children’s curiosity from a young age.

Each of seven curiosity components described above can be incorporated into positive interventions that enhance curiosity in children. Given this critical period as children enter
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kindergarten and first grade when curiosity behaviors like exploration or inquiry in the classroom starts to decrease (Berger, 2014; Engel, 2015), the curiosity toy kit in Appendix A is designed for parents to enhance curiosity in 5- and 6-year old children at home.

Curiosity toy kits can be made from readily accessible household items and are intended to be used at home so children and parents alike can enjoy the practice of cultivating curiosity as part of their everyday lives. These toys are intended to be used as tools to help a child build positive habits via practicing curiosity-specific behaviors. It is recommended that a parent offer only one toy at a time to their child each week, eventually introducing all 7 toys. This allows the child more time to play with each toy and derive its full benefits, practicing repetitive habits of one curiosity behavior, before moving on to the next toy. Person-activity fit can be incorporated into this intervention depending on the child’s temperament or interest in each individual toy, so the order of the toys can be rearranged to best suit the child. Applying Schueller’s (2014) strengths-based approach, if an adult notices that their child is asking many great questions and wants to encourage this behavior, they can introduce the Investigator Cap earlier on. Alternatively, the toys can be used to enhance a weaker area of curiosity behavior. For instance, a child who may be showing early signs of attention deficit disorder could be offered the Magnifying Glass earlier on to encourage a mindful approach of focused attention in their daily activities. Once all 7 toys are introduced, parents can incorporate all toys into one kit so the child has access to all of them. This way, the child now has more agency and can seek out whichever curiosity toy is most interesting to them.

To maximize potential effectiveness of the Curiosity Toy Kit, adults can also model the curiosity behaviors, such as inquiry and question asking. By using, “I wonder…” “what if…”, expressions of awe and surprise, or even pedagogical questioning (asking questions as a way to
teach), adults can establish themselves as a knowledgeable informant (Yu et al., 2019). Because children can distinguish between knowledgeable informants and non-knowledgeable naive informants (Engel, 2015; Yu et al., 2018), there is a delicate balance to display comfort in not knowing. Modeling the behaviors of saying, “I don’t know, but let’s find out” can be a positive way to demonstrate epistemic curiosity for your child and show that there are alternate ways to satiate their curiosity.

**Limitations and Future Directions for Research**

There are several limitations concerning the scope of this literature review and intervention design. First, distilling a complex, multi-dimensional construct like curiosity into seven components is neither an exhaustive nor holistic view. Instead, I highlight several salient constructs to help enhance curiosity in early age children. Additionally, while anxiety, stress, lack of a secure attachment style, and cultural differences in children may suppress curiosity in early childhood and beyond, there may be other potential inhibitors of curiosity and how they operate. This is an area of research that deserves more attention. Lastly, there are many topics of interest around curiosity that warrant discussion and future research attention including the connections between curiosity and intelligence, curiosity and exploratory play, and curiosity and creativity. This paper did not address these topics in detail.

There also exists limited knowledge on how curiosity is nurtured differently in cultural contexts. Previous studies have shown conflicting results about how cultural upbringing may or may not influence curiosity behaviors such as inquiry or storytelling. Further, there is minimal research on how curiosity is developed and expressed in kindergarten-age children across cultures, in classrooms around the world, or how adults (parents, guardians and teachers) may encourage curiosity in different contexts.
Finally, this paper focuses largely on how to foster curiosity in early childhood, specifically at 5- and 6-years old. While a critical stage of development, this is a narrow age range. It would be useful to extend the current findings by examining how curiosity develops beyond early school years at each stage into adulthood and throughout our lives.

**Looking Ahead: Directions for Future Research**

“Research is formalized curiosity. It is poking and prying with a purpose.” - Zora Neale Hurston, 1942

It is time to get even more curious about curiosity. Potential areas for future research include:

- Designing an empirical study to operationalize and measure the desired curiosity behaviors in the Curiosity Toy Kit. Ideally, this can be via a scale that breaks down each intervention into its corresponding elements to isolate the target activity, active ingredient, target change, target system and the desired outcome (Pawelski, 2020).
- Creating self-report curiosity scales for children
- Developing more longitudinal studies on the development of curiosity as it relates to holistic well-being, academic performance, and success in adulthood
- Understanding the potential value of alternative education approaches, whether they foster more curiosity and if this can predict improved academic outcomes
- Studying curiosity across more demographics including culture, race, gender, and socioeconomic status (specifically those with low SES) so we have a more representative sample to understand how we can nurture curiosity in everyone. All children are born curious, but there remain opportunity gaps for all children to equally nurture their curiosity.

It is imperative that curiosity remain a topic of study for researchers across multiple
fields, including but not limited to positive psychology, developmental psychology, and cognitive neuroscience. The collective knowledge and energy across these communities and individuals outside of academia offer collaboration opportunities that will only buoy new discoveries for curiosity and well-being outcomes for children and adults alike.

**Conclusion**

“I think, at a child’s birth, if a mother could ask a fairy godmother to endow it with the most useful gift, that gift would be curiosity.” - Eleanor Roosevelt, 1935

Curiosity is foundational to what makes life worth living. Across multiple scientific fields of study, there is strong evidence to support curiosity is widely beneficial. Yet there is still much to learn on how to accurately define, measure and enhance curiosity, particularly its connections to childhood well-being, academic achievement, and lifelong well-being. How curiosity in childhood leads to flourishing in adulthood, and how we can sustain curiosity throughout our lives are interesting research questions ripe for exploration, like an “itch waiting to be scratched”. The more we turn our attention towards studying curiosity, the sooner humanity can truly maximize its collective potential. And if curiosity can become a foundational pillar of building positive educational systems worldwide, this would be monumental progress towards democratized well-being for all.

Curiosity is in all of us. It is highly malleable and can become either a superpower or a supernova: a fleeting flash of light, then slowly fading. How we nurture curiosity in early childhood plays a fundamental role in whether curiosity becomes a core part of our lives. It not only offers potential to thrive beyond simply feeling good, but also truly living well. Curiosity is a critical pathway to flourishing and channeled in the right way, it can lead us to interesting questions and even more interesting answers as we live our best lives.
Appendix A – Curiosity Toy Kit Instructional Guide

The Curiosity Toy Kit

Michelle Kwan, Masters in Applied Positive Psychology

Curiosity has many benefits when it comes to your child’s well-being. Curiosity promotes focused engagement in novel and challenging situations, so it can help kids learn (Kang et al., 2009). Curiosity can also help kids make new friends (Frederickson, 2001). Studies show that even one adult can influence a single child’s expression of curiosity, so it is important that adults support, model and nurture their child’s curiosity from a young age (Engel, 2015).

This toy kit is designed for children in kindergarten and first grade (5-6 years old) as this is a critical stage of development. Research suggests that children who are curious score higher on early childhood academics like reading and math (Shah et al., 2018). Also, as children begin formal schooling, curiosity and its important behaviors like exploration or inquiry in the classroom starts to decrease (Engel, 2015, Berger, 2014). This toy kit will encourage your child to continue cultivating curiosity as part of their daily routine.

How to Build a Curiosity Toy Kit:

Curiosity toy kits can be made from everyday household items. These toys can be used as tools to help your child develop curiosity-specific behaviors and build positive habits. Today, you are probably already nurturing your child’s curiosity in many ways already. Here are some other ways that you can promote curiosity in your home. Introduce one new toy at a time each week and watch your child’s curiosity thrive!

A Magnifying Glass to Develop Attention

Why Attention Matters: Attention is mindful immersion, leading to an experience where your child is fully focused and engaged in the present moment. When your child is paying attention to their environment, they’re likely to notice more and probe deeper. Research has also shown that attention is a central mechanism in the process of learning (Engel, 2015).

How to Use: When using the magnifying glass, encourage your child to look closer and to focus. What do they notice when they look closer? What didn’t they see before? What interesting observations or questions do they have?
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A Curiosity Cabinet to Stimulate Novelty

Why Novelty Matters: Novelty is a key component of curiosity because when we focus on new things, we broaden our knowledge and skills (Silvia & Kashdan, 2017). Novelty incites interest, a knowledge emotion that motivates people to try new things, explore complex ideas, meet intriguing people, and do novel actions (Silvia & Kashdan, 2017).

How to Use: Find small, novel objects around your home and put one in each drawer—i.e., a Cheerio, raisin, some tape, a hair tie, a leaf, etc. Try to find objects with varying textures, colors, shapes, etc. As your child plays with the curiosity cabinet, be sure to smile and interact with them in an encouraging manner as they open new drawers and examine each object. Savor the moments in how your child responds to each new object. Don’t forget to change out the drawers regularly to keep up the novelty factor!

A DIY Makeshift Tent for Savoring Solitude

Why Solitude Matters: Children need uninterrupted time alone to develop their sense of curiosity. Developmental research has shown that solitude and free play are both extremely valuable to intellectual development (Engel, 2015, pp. 160-161). Piaget (1964) emphasized the intellectual mileage children get when following their own hunches, questions, and urges, especially when it comes to interacting with objects. When children are allowed to act on their own, they exhibit curiosity-specific behaviors through their need to investigate and acquire new information (Dewey 1911; Cuffaro, 1995).

How to Use: Build a makeshift tent with a blanket, a clothesline, and a few pillows. This intentional space in your home now signals to your child that when they step into this zone, they can have uninterrupted time alone to engage in the world around them, on their own – they can let ideas marinate, get lost in their own thoughts, explore, have free play, and learn. Try to give them some space when they are in the tent and see how they realize the benefits of solitude and quality alone time.
An Investigator Cap to Invite Inquiry

Why Inquiry Matters: Young children ask questions as a way to better understand the world around them. Curious children have an urge to know more and desire knowledge and information, and inquiry is one way to acquire this information. Encouraging question-asking will also allow you to get a better understanding of what topics your child is curious about, and also how you can help them develop better questions (Engel, 2015).

How to Use: When your child is wearing their investigative cap, this signals that they are ready to ask lots of questions. Be fully present with your child and engage in the conversation, encouraging their curious inquisition. Use positive language such as, “that’s a really great question!” If a question comes up that you don’t have an answer to, this is a great opportunity to demonstrate your own curiosity. You can say something along the lines of, “I don’t know. Let’s find out!” You can also model inquisitiveness by asking questions yourself, using statements such as, “I wonder what happens if…”. “Why do you think this is happening? “Where is the water going?”

A Pair of DIY Binoculars to Encourage Exploration

Why Exploration Matters: Exploratory behavior is a defining behavioral outcome of curiosity (Grossnickle, 2016). A child who wants to know more will naturally explore, so encouraging this behavior is beneficial to boosting curiosity. A set of DIY binoculars is the quintessential toy for exploration, probing deeper, and going beyond the evident. It expands the opportunities for an already curious mind to desire to know more.

How to Use: With these binoculars in hand, encourage your child to go exploring anywhere nearby that’s safe to do so. These binoculars are great to use outdoors – for cloud gazing, bird watching, or even exploring one’s own front/back yard. Follow your child’s lead and encourage them to look all around – up, down, and sideways. See where your little explorer leads you!
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A Mystery Grab Bag to Elicit Surprise

**Why Surprise Matters:** Our curiosity is aroused when we are surprised (Bonawitz et al., 2012; Doan et al., 2020). Surprise is known as a knowledge emotion (Keltner and Shiota, 2003), that leads us to probe deeper and develop a sense of curiosity about the unexpected. When our expectations are violated, an urge to know more is sparked— the urge that leads to curiosity. Surprise can also lead to positive emotions and increased memory for surprising new information, an important component in learning (Kang et al., 2009).

**How to Use:** Place a small item inside the bag, ideally something difficult for your child to guess. Build some suspense and excitement by encouraging them to use multiple senses— touch, smell, hearing or taste (if it’s safe) before you let them finally look at the object and discover for themselves what it is. When the object is not what they expected, relish in their surprise and delight! Allow time afterward to satiate their curiosity about this surprising object.

A Kaleidoscope to Inspire Awe

**Why Awe Matters:** Awe is considered a knowledge emotion because in this emotional state, we develop the need to take in novel, complex information (Shiota et al., 2017). Inspiring awe and its close cousin wonder can encourage children to develop an interest in what they are seeing, leading to curiosity.

**How to Use:** Encourage your child to fully appreciate the beauty and wonder of the kaleidoscope. You can also model awe when using the kaleidoscope yourself by saying something such as, “Wow! Isn’t this amazing?!” or “How incredible! What do you think?” to demonstrate that being fascinated and in awe of something is an encouraged behavior at home.

Looking Ahead:

After introducing all 7 toys, give your child the reigns to explore. Put the toys all in one kit so they can continue playing with what’s most interesting to them. See what other household items might also inspire curiosity, i.e., Amazon’s Alexa or Google Home for inquiry or floating vs. sinking toys to elicit Surprise. Savor each moment your child lets their curiosity shine!
References


http://dx.doi.org/10.1037//0022-0663.94.3.545


https://doi.org/10.2307/1127388


Behn, A. (1688). *Oroonoko: or, the royal slave*. William Canning.


How to Enhance Curiosity in Early Childhood


Curiosity. (2021, July 6).


How to Enhance Curiosity in Early Childhood


James, W. (1899). *Talks to teachers on psychology: And to students on some of life’s ideals.* Henry Holt & Company.


How to Enhance Curiosity in Early Childhood


Litman, J. A. (2010). Relationships between measures of I- and D-type curiosity, ambiguity tolerance, and need for closure: An initial test of the wanting-liking model of information

https://doi.org/10.1016/j.paid.2009.11.005


https://doi.org/10.1207/s15327752jpa8001_16


How to Enhance Curiosity in Early Childhood


Ostroff, W. L. (2012). *Understanding how young children learn: Bringing the science of child development to the classroom*. ASCD.


Penney, R. K., & McCann, B. (1964). The children’s reactive curiosity scale. *Psychological Reports, 15*(1), 323–334. [https://doi.org/10.2466/pr0.1964.15.1.323](https://doi.org/10.2466/pr0.1964.15.1.323)


https://doi.org/10.1207/s15327752jpa8703_11


https://doi.org/10.1207/s15327078in0104_9


https://doi.org/10.1016/j.dr.2018.05.002


https://doi.org/10.1037/0012-1649.18.5.704


https://doi.org/10.1016/j.paid.2019.109555


https://www.brainyquote.com/quotes/william_arthur_ward_125714

