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Curiosity and Education: A White Paper

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Introduction

"Children are in love with life… Always imbibing some lesson and realizing the joy of knowing. / We must teach the child by means of this spontaneous curiosity within him for the external world."
- Rabindranath Tagore

Tagore's romantic idea is one shared by many: that we all, as children, have a natural curiosity – a tendency to explore the world – using new experiences to reconstruct how we understand our world and allowing for a life rich with excitement in discovery. Tagore's sentiment makes curiosity a necessary, if not sufficient component, for learning and sustained educational aspiration.

We all have stories of when we were curious, whether it was our first experiences with music or language or when we suddenly wanted to know more about something which we never knew existed; or perhaps the story is about our children, surprising us with their ever-more complex ways of questioning the world around them. As humans, we share this knowledge of 'curiosity' in our experiences, having felt its presence at some point in our lives.

Yet despite the ubiquity of such experiences, the majority of our schools and curriculums seem not to consider curiosity at all, focusing instead on rote memorization, subject-specific skills, standardized assessments which emphasize learning minimums, and disciplinary procedures that encourage silent knowledge consumption rather than inquisitiveness or interaction. Such practices tend to emphasize outcomes over the learning process. Furthermore they limit what children should or can learn and prevent any exploratory learning that fosters curiosity and leads to more sustained educative engagements.

The dilemma lies in the concept of 'curiosity' itself. Although we all have experienced the feeling of curiosity at some point in our lives, determining *what* actually constitutes curiosity is another thing entirely. RSA's *The Power of Curiosity* provides a working definition, saying that curiosity is "the desire to close an information gap between a given reference point (some desired knowledge) and a person's existing information set" (RSA Projects, 2012). But what types of information gaps and when? How do we harness and develop our curiosity and in what environment? How is curiosity linked to other measures of educational achievement? How does curiosity relate to current pedagogical strategies such as experiential learning? Finally, how can we make curiosity a conscious and integral part of our classroom practices?

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This white paper explores the concept of curiosity, surveying how scholars from differing disciplines have characterized its attributes and importance to human

development. We use these definitions to explain how curiosity can be actualized in educational spaces. In the first half we focus on the *epistemic-perceptual* and *diversive-specific* dimensions of curiosity (RSA Projects 2012), showing how curiosity is not a singular phenomenon, but multidimensional in its purpose and direction. We include differing views on curiosity not to choose one definition over another, but rather to show how these approaches together inform our pedagogical recommendations. We give special focus to the idea of curiosity as a "knowledge-emotion" (Gallagher, 2011), articulating its link to other emotions including anger, anxiety, and open-mindedness. In the second half we apply curiosity to the educational space, showing how curiosity is linked to particular pedagogical strategies and how it can be developed in the classroom.

Through this white paper we would like to bring the concept of curiosity to the forefront, making it a serious space for scholarly research and educational intervention. Unlike other pedagogical areas such creativity and experiential learning, curiosity has not yet had a demarcated space for its exclusive study. We present this paper as the beginning of such an investigation.

What is curiosity?

Curiosity is seen as one of the vital components of human development, without which we would not survive till mature adulthood. Tomkins (1962) argues that,

> ''The importance of curiosity to thought and memory are so extensive that the absence...would jeopardize intellectual development no less than the destruction of brain tissue...there is no human competence which can be achieved in the absence of a sustaining interest" (347).

Our intellectual growth is *made possible* only through our ability to actively and willingly inquire and *makes possible* directed thought towards self-development and change. Without curiosity as a natural "drive", we could not re-learn and adapt to ever-more complex situations (Berlyne, 1954). Kashdan and Gallagher (2009) provide a definition of curiosity's attributes that emphasizes its benefits for human intellectual growth. These characteristics include,

> "being interested in new things and possessing an open and receptive attitude toward whatever is the target of attention (Bishop et al., 2004)…The immediate function of curiosity is to learn, explore, and immerse oneself in the activity that initially stimulated the deployment of attentional resources (Loewenstein, 1994)" (988).

However, not all of our experiences stimulate our curiosity or drive our intellectual development. Rather, curiosity is piqued in relation to "cognitive incongruity" i.e. *discrepancies or incongruities between what we think we know and new information* (Lowenstein, 1994). These incongruencies can either stimulate us to inquire further or prevent us from searching for answers. If, for example, new information is so divergent from what we expect, we may either ignore or fear these new messages (Lowenstein, 1994). If, on the other hand, new information is too similar to what we expect, we may be dismissive and not inquire further. In this sense, incongruity theory echoes Vygotskian developmental theory – and especially the concept of "zone of proximal development" (Vygotsky, 1978) – arguing that curiosity, like any of our

other learned tasks, is a gradually developed and continual *process*. Our curiosity continues to develop towards ever more complex questions and solutions as we are faced with situations and information that falls within the "intermediate levels of cognitive incongruity" (RSA Projects, 2012).

While all curiosity seems to fall under the broad need to bridge information gaps, curiosity is not always directed to the same goals nor does it utilize the same human capacities. Combining the work of psychologists Berlyne, Lowenstein, Reio, and Kashdan, RSA Projects defines curiosity on two interlinked spectrums: first, the *epistemic-perceptual*, and second, the *diversive-specific. Perceptual* curiosity is based on attention to the immediate environment and its concomitant sensory processes, while *epistemic* curiosity relates to the desire for information and knowledge. A *diversive* curiosity would be one that is open and undirected, based on the sheer need to learn something to exit, say, a state of boredom, while *specific* curiosity is directed to solving a specific problem or answering a specific question.

According to the spectrum approach, in any circumstance, one's action can fall within one of four 'curiosity quadrants', functioning in 'epistemic and diversive', 'epistemic and specific', 'perceptual and diversive', or 'perceptual and specific' ways. For example, an 'epistemic, diversive' curiosity might be the wikipedia surfer, who can spend hours clicking on hyperlinks that send him or her deeper into new realms of knowledge, even if the new information takes him or her further away from the initial purpose. An 'epistemic, specific' curiosity is demonstrated when one seeks out all the information necessary to learn how to build a sailboat or complete a thesis project. A 'perceptual, diversive' curiosity is promoted when an individual explores new environments based on sensory data i.e. sights, sounds, smells, and textures. For example, when a person wanders, without previous intention, into several stores while window-shopping. A 'perceptual, specific' curiosity is best understood as the need to experience sensory data related to a specific activity. One example, would be the curiosity which leads to people going on a rollercoaster so they understand what it feels like. Critically, *these types of curiosity are not zero sum,* a person can cultivate multiple types of curiosity simultaneously without losing out on one over another. This particular character of curiosity is especially relevant when trying to understand how to cultivate curiosity in classrooms, a topic that we will return to below.

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However, 'where' curiosity is located has become a topic of debate as cognitive views are being replaced with 'embodied' or 'tactile' views of curiosity. In this view, the mind-body separation traditionally maintained in Cartesian metaphysics is critiqued, and curiosity is linked to our body's ability to actively change our lived environment (RSA Projects, 2012). Rather than objects being linked purely to their sensory characteristics – their colour, shape, etc – objects are characterized in terms of their use or affordance. When we are actively, rather than passively, connected to our world, we can *participate* in the world, experiencing the world through our embodied handling of it. Curiosity arises in this active handling as "we become particularly interested in things we can change" (Sennett, 2008). The idea of kinesthetic learning closely follows from this discussion of embodied curiosity and suggests that active manipulation of our material environment with our body is a necessary part of human

development. Later on in this paper, we return to the idea of bodily learning in order to show why and how curiosity must be integrated into on-going pedagogical strategies such as experiential learning.

One of the primary components of curiosity in the 21st Century is its correlation to technology of varying sorts. One important concern is that any media – textual, audio, visual – will have its own strengths and promote certain kinds of access to information. Building on McLuhan's notion that "The medium is the message", Carr writes that all new mediums by which to consume information "influence how we think and act" and that the internet technology's in particular "alter our patterns of perception steadily and without resistance" (Carr, 2010: 1). According to this view, the internet (and hypertext) actually produces a human being who is able to grasp lots of different information quickly, but without the ability to focus on any specific area. Thus, while an 'epistemic, diversive curiosity' is developed, a specific curiosity which allows an individual to dig deeper into concepts and build towards previously identified goals does not necessarily follow.

While new web-based information services like Wikipedia, do seem to promote an 'epistemic, diversive' curiosity, we think this general view of technology and curiosity may be a bit limiting. It may be true that some uses of the internet and hypertext have resulted in the increase in a particular curiosity type, the key is to understand how internet technologies can function in multiple ways. Wikipedia is very different than a blogspot in which individuals still read full, linear text (and associated videos/audio) before clicking on other interesting links. The question we have to ask is how we can make hypertext models useful towards multiple ends. Can we link various modalities, provide users experience, and create multiple pathways which both feeds off individual diversive curiosities while leading towards specific goals? From a pedagogical perspective, if certain media have certain benefits then pedagogical interventions need to be able to flexibly use them in relation to one another to produce students equally able to expand their knowledge base while producing work which shows a deep understanding of particular concepts.

Curiosity as a 'Knowledge-Emotion'

Like the split between the mind and the body, Western metaphysics has traditionally split rational thought and emotion. In the *Birth of Tragedy*, Nietzsche famously historicized this split, illustrating how it functioned in Ancient Greece as the Apollonian i.e. the organized, rational, and differentiated, and Dionysian i.e. chaotic, emotional, and undifferentiated, spirits. Yet, as scholars in the phenomenological tradition (Heidegger) have begun to focus on *bodily practice as knowledge* the split between emotion and rational thought cannot be so easily made. This is primarily due to the fact that emotion is also necessarily bodily. Serre (Connor in Serre, 1985) argues that "the senses are nothing but the mixing of the body, the principal means whereby the body mingles with the world and with itself, overflows its borders" (3). It is this bodily function, connecting the interiority of Self with the external world, which is the basis for an affective social engagement. Affect is *feeling* in a dual, intertwined sense: first, the literal sense of touching; and second, the figurative sense of connecting Self with this external world. This manifests as an affective intensity (Massumi, 2002), which is the basis for social engagements in which individuals are predisposed towards particular knowledge-values over others.

It is in this sense that we find curiosity's characterization as a 'knowledge-emotion' especially useful. Curiosity-as-emotion is a bodily experience that drives humans to seek out (or not) particular types of knowledge. One of the primary features of this emotional drive is that it is self-propagating, meaning that as individuals cultivate curiosity and satiate the desire for knowledge, their emotional need to seek out more knowledge is likely to increase (Kashdan, 2009). Yet this emotional drive is not monolithic. Rather, individuals seek out particular knowledge that resonates with their complex lived experience. In other words, curiosity and its development must always be *contextually grounded* within a Self. The task of a pedagogue, then, is to recognize what types of knowledge create an affective intensity with specific student groups and which do not, utilizing this knowledge in structuring lessons.

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Given this emotional undercurrent of curiosity, its increase or decrease in a given context is necessarily related to how curiosity functions in relation to other emotional states. Specifically, curiosity is 'sparked' or harnessed when it is properly engaged while considering other emotions including fascination with novelty or feelings of uncertainty, anxiety, fear, and anger.

Curiosity, Anger and Anxiety Reio and Callahan (2004) argue that the link between curiosity, affect, and social learning has been understudied but that affect plays a central role in our social behavior and, subsequently, in our performance in work tasks. Through an in-depth study of job performance in 233 service industry jobs, they argue that curiosity has relationships with both anxiety and anger. While their findings reveal a *negative* relationship to anxiety, they find that "one may initially think of anger as a discrete emotion that would be negatively associated with an increase in curiosity or socialization-related learning, and this may often be the case. However, it may also be that low levels of anger can increase learning motivation" (Reio and Callahan, 2004: 10). In this case, curiosity functions as a *mediating state* between anger/anxiety and learning socialization/job success.

Kashdan (2009) deepens the understanding of curiosity in relation to anxiety, by thinking about the "curiosity and anxiety systems as two knobs" (172). As individuals, we tend to focus on the anxiety knob, trying to decipher how uncomfortable a situation might make us. But when we focus on the anxiety knob, we let our 'explore knob' diminish. What occurs is a situation in which "If Anxiety is high and Explore is low, there is nothing you can do to change your situation. Anxiety can't go down. You simply can't move at all" (Kashdan, 173). One primary form of anxiety especially important for our purposes in this paper is the anxiety that one will make mistakes. When we fear our mistakes and perceive them as crimes, we are not likely to be creative or interested and one is likely not to explore or ask questions about their natural world. Moreover, anxiety produces a number of secondary negative consequences in that it drains us of mental energy, drains us of physical and emotional energy and, in turn, we can stagnate or fall into chaotic patterns.

As an antidote to negative feelings of anxiety, we can focus on an intermediate type of anxiety that is tied to curiosity. When one is mildly anxious – experienced as that feeling of butterflies in one's stomach – one is likely to focus, avoid errors and try to improve his or her situation. When we are curious, we experience this mild anxiety, feeling the fear of the unknown or new. Yet novelty also provides intrigue, surprise, mystery, and complexity – all of which spur us towards curiosity and help us overcome our feelings of anxiety (or use this anxiety towards finding answers to particular problems). Kashdan terms this the "novelty potential" associated with our experiences (189). When we are faced with a high novelty potential and we have the confidence that we "have the skills and abilities to deal with or make sense of the novelty", then we are likely to allow our curiosity to grow, seeking out such novelties rather than setting them aside.

Curiosity, novelty, and boredom Gallagher (2010) builds upon this association between curiosity and novelty. Her primary objective is to show how and why humans need novelty and change in order to survive and live fulfilling lives. She argues that even though curiosity, and seeking new ideas, has traditionally been stifled in, for example, religious settings and educational institutions, "curiosity about the new and unfamiliar has long been with us" (125). The stifling of curiosity has reflected ones social power position, related to gender, class, race or ethnicity. For those not in positions of power, curiosity was delimited such that these groups would not get any "ideas" about who they are and what they might like to change about their positions in society (Gallagher, 2010: 129). In classroom situations, the same power dynamics often hold true, differentially allowing students to explore based on their ethnic, linguistic, class, or gender backgrounds.

After anxiety, the other emotion with an inverse relationship to curiosity is boredom. Boredom marks that emotional response to that which is expected and seemingly commonplace. Initially, boredom was thought to be an innate characteristic, something that the individual in question could not change and was to be admonished for. Over the course of the 18th Century, however, it was determined that "tedium related to social and physical environments which failed to engage you" (Gallagher, 2010: 130). The upshot of Gallagher's statement is, of course, that our learning environment can *spark our potential for boredom or curiosity*. When we encounter classroom situations that are expected or familiar, we are likely to respond with feelings of boredom, and subsequently not engage. When we encounter situations which are challenging and unusual, without being so much so that we are overtaken by anxiety or fear, then we are more likely to engage. Kashdan (2009) argues that we can train ourselves to become curious in any situation whether familiar or not, by "finding the unfamiliar in the familiar", something which we will return to later in this paper as a way to understand how to infuse curiosity into our pedagogical practices (79).

Curiosity and the State of Education in the United States and India

The state of 21st Century education has traversed two nearly diametrically opposite paths. On the one hand, technologists have hailed the technological revolution as the method to de-center learning and allow for creative, child-centered approaches to education (Kent and McNergney, 1999). On the other hand, the

majority of students receive public education based on traditional learning models, which encourage rote memorization, the meeting of minimum academic standards of learning through high-stakes testing and the implementation of disciplinary procedures. Scholars link such educational practices to the rise of industry in the late 19th Century, which encouraged assembly-line approaches to learning and post-schooling employment or educational opportunities (Freire, 2000; Robinson, 2010).

With a public education system expected to reach large populations, the US Department of Education has sought to create a national set of standards that teachers should use when designing lessons. This became particularly necessary when a 2004 titled "*Ready or Not: Creating a High School Diploma That Counts*" argued that then-American high school curriculum did not adequately prepare graduates for employer and college demands. In response, the national government has supported the Common Core Standard initiative that makes it possible for a 7th grader in Alaska to be expected to know the same content for math and language arts as a 7th grader in Georgia. In 2009, the Obama administration's Secretary of Education, Arne Duncan, announced the Race-to-the-Top Competitive Grants for schools who adopted the Common Core Standards, identified as internationally recognized standards and assessments that prepare students for college and the workplace. In this way, students' academic achievements can only be evaluated by the state's standardized tests and schools' achievements are directly linked to test scores. These methods congealed in the national No Child Left Behind Act (Meier and Wood, 2004), which linked a school's educational success to its passing rates on annual state-wide standardized tests. Test results have long-term implications for schools, as states can choose to either fund, not fund, or close a school based on their students' test scores. Racially, ethnically, and economically marginalized populations, the principal targets of legislation like NCLB, are disproportionately affected by these testing models and students from these communities are faced with constant pressure to pass tests (Kozol, 1991). U.S. schools that have been singled out for praise, such as KIPP schools, have integrated this approach into the fabric of their pedagogic strategies, relying on targeted test prep to increase overall test results, often at the expense of child-centered, experiential learning.

The Indian context reflects much of the same educational logic. Students attending government schools (of which nearly 70% of the Indian student population attends) are encouraged to memorize basic math and reading skills which will allow them to pass annual exams, culminating in the 10th standard SSLC exam, the barrier to entrance to two-year PUC college. Unfortunately even those who pass out of PUC Colleges with degrees in communication, computer science, or finance often find that they do not have the requisite skills necessary to compete for jobs. While they have learned to memorize information, passively follow instructions, pass examinations and, in some case, obtained a basic level of math or science expertise, they lack many of the softer skills, generally associated with liberal-arts education, necessary to join a cosmopolitan or global workforce which increasingly requires interview skills, communication skills (especially in English), tolerance of difference, confidence, critical thinking, reliability, decision making, innovative and improvisational thinking, and leadership (Anand, 2011). In many cases, such graduates have had to be re-trained by companies who bear the cost of re-educating students.

Given this state of education, we argue that curiosity may play a key role in allowing students of all ages to *develop these 'softer skills' while simultaneously increasing their level of achievement based on standard exam metrics.* This is not to say that curiosity alone is a sufficient condition for high achievement in classrooms and jobs. (Indeed, students must still learn content knowledge in various subjects to become competent members of a specific occupation.) However it is undoubtedly a *necessary* condition for the development of second-order skills such as critical thinking and decision making.

In the rest of this section we will outline the relationship between curiosity and other valued educational traits in the current knowledge economy including creativity, innovation, open-mindedness, and tolerance.

Curiosity, uncertainty, mindfulness and tolerance

The contemporary world has frequently been described as 'global', 'connected', and even 'flat' to represent the unique characteristics of our ability to travel both physically and virtually through space in ways which we had never conceived before (Friedman, 2005). This process of globalization has made it almost impossible to remain steadfastly isolated from people different than ourselves linguistically, culturally, or ethnically. Moreover, this connectivity has, as we noted above, created the need for a new set of social skills which emphasize our ability to communicate across difference, be open to alternative points of view, and show tolerance for those who are different from ourselves. Yet despite such added emphases our contemporary world continues to be marred by racial and ethnic discrimination, fear of religious difference, and gender inequalities. Much of these tensions arise from our inability to properly deal with that which is unknown. This results in fear-based action rather than empathy-based actions. Kashdan (2009) writes, "Our default mode of thinking is mindlessness. We reflexively label and categorize things. For example, other people get categorized as our friends and perhaps inner circle, or they are outsiders whom we tolerate, ignore, or shun" (26). When we label we make sense of the world in simplistic and non-reflexive ways which pre-determine what things are and how we should act with them.

Curiosity plays a central role in breaking down these types of habitual labeling techniques, increasing an individual's open-mindedness and in turn helping individuals to develop the ability to cope with unfamiliar situations. *Mindfulness* is our ability to remain present, non-judgmental, accepting, compassionate, and open in our daily experiences (Kashdan, 2009, 27). When we are mindful, we are aware of what is happening in our experiences and likely to observe them with a sustained interest. However, this mindfulness cannot be sustained without a pre-existing state of curiosity, understood here as a knowledge-emotion. If we are unable to constantly observe with the eye of someone who believes that each experience is novel, worthwhile, full of new information, and not anxiety- or fear-producing, we are less likely to be fully present, attentive, and mindful during these everyday experiences. Several studies of mindfulness have shown its positive effects on academic performance (Semple, Reid & Miller, 2005; Beauchemin, Hutchins & Patterson, 2008) and awareness and self-regulation during classroom lessons (Deci and Ryan, 2000).

Curiosity and mindfulness have the added effect of allowing individuals to cope with unfamiliar situations. Generally, individuals use stereotypic labels to make sense of their surroundings, assuming previous knowledge about a subject or person. These labels have the effect of making the world 'known' and preventing the kinds of anxieties that are associated with the unknown. However relying exclusively on these stereotypic ways of knowing make new and unfamiliar situations especially difficult to cope with. Rather than staying present and attentive to what these new experiences might help us know about our world and ourselves, individuals may fear or shun these circumstances. When an individual is curious (or has their "curiosity knob turned up") she is likely to position herself within these new experiences quite differently. Instead of relying on labels and fear, she is likely to consider them with an open-mind, observing, asking questions, making connections, and seeking to find ways to understand that which she is experiencing. This curiosity-base for experience, in turn, allows such an individual to show a higher level of tolerance for such unfamiliar people or situations, providing a new basis for empathetic communication. In fact, we argue that curiosity can be a very important starting point for a re-definition of 'civility', which does not stress merely tolerating difference, but seeks to create connections between people by retaining an inquisitive and mindful orientation towards interaction.

Curiosity, creativity, and innovation

Creativity and innovation have been two of the hallmarks of 21st Century management rhetoric. Especially within the technology sector, companies have sought employees who have the capacity to think creatively and innovate upon current products to increase market earnings. In scholarly literature, creativity has been defined as the "ability to produce work both novel and appropriate" (Sternberg and Lubart, 1999) while innovation has been defined as "the successful implementation of creative ideas within an organization" (Amabile, Conti, Coon, et al. 1996). Both creativity and innovation have been emphasized in contemporary work environments because they are associated with the profit-making purpose of the perpetually growing reach of free-market capitalism. As a result, creativity and innovation-based approaches embed efficiency and value-addition as necessary parts of their logic. The best example of this new emphasis on innovation is a company like Google, which includes time for employees to develop products outside of their defined tasks. In so doing, Google emphasizes innovation as a necessary part of their companies vision, selecting employees who have an eye towards creating products which can reach new niche markets.

Many have seen curiosity as directly linked to creativity and, in some cases, have argued that creativity and curiosity are synonymous (Voss and Keller, 1983). While curiosity and creativity are indeed corollary concepts, curiosity plays a far more important role in educational space precisely because it is not so directly linked with singular purposes such as profit-making. As discussed earlier, curiosity can take on both a diversive and specific form, meaning that curious individuals are not only inclined to seek solutions to problems with particular results in mind, *but can also ask questions, seek knowledge, and find answers without intending any end goal.* This is not to say that curiosity will not result in new innovations. It will; and it does. In fact, the ability to seek knowledge in seemingly divergent fields has been thought of as the first step towards creativity and subsequently innovation. These divergent and

incongruous paths of questioning eventually connect to one another, resulting in more focused inquiries which can result in novel solutions to problems. However unlike orientations towards innovative thinking, curiosity-based thinking rarely begins with the final outcomes as a foregone conclusion. It is therefore far more dynamic (and perhaps less efficient), allowing for individuals to find knowledge that moves beyond the practical needs of companies. We believe that this feature of curiosity is what makes it especially important for educational spaces, providing the opportunity for students to explore their natural world without having their ideas or thoughts overdetermined by any necessary outcome.

Curiosity in the Classroom

Given curiosity's possibility for educational achievement, how do we promote it in children? In other words, what are the necessary requirements if teachers seek to develop curiosity in children? To promote curiosity is to consider and integrate a number of educational theories including: theories of intelligence, differentiated instruction, experiential and kinesthetic learning techniques, and process orientations towards success. In this section, we articulate how curiosity can be cultivated as part of these pedagogical methods.

We argue that there are two primary assumptions about intelligence that must necessarily undergird any attempt at infusing curiosity into classroom instruction. First, pedagogues seeking to cultivate curiosity in children must consider *curiosity as a disposition, rather than a static state*. By terming curiosity a disposition, we place emphasis on its *relation character.* In other words, how a student relates to any particular environment will determine if, how, and to what extent a student will be curious. For teachers, this means that how they shape learning environments and how they teach can affect if and how children are curious. Rather than categorically determining a priori if a student is 'curious or not', teachers will seek to re-invent classroom practice to create spaces in which students can feel more comfortable being curious, of which we provide more details below.

Second, and related, those seeking to teach curiosity must rigorously refrain from and challenge any notions of 'fixed intelligence' regarding students i.e. that students are inherently intelligent, less intelligent, etc. This model of intelligence prevents both teachers and students from cultivating a learning environment in which students can believe in their ability to grow, change, learn, and think in more complex ways.

In the *Ignorant Schoolmaster,* Ranciere posits that intelligence (or lack there of) is a belief rather than a provable fact, meaning that 'IQ' and measures of intelligence are far less important than a teacher or students' belief that they are capable of learning. Ranciere (1991) terms this particular disposition as the "will to intelligence." Two theories that build upon Ranciere's philosophical principle are Dweck's theory of incremental growth and Gardner's theory of multiple intelligences. For Dweck, students who see the brain as a muscle, which can grow and change, see their own intelligence as malleable and open to growth with hard work (Dweck, 2006). The implication, of course, is that these students are more likely to take their learning seriously, believing that what and how they function within learning spaces will have

direct benefits for themselves. These students will be less likely to stop trying when classroom learning is challenging or unfamiliar. Such students will also have a greater likelihood to remain curious, asking questions and seeking answers that can push them towards further intellectual growth. For Gardner, intelligence can never be quantified in any singular fashion (Gardner, 1983). An intelligence test or skill-based exam will reflect only a particular type of intelligence and cannot be generalized as reflecting overall intelligence. Gardner creates a model based on eight-separate modalities – musical–rhythmic, visual–spatial, verbal–linguistic, logical–mathematical, bodily–kinesthetic, interpersonal, intrapersonal, and naturalistic – by which to understand human intelligence. Students may be predisposed to being curious about different subjects and in different way based on the types of intelligences they may manifest most strongly (without regarding these categories as independent, unchangeable, or static). Teachers, therefore, must pay special attention to how students engage with material, assess the types of intelligence students possess, and utilize this knowledge to cultivate curiosity in their students.

Learning Environments

In the traditional classroom, the teacher stands at the front of the class, while students sit in rows of seats, listening to a lecture, answering particular questions, and filling out worksheets and exam papers. These classrooms rely on a rigid, hierarchical separation between the teacher and her students and, moreover, emphasize and encourage disciplinary procedure. When teachers create these learning environments, they construct a world in which there are particular right and wrong answers that students must find, and discourage approaches to problems that do not follow a linear and singular path towards solution. Over time students learn to follow directions within a teacher's prescribed script, never veering off course, challenging their teacher's authority, or seeking their own individual approach to problems.

In Holt's critique of this form of classroom learning, he identifies two primary outcomes of this approach: first, students begin to fear making mistakes in classrooms; second, these classrooms become the "place where children learn to be stupid," learning not to use their own minds to seek solutions because of the fear that he or she may be wrong (Holt, 7). As Holt argues, "…if, as usually happens, we point out all his mistakes as soon as he makes them, and even worse, correct them for him, his self-checking and self-correcting skill will not develop, but will die out. He will cease to feel that he has it, or ever had it, or ever could have it… What did what *they* [or the students] thought have to do with what was right? Right was what the teacher said was right, whatever that was." Such insights hold quite a bit of import for the teaching of curiosity. When students begin to believe there is one right answer, of which they are incapable of finding without the assistance of a teacher or other authority figure, they are likely to cease being curious and stifle their inherent inquisitiveness. While students may have shown interest in particular subjects and ideas, by the time they have finished with their classroom education, they mute any sign of interest or curiosity.

We suggest two important changes in learning environment that can encourage curiosity rather than stifle it. First, teachers should encourage *process* rather than outcome orientations within their classroom spaces. Rather than

emphasizing 'correct' answers during classroom instruction, teachers should instead challenge students to find their own methods by which to solve problems and come up with solutions. Corlis and Weiss term this "program openness", and emphasize learning tools which do not have pre-determined learning outcomes (1973). When process is emphasized over outcomes, then students can explore new concepts without experiencing the fear of failure. However, a central difficulty in trying to create such learning environments is the loss of control experienced by teachers in the classroom. When teachers are no longer the sole authority figure, nor are the guardian of necessary knowledge, it can make the teacher's task less straightforward. What is a teacher to teach if they no longer are to merely teach particular skills to students? For curiosity to flourish, a teacher must become a "facilitator" rather than as benefactor of information, creating semi-structured learning environments that allow for independent and group learning through activities. Such an orientation takes a student's experience and knowledge seriously, emphasizing its utility towards the understanding of classroom objectives and outputs.

Second, classroom learning environments must eliminate the work-play boundary which generally underlies both teacher and student perception of how classrooms should function. When classrooms are constructed as places of 'work', students are characterized as workers rather than learners, assigned tasks to complete and deadlines to meet, "curiosity, questions, speculation – these are for outside school not inside" (Holt, 10). For students, the effects remain long-term as they view their occupations in terms of necessity rather than passion, continuously seeking outlets from their jobs instead of seeing their jobs as part what brings them pleasure and fulfillment. Kashdan (2009) argues that the dichotomy between work and play must be reversed if curiosity is to be promoted in children. He posits that learning environments that

> "include playful group assignments, surprises, and personally meaningful challenges can trigger that initial surge of interest. Of course, it shouldn't be so challenging that it causes anxiety or so underwhelming that it causes boredom. By allowing people to feel able and competent, they will be less focused on trying to avoid looking like an idiot and failing and, in turn, they can be more deeply attentive to the task at hand. These are ideal conditions for a sense of wonder and intrigue to emerge." (85)

One example of this strategy for promoting curiosity-based learning in classrooms might be the *nalikali* system promoted for children ages five to seven in government schools in the state of Karnataka, India. In the *nalikali* model, students are encouraged to learn through singing, dancing, drawing and teachers are encouraged to decorate their classrooms with student work (Burden, 2004). As part of the model, teachers are characterized as facilitators who develop students' natural interest in several subjects. While the implementation of the nalikali curriculum can be less than ideal at times, its vision resembles the underlying values that can promote curiosity in children. Interestingly, as students' transition from third standard to fourth, they must also transition to a completely different learning style which, not surprisingly, reinforces discipline, standardized curriculums, and examination-oriented memorization. Age is implicitly marked in the logic of this transition, assuming that children, after the age of six or seven, no longer need 'joyful learning' but rather must get down to the serious business of 'being educated'. The shift in learning

environment reflects this mentality towards children's education and systematically delimits when, and at what age, exploration can be appropriate.

Classroom Pedagogy

Pedagogy reflects the philosophical first assumptions that a teacher deploys when teaching in a classroom. It is not *what* a teacher teaches, but *why* and *how*. In one sense, pedagogy is a teacher's own disposition, belief system, and ideology as it filters through their teaching practice. If, for example, a teacher believes strongly that knowledge is finite, static, and quantifiable, his or her pedagogic style will function accordingly. Such teachers may emphasize learning discrete fact and ideas, discussed most comprehensively in Freire's "banking model of education" (2000). Given this view of pedagogy, a teacher must herself cultivate curiosity in order to properly manifest this belief in her teaching practice. If a teacher is curious, constantly asking questions, showing her willingness to pursue areas of interest that she may not already grasp, and seeking new tactics by which to understand complex issues, this inherent curiosity will be reflected in her pedagogy. In the classroom, students will naturally observe how a teacher functions in the world, and begin to mimic particular attributes they find compelling. In other words, the first strategy a teacher can employ to cultivate curiosity is by being a model for curiosity in her own actions.

In another intertwined sense, pedagogy is the methods and practices employed by a teacher during instruction that facilitate particular types of student learning (Bruner, 1966). In order to develop curiosity in children, a teacher must deploy an array of pedagogical strategies and utilize different learning modalities such that students develop the confidence and inquisitiveness necessary in order to explore varying learning outcomes. Three primary pedagogic strategies that may contribute to the cultivation of curiosity in children are: experiential learning, self-learning, and peer-based learning (the first two are discussed below). While in particular classroom activities these pedagogical strategies are rarely separated and function in a holistic, integrated fashion, we find that separating them conceptually can help us understand each strategies unique characteristic and its possible link to curiosity.

Experiential Learning

The idea of learning through experience is not a new one and has been a mainstay in philosophy of education programs since, at least, Aristotle and in the modern Western educational system since John Dewey. Understanding the need for students to make sense of what they experience in their lives as part of their educational endeavors, Dewey wrote, "There is an intimate and necessary relation between the process of actual experience and education" (1938). Since Dewey, educators have sought to develop strategies by which to harness the natural learning that occurs in experiential contexts within classroom learning spaces. As defined by Northern Illinois University, in experiential learning "instruction is designed to engage students in direct experiences which are tied to real world problems and situations in which the instructor facilitates rather than directs student progress" (2). Yet, experiential learning is not merely 'hands-on-learning' or 'learning-by-doing' in that students are encouraged to focus their experience towards defined learning outcomes, allowing for experiential learning to have practical applicability to future endeavors.

One of the most difficult aspects of utilizing experiential data within classrooms is the near infinite amount of sensory data children are faced with when they move through daily life. In order to help students make sense of these sensory data, pedagogues interested in experiential methods integrate a structured process of reflection, critical analysis, and synthesis of new experience with previous understandings of concepts. Haynes (2007) outlines a four-step model of experiential learning which includes: 1) "Doing", which entails hand-on experience and the act of creation in any form i.e. making a model, giving a presentation, creating a play, etc; 2) "Reflection", which entails observing and discussing what the experience during the creative process; 3) "Critical Analysis", which entails articulating problems which may have arisen during the process and identifying recurring themes; 4) "Generalizing", which entails abstracting key takeaways from the learning experience which may be useful for future endeavors; 5) "Application", which entails students applying their newfound knowledge to a new situation. Generally, peers, in groups and through peer-discussion, drive experiential learning, an aspect we will return to further below. However, it should be added that experiential learning need-not be peer-based. In fact, as students develop these skills they may be able to direct their own experiential learning processes, identifying themes and problems on their own, before applying solutions to new contexts.

Curiosity plays a central role in experiential learning *both as an outcome of such approaches and as a means to drive experiential learning.* As students go through experiential processes, they begin developing critical reflection and questioning skills, see moments of success, and feel personally invested in continued exploration. As discussed earlier, because curiosity is tied to bodily practice, these focused approaches to hands-on engagement are the basis for cultivating a curious mindset. However, as importantly, curiosity can become the basis for experiential learning, provided the drive by which students focus their experience. As noted earlier, one of the primary difficulties that teachers face is finding ways of focusing hands-on experience. In a sense, curiosity can play a focusing role at each stage of the experiential learning process, first by helping naturally focus students on "doing" activities which they find interesting, then by spurring on a set of 'curious' questions and concerns about the activity which they have undertaken. Rather than seeing these two processes as causal i.e. curiosity coming first or experiential learning coming first, we see these two as dependent upon one another, the cultivation of one assisting in the propagation of the other. As with other important pedagogical strategies, curiosity functions as a necessary part of experiential learning strategies and must be developed as part of the experiential learning process.

Differentiated Instruction and Self-learning

Differentiated instruction is a set of teaching practices that acknowledge that not all students are alike in how they think nor in how they learn. According to Hall, Strangman, and Meyer (2011), "To differentiate instruction is to recognize students' varying background knowledge, readiness, language, preferences in learning and interests; and to react responsively. Differentiated instruction is a process to teaching and learning for students of differing abilities in the same class. The intent of differentiating instruction is to maximize each student's growth and individual success by meeting each student where he or she is and assisting in the learning process" (1). For instructors, understanding what students' strengths and weaknesses is essential in

re-orienting classroom objectives and particular instructional strategies to best allow for student learning. In many cases, the assessment of strengths and weaknesses follow one general trajectory i.e. to understand student skill levels on subject-wise concepts in math, science, english, etc. In most observed classrooms, students are differentiated based on how well they perform on a number of start-of-term exams. These exams are then used as the basis for targeted intervention with students who may be performing poorly in particular skill areas. However, such exams fail to assess and help teachers differentiate on two other essential features of individuated instruction that assist in the cultivation of curiosity: 1) the learning style of the student; 2) the interest areas of a student.

Learning styles, also termed 'memletic' styles, are based on how individuals utilize their various sensory processes along with their interpersonal preferences and therefore take in information. Generally, learning styles are separated into seven components: visual, aural, verbal, physical, logical, social, and solitary. Every individual varies in which of these learning styles they prefer and, indeed, these learning styles are not static or compartmentalized. Rather, individuals may be adapt in more than one style or need to utilize more than one learning approach when trying to understand concepts. When teachers approach instruction with a conscious knowledge of how students learn differently, they are likely to give students multiple and varying methods by which to learn content, thus providing students the greatest opportunity to learn. Curiosity is intertwined with an individual's learning style in that we prefer to use a particular sensory process to seek new information. When we are given the opportunity to learn in a way that takes into account our preferred way of learning, we are more likely to inquire further. For example, in a classroom in which only a lecture style approach to instruction is provided, a student who prefers learning physically i.e. through the act of doing, will likely neither access the content of the lesson nor be interested in pursuing the subject further. If, however, the same information is provided through a modeling exercise or another creative physicalized form, the student is likely to enjoy the lesson, learn the information, and be ready to learn more. In this sense, classroom instruction can begin to parallel how a student has learned and explored throughout their lives outside the classroom.

Secondly, and as importantly, differentiation also must include pedagogical variation based on student interest. From early on in a child's education, they begin differentiating between subjects, which they 'like' versus subjects which they 'don't like' with little challenge or reappraisal in new classroom contexts. Generally these views on subjects correspond to the types of success students have experienced in various classrooms or to how emphatically a teacher seeks to involve a child into that classroom learning. Regardless of subject area, teachers should find ways to understand what students show interest in outside of the classroom, whether sports, music, etc. and utilize these interests towards specific learning goals. When students begin to see their own interests reflected in the classroom objectives and curriculum, they are likely to become self-motivated in the pursuit of questions and answers. Rather than seeing classroom knowledge as something 'outside' of themselves, they begin to see this knowledge is inextricably linked to their own cultivation of self. In this sense, interest-based models of education in classrooms are the beginning of a self-learning process which is based on student's individuated curiosities. In

exploring their interests, students will begin seeing and making connections to other concepts and subjects, necessarily expanding their sphere of curiosity.

It should be noted that part of the problem of integrating these types of differentiation into instruction is because interest-based and learning-styles based is difficult to assess. While this aspect of measurement is not the focus of this paper, there are several assessment tools, including portfolio-based models which may be helpful for teachers interested in cultivating this approach.

Classroom Activities

Thus far we have discussed curiosity as an aspect of the learning environment and its role in established pedagogical strategies. However, it is our belief that curiosity can also be cultivated as a separate skill within classrooms. In order to do so we have outlined a few important 'activity parameters' along with some suggested activities which can promote curiosity in students. It is important to remember at this point that curiosity is not a singular phenomenon, it can be diversive or specific, epistemic or perceptual, and *classroom activities should be oriented towards cultivating each form of curiosity*, rather than emphasizing one type at the expense of another.

1) Making the "familiar unfamiliar" and "unfamiliar familiar":

Researchers in the field of anthropology have had a long held saying about how they orient themselves to their ethnographic, empirical research which is to "to make the strange familiar and the familiar strange"; an orientation which forces individuals to challenge their assumptions about the world and, as importantly, strikes at the heart of how curiosity might be propagated in classrooms.

As mentioned earlier, boredom is one of the most detrimental emotions for curiosity, preventing an interested and continued exploration of the natural world. When students in classrooms think they already know about a place, people, or concept, they feel a familiarity that then leads to dismissal and a rigid boredom when they are faced with learning tasks dealing with these ideas.

Part of our goal as pedagogues is to create activities that challenge students to search for the "strange" or novel in these everyday, familiar tasks. When students begin seeing that even familiar activities still carry an infinite amount of new and interesting information for them to discover, their curiosity is cultivated. Kashdan (2009) suggests one activity to develop this orientation towards experience. He suggests that an individual can find something unappealing or seemingly boring, and be given the explicit task of finding three aspects of this concept or activity which is unique. After writing these unique aspects down, the individual should talk within a group to explain what they have discovered. Such activities should develop open-mindedness and inquiry-stances, which should, in turn, unleash curiosity in students.

We extend Kashdan's model by arguing that such activities should also be created in reverse: students should identify ideas, concepts, things which they have

limited knowledge of or even fear and find aspects which are familiar. In doing so, students will begin reducing the anxiety which they feel with unfamiliar concepts, allowing them to feel comfortable and capable of working in spaces which remain largely unknown. This ability to feel capable of inquiring within the unknown can be the other important basis for cultivating curiosity. Moreover, the reduction of fear of the unknown allows students to deconstruct some of their held labels of people and things, challenging them to inquire further before making judgments and fostering tolerance.

Importantly, such lessons are not subject-specific. Teachers of math, science, and English can all utilize these activities towards particular objectives. A science teacher may use this approach to begin a lesson on plants and photosynthesis – having students make unfamiliar observations of the trees near their house and research three aspects of plant growth which is similar to human growth, while an English teacher may use this tactic to begin a discussion of the novel form – having students make three new observations about a recently completed book and finding cultural similarities between themselves and the characters of a novel set in a foreign country. In such instances, curiosity can be cultivated in either epistemic, specific or perceptual, specific ways depending on the particular classroom objectives.

2) Assignments with no predetermined outcomes and Letting Indeterminacy Drive Inquiry:

To begin cultivating curiosity, students must become socialized to both accept inquiry *without* the need to know particular answers and secondly, must be willing to allow for exploration without always choosing or being in control of the specific task or idea to be explored. In most classrooms students do not feel in-control of subject matter or what they are learning, yet this is a *passive* lack of control in which students both do not choose but are not consciously made aware of their lack of choice. Moreover, tasks are given with the explicit assumption that there will be a specific correct answer, which students must discover. In fact, this constant reminder that students should find the one 'correct' answer creates a very real anxiety when they are faced with a situation in which there may not be a single correct response.

To begin unlearning and re-learning, students should be given tasks in which indeterminacy is explicitly made part of the task. For example, in *How to Become an Explorer of the World*, Keri Smith (2008) provides a template activity in which students are asked to create a four column chart in which they write, "What to Collect", "Where to Explore", "Method of Investigation", and "Documenting Method". The teacher can provide several different options for each category, which should then be chosen at random by the student. In this way, students are made to understand that problems can be solved in multiple ways *and* begin to find ways to navigate different data and methods with equal dexterity. Moreover, because data and methods are not predetermined, what students discover is also open. When students share these findings with classmates, they come to understand that creative solutions may not look the same and that answers arise based on their subjective ability to use the varying tools at their disposal.

Again, such an activity can be carried out for students in different subject areas, allowing for equally fruitful considerations of the scientific method as historically grounded questions of how we study the past. Secondly, such activities have the added bonus of integrating epistemic specific and epistemic diversive curiosity simultaneously as students may be given a task which they are unfamiliar with and may go through an 'exploratory' phase in which they do not have specific questions or themes in mind, before transitioning to a 'focused' phase in which their inquiry is driven by what they have begun to discover.

3) Ethnographic Training:

In many qualitative research disciplines, including anthropology, sociology, education, and development studies, data is collected through a method of data collection termed ethnography. In ethnography, researchers are expected to spend a long period of time within a particular research site, observing research subjects as they move through daily life and interviewing research subjects about particular aspects of their daily experiences (Hammersley & Atkinson, 2000). The ethnographic approach challenges the researcher to see beyond the 'surface' of daily interactions, trying to find deeper relationships and ideas regarding political economy, gender, class, caste, race, and language which those who are immersed in those contexts may no be unable to consciously see. The practice of ethnography trains the researcher to always seek something unique or different in experiential contexts and frames these insights within a larger sociocultural context. These lenses become an integral part of field research and also are the basis for a 'curious' way of seeing the world.

Providing some of these skills to students can help them also train their 'way of seeing' such that they come to expect every experiential context to reveal unexpected and interesting insights. The three most important aspects of this ethnographic approach are to: 1) observe systematically and for focused periods of time; 2) collect data in different forms: through writing fieldnotes, taking pictures or videos, gathering artifacts from different places; 3) finding themes and trying to understand what these themes might mean. One principle characteristic of this kind of exploration is to understand perspective. As Smith (2008) argues, "An average tree looks very different depending on if we view it from close up or far away" (18). To get students to see complexity through inquiry, they should be given opportunities to see such changing perspective, to utilize as many senses to describe an object or concept and to then experience this perception of 'newness' in objects. One simple method to begin is to provide students cameras and to have them take pictures of everyday objects. However, students should not take just one of any object. They should be encouraged to take many, from far away and from close, from various angles, and with different lightings. When students begin to see how diverse an object can look, they become curious to explore these perspectives, seeking new ways to represent such objects.

The above example, may demonstrate how ethnographic techniques might develop a perceptual form of curiosity. However, an 'ethnographic mindset' may also help develop an epistemic curiosity in history or English classrooms when events are presented from multiple perspectives through oral histories, allowing students to

juxtapose multiple points of view as they inquire further into a particular historical event.

4) Mindfulness Training:

As discussed in detail above, mindfulness and curiosity have been linked as mutually beneficial emotional dispositions. Several centers have focused on mindfulness as a core component of classroom curriculums, one of the most prominent being the *Mindfulness in Schools Project* (http://mindfulnessinschools.org/). Such programs emphasize a method by which students are taught how to remain calm, composed and relaxed while listening to lessons, and able to access new ideas without experiencing anxiety, boredom, or loss of interest. These emotional dispositions are also the primary foundation for cultivating a sustained curiosity.

One important component of this type of training is a specific lesson focus on curiosity and mindfulness in which nurtures an attitude of kindness and curiosity during everyday experience. One particular lesson which can be done in classrooms is what they call, "Feet on the Floor, Bum on the Chair". In this lesson, based on certain precepts of meditation, students are asked to sit upright, with eyes closed, and begin to experience all the characteristics of their very experience of sitting. They should become aware of the way their back feels against the chair, the tightness of their socks and shows against their feet, and each body part thereafter. The lesson is designed as an 'exploration through touch', following from the fundamental theory of 'bodily intelligence' and cultivating a students focused inquiry into sensation. Such lessons can take less than five minutes during class and can ready students for any of their subject-wise lessons. When students have started with this experience-based, inquisitive understanding of Self in world, they are more likely to being this type of awareness to their subject-wise lessons.

Conclusion

In this paper we have highlighted the unique characteristics of curiosity and shown how it relates to other highly important human dispositions including creativity, innovation, tolerance, and mindfulness. Throughout we have tried to reflect upon curiosities multidimensional character, never trying to define its attributes in a singular way. We have argued that curiosity is an integral part of learning processes in classrooms and must be *consciously developed* such that students continue to harness that drive for new knowledge which they have since early childhood. Rather than see curiosity as wholly separate from ongoing educational and pedagogic processes, we have shown how curiosity can be linked to experiential and differentiated learning, while also suggested particular activities which can develop curiosity even as teachers attempt to teach subject-wise skills. Indeed, as educators, we realize that teachers have multiple competing objectives during any classroom lesson, juggling the parameters of state curriculums and standards, structural inequalities which place certain students at disadvantages, and the difficulties of time management and classroom discipline. Rather than seeing curiosity as a separate subject area in need of its own classroom space, we have tried to suggest ways in which curiosity can be cultivated as part of subject-wise curriculum planning. Indeed, it is our belief that taking curiosity seriously and boosting our students curiosity

during can result in higher levels of academic success while making our lives as teachers more fulfilling and engaging.

We would like to end with a few thoughts on how to proceed further. First, it is our goal to construct a 'curiosity curriculum' that teachers can integrate into their daily lessons. The curriculum, rather than being a separate set of lessons, is conceived as a set of activities that can be flexibly utilized by teachers teaching various subjects. Secondly, as we pilot this curriculum in multiple school contexts in multiple national contexts we seek to empirically understand how students' classroom dispositions change. Are they more likely to ask questions? How much more engaged are they in daily instruction? How likely are students to begin asking questions outside of focus areas or to expand their 'spheres of curiosity'? This pilot will be the first step in developing a set of measurement and assessment tools for teachers interested in understanding how effective their pedagogical strategies have been cultivating curiosity in their students.

Through this iterative process, we hope to bring curiosity into mainstream education, making it a serious and practical consideration in how we set up our classrooms, how we choose to teach lessons, and what activities we seek to use. Curiosity is the basis of our learning during early childhood and it is our belief that it can remain so throughout the rest of our educational lives.

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