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Open Pandora's Box: Curiosity and Imagination in the Classroom

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Theories Are Lenses

We all look at children through a lens. When you watch your daughter, your student, or your experimental subject, what you see is shaped by your theory of development. Each theory tends to highlight some aspects of a child's behavior and mask others. Your theory also guides your interpretation of what children do and say. A theory can expand and deepen our understanding of children, but it can also distort and limit our view.

Let me begin by describing a recent conversation I had with a friend. The friend was complimenting me on my three sons—how well they had "turned out." She said this with some surprise and admitted that when they were little she thought they were totally wild and out of control: "You had no rules at all." I disagreed, suggesting that my rules may not have been about things like swearing, or keeping their clothes on, or saying "thank you" to a grown-up, but had more to do with working hard at things and being kind. She thought about that for a minute and then said, "But what? Did you punish them when they weren't kind? Did they have a consequence when they didn't throw themselves into things?" Honestly, I was baffled. Then I realized that her implicit model of development was showing through her questions. Her model of development is clearly based on behaviorism—the traits that will emerge over time in a child are the ones that are regularly rewarded, while undesirable behaviors that are punished will disappear.

My friend is not odd or unique for thinking about everyday experiences through a theoretical lens. We all have implicit models of child development, though we rarely articulate what these are, and even more rarely know how we acquired them. I often drive from my home in the Berkshires in Massachusetts to New York City. As I make my way south, I pass two family day care centers. The first, a large old farm house with a fenced-in playground outside, has a sign that reads, "My Little Angels Day Care." Right down the road from it is another one, also an old family house. This one is named "Little Professors." The two day care directors surely have different models of childhood. What people say about and to children often offers clues about their implicit model of child development.

When you praise a child for being kind to a friend, somewhere within your thinking is the idea that children crave social approval, and such approval can shape the way they interact with others. When a teacher leaves a child to play with a bunch of blocks, she's assuming that cognitive development occurs spontaneously when children have a chance to interact with the physical world. A teacher who makes sure her students see her looking up answers to questions she doesn't know may believe that children imitate the behavior of adults they feel close to. When you suggest that four-year-olds should sit quietly in circle time because they will have to sit quietly at their desks when they are older, you believe that development is a process of acquiring and strengthening habits and behaviors.

But it's not just parents and teachers who carry around implicit models of child development. Psychologists do, too. The models psychologists create have a huge impact not only on what they learn about children in their research, but on what the rest of us think—particularly about what happens in schools.

Let me describe two powerful metaphors that have shaped the way people have thought about young children over the past 75 years or so.

The Wild Child

The earlier of these two metaphors is that of the Wild Child. In his classic book, *Emile: Or, On Education*, Jean-Jacques Rousseau put forth the idea that children are innocent and unconstrained by adult conventions (1979). Using a darker lens, Anna Freud saw the young child as a mass of unruly emotions with no control, governed by selfish drives, claiming that if you put a toddler on any street corner in Cambridge, by the time they reached the center of the city they would have committed every crime known to mankind.

Innocent or anarchic, the Wild Child view implies that it is up to adults to constrain young children, train them, and rein them in.

The Little Scientist

The second metaphor is that of the Little Scientist, a view which can be traced to the Swiss scientist, Jean Piaget (1955). Trained first in biology (he published his first scientific paper on mollusks when he was 13 years old), he wanted to understand how a gurgling, kicking, crying baby could become a rational scientist capable of abstract thought. The careful observations he made of his own children, and the ingenious experiments he conducted with other children, contributed to what was, at the time, a radical new view of children, one that persists today. In this view, children are eager to understand the world, acting on their environment almost from the beginning, in their efforts to make sense of experience. Piaget viewed development as the process by which children form ever more rational and scientific understandings of the world.

If you watch a child in your classroom through Piaget's eyes, you can see the child testing out hypotheses about how things work. For instance, imagine a four-year-old child faced with a set of eight blocks. She may begin building a tower. Then she might try a more sprawling shape, and then another one. If we look at this from Piaget's perspective, we would predict that at some point she will uncover a basic principle of the physical world—that no matter what the shape of the building, if she uses the same blocks again and again, the volume of the building remains constant. The child, we imagine, from Piaget's perspective, is sitting alone with some objects, figuring things out, much like the scientist alone in her lab with test tubes. In fact, a recent book considered by many to summarize the most up-to-date research on the infant's mind is titled *The Scientist in the Crib* (1999).

Of course, research has come a long way since Piaget's first investigations. We have new methodologies and have collected data in a much wider variety of contexts and communities. Ironically, much of the contemporary research has actually led us away from Piaget's early emphasis on the child's eagerness to find out, and instead has led us to emphasize the child's ability to master the everyday world—we imagine a goal-oriented child whose amazing cognitive skills seem to be in place earlier and earlier. A striking example of this is the work of Karen Wynn, who has shown that during the first year of life, babies seem to show some rudimentary understanding of addition (Wynn and Chiang, 1998). In one of Wynn's studies, infant subjects are shown an object, for instance a small toy duck. Then a screen is dropped in front of the object. Next the babies watch as a second object is put behind the screen along with the first object. Then the screen is removed. If there are three objects instead of two, babies gaze longer, suggesting that they can detect a discrepancy between how many should be there and how many are there. Such research supports our modern view that children are eagerly seeking to understand how the real world works. We have come to see even very young children as cognitively similar to adults. In this view, logic about the real world is everything, and feelings rarely affect how the child thinks. So, why does this hyper-rational view of the child matter to teachers? What is at stake here?

Much of the research done in the past 50 years has led us to view the child as overly rational, ready and eager to learn what grown-ups have to teach them, with little need for time and encouragement to explore their own imaginative renderings of the world around them. I think this view has led to some serious problems with the way we educate and raise our children.

Though Piaget would turn over in his grave, the work of those who followed him has led us to view children as incomplete adults, moving in a neat linear fashion toward knowing the things grown-ups know.

Take, for example, the answer one often hears when challenging the current practice of assigning homework to kindergarten and first-grade children—that they will have to do it when they get older, so they should get in the habit when they are young. Such an answer reveals an underlying theory that development consists of the acquisition of habits. But such a theory is insidious—before you know it, teachers and parents are pleased when young children exhibit adult behavior, interpreting the behavior as a sign of rapid progress. Taken far enough (and it often is), such a view leads adults to misinterpret developmentally appropriate behavior—they worry or disapprove when a three-year-old behaves in three-year-old ways. Consider, for instance, the beginning of an article published in *The Onion* some years ago.

> Day after day, upon arriving home from preschool, Caitlin would retreat into a bizarre fantasy world. Sometimes she would pretend to be people and things she was not. Other times, without warning, she would burst into nonsensical song. Some days she would run directionless through the backyard of the Serna's comfortable Redlands home, laughing and shrieking as she chased imaginary objects. When months of sessions with

> a local psychologist failed to yield an answer, Nicholas and Beverly took Caitlin to a prominent Los Angeles pediatric neurologist for more exhausting testing. Finally the Sernas received the heartbreaking news: Caitlin was among a growing legion of U.S. children suffering from Youthful Tendency Disorder.

Though this was written as satire, it captures a serious reality—too many parents and teachers expect children to conform to a model that does a serious disservice to the way children really think and feel. This view seems, to me, to also be incorrect.

Why Existing Models Are Off-Base

There are two ways in which the prevailing metaphors of Little Scientist and Wild Child are inadequate. First, those metaphors are constricting, and lead us to expect children to be one or the other—we focus on the rational activities of a child, or we see the child in terms of her emotional drives. But the children teachers and parents encounter are rarely either rational or wild. They are usually both, often at the same time, or in quick succession. Years ago, as a graduate student, I studied briefly with a professor who was investigating the development of mathematical knowledge. One experiment involved asking each four-year-old subject to solve a wide range of shape and number tasks. The tasks took a long time to complete, and required the child to stay focused on the questions. One little participant was clearly getting antsy, looking away, fidgeting, and yawning, even though he hadn't yet completed the experiment. The graduate student collecting the data was worried that the child wouldn't finish, and said, "I know you are a little tired of this, but we just have a few more problems for you to solve, so please concentrate. Now, please look at these shapes and try to match them up." The little boy promptly got down on all fours and growled at the experimenter. At such a moment, trying to isolate the child's mathematical thinking from his boredom, his ability to pretend to be a tiger, and his frustration with the unfamiliar and, by now, irritating adult, is at best pointless. At worst, it leads experimenters to collect data that don't really reflect how problem solving (or any other "cognitive" activity) is intertwined with feeling and imagination.

Imagine the child described earlier, who is offered some blocks—the kind of display a researcher might use to test the Piagetian concept of conservation. After the little girl knocks down the first tower, before she thinks of building a tunnel, she may well have to grapple with her excitement at having made something so high and perhaps wobbly, as well as the thrill of knocking all those blocks down and making all that noise. It seems highly implausible that her imaginative and affective responses to the tower can be held at bay while she applies her cognitive skills to solve a task posed by an adult experimenter. In other words, most attempts to isolate one aspect of the child's mind leads to a distorted view of how these processes actually unfold.

The second problem is that both the Wild Child and the Little Scientist metaphors ignore the powerful role imagination plays in the young child's mental life.

Let me illustrate what I mean with an example. Imagine a child who is given a sponge and asked to wipe the table clean. At first the task is pragmatic—the child is oriented toward the real world of socially valued activities. At some point, the child may become interested in how the sponge holds water, and then releases water when squeezed. She may be more interested in the physical laws that explain the water in the sponge, and less interested in the goal of cleaning the table. At some point, however, her interest in the water may change, as she begins to think about the way the sponge looks, and begins to imagine it is a small dog, her pet. She may well begin to play "baby puppy" with it. In the space of just a few minutes she has moved from one way of thinking and being to another—as her orientation switches, so do her interests, her way of thinking, and the meaning of her actions.

A Different View of Children

We need a richer view of young children, one that takes into account the complex ways in which children construct meaning and learn about the world. They do this in part by transforming the world through their imaginative activity.

Yes, children want to learn the rules of real life and understand how the world works—but one of the ways they do this is by creating their own versions of reality, by imagining not only how things are, but also how they might be. I have called this the distinction between what is and what if. One can see children exploring these two dimensions when they play and tell stories. One can also see the fluid and dynamic way in which children shift between different orientations. Children aren't simply rational, or wild, or imaginative. These orientations, or ways of structuring experience, are often intertwined. The child solving math problems is also the child who wiggles and dances with excitement or frustration, and transforms herself into a barking dog. Often children switch quickly and fluidly from one orientation, or mode, to another. The switches between their orientations can happen rapidly, and subtly, and not always in accordance with teachers' schedules.

In one kindergarten classroom where I was observing, a group of young children were playing in the house corner. Their complicated play involved a hospital for animals. At one point the teacher came over to ask the children to put the stuffed animals away and get ready for math time. One five-year-old girl began to cry, explaining that she wanted her (stuffed) dog to watch her during math. The teacher kindly took the dog and sat him on the windowsill overlooking the work tables. The girl looked up at the toy dog, and began to cry again, saying, "But you've faced him the wrong way, and he won't be able to see me." The teacher turned the dog around to face the classroom; the little girl sighed with relief, and began her math work. This anecdote illustrates the subtle ways in which children move from a play orientation to a real world orientation (baby animal hospital to math time). But it also shows the ways in which those orientations can be intertwined. Even though the game is over, she still imagines her dog can see her. But she applies real world knowledge to the problem of perspective—he won't know what she is doing if he can't see what she is doing, and he can't see what she is doing unless his eyes are directed toward her.

At another early childhood center, I watched two little girls deeply engaged in a domestic scene involving several phone calls to their husbands about what the moms were cooking for dinner. One of the little girls realistically held her baby (a doll) on her hip, swaying back and forth the way many real mothers do while holding a baby, and talking to her husband on the play phone. But at one point the other girl said, "Hey, let's go over and help with the blocks." The first child dropped her "baby" head-first in the high chair, and rushed away from the dress up/house area. Suddenly the scene, infused a moment earlier with such realism, had been transformed back into toys that held no significance. Such rapid switches remind us how many different orientations and ways of constructing reality are available to children, and how quickly they can shift from one to another.

Not long ago I was visiting in a classroom of children between the ages of five and seven. The children had been studying animal life. The teacher went up to the easel and suggested they make a list of all the ways one would know there were animals in the woods, titling the paper "Signs of Animal Life." Children called out a variety of suggestions based on their previous discussions and classroom activities, as well as their personal experiences hiking. The list included such accurate suggestions as tracks, scat, nests, and fur. When one child raised her hand and suggested "fire," the teacher, a bit surprised, asked how fire could be a sign of animal life. The girl calmly answered, "Well, then you'd know there had been a dragon in the woods."

A good deal of current research focuses on how children begin to differentiate between what is real and what is not real (Wooley, 1997; Lillard, 2001; and Harris, 2000). But, for our purposes, the example suggests that the worlds of real and not-real are not neatly or stably divided in the everyday life of a five-year-old. Different kinds of knowledge and different mental worlds (the world of shared everyday reality and the world of fantasy, for instance) often coexist.

In my own research, I have collected children's stories and observed children playing in their homes, schools, and day care centers. Stories that children create spontaneously, or construct in the context of meaningful everyday activities (storytelling in school, or during play time) are an excellent source of evidence for the ways in which children move back and forth between different ways of thinking. The following story, written by a six-year-old, contains good examples of such flux.

> The Story of Jane Goodall
>
> Long long ago, hundreds of scientists from all over the world were going to the jungle to study animals. But people kept on disappearing

when they went to the jungle. Nobody knew why they were disappearing. Finally, the ruler of Zuubaarra told six very brave explorers to invent something to find out what the thing was that kept making people disappear.

John, Jack, Bob, Bishop, Ariel, and Matt were the scientists' names. For five years they built a machine. It flew above the jungle. It had a sensor that took pictures of any sights of life. Finally, on April 23, they sent the machine on its mission. The six brave explorers kept on tracking the machine they had sent. They used their tracking machine to track it. On the sixth month they decided to give up. They thought the machine would never come back. Eventually one whole year passed and the machine came back. The machine had taken 3,000 pictures. So they got the film developed. They looked at all the pictures. All of them were of birds, tigers, and jaguars, except for one. It looked like a hairy human, and it walked on two legs just like a human. So the six scientists decided to invent a trap and go to the jungle. It took them over one year to finish the trap. The scientists went to the jungle with the trap. Time passed, and eventually they made it to the jungle. The scientists waited in the jungle for the weird man-like animal to get trapped in the trap. The scientists waited all day and all night. In the morning when the scientists woke up the animal was trapped in the trap. The scientists were so amazed. At first they didn't know what to do. The scientists decided somehow they had to get the cage with the monkey in it into their boat. So all six of them grabbed onto the bars. They lifted and lifted and they got it up into the air and boom! They got it into the boat and luckily the boat didn't break. The six scientists jumped into the boat. The scientists started rowing the boat. After three hours they made it home. They pulled the cage out of the boat. The scientists dragged the cage into the lab. The scientists ran lots of tests. They put wires all over the thing. They ran a stress test. But after a couple of weeks something bad was happening to the scientists. They were throwing up and getting bad bloody noses, and much more. They decided to go to a doctor. It turned out they had gotten a disease from the jungle.

They had to stay in the hospital. They never lived to find out what the thing was. 50 years passed. Things changed. But there was one lady who remembered those six scientists as heroes. Her name was Jane Goodall, and she wanted to go to the jungle and find out what those things were. She thought about if she should go or not. And there were reasons she shouldn't and there were reasons she should. But after all it wouldn't be too bad, so she decided to go. She packed up her bag with food and drinks and medicine. She rented a canoe and went to the jungle. When she got there she thought it was a little cool. She got her backpack and went out. She was exploring the jungle and going to all different places. Finally she got to this little cave-ish like thing that was made out of sticks and leaves. She went inside the cave. There were those things that nobody knew what they were. At first she was a little scared by them. Then the things jumped on her, and they started petting her and hugging her. She noticed they weren't scary. So she started going farther into the cave. In the back of the cave there were all these old people that were trapped in there as slaves. She got the people up and helped them out of the cave. The monkeys started following her, but then when she went out of the cave they stopped. She helped the people go back through the jungle. They got in her boat, and they went home. She let the people out. She helped the people build new homes. She decided that she wanted to keep on going back to the jungle. She studied the things and decided that they weren't anything like humans except for their intellect. She named the things chimpanzees. And that's the story of Jane Goodall.

In this story, the young author draws on a wide range of information and sources of experience as he constructs his narrative. Background information illuminates the sources for and influences on his story. The little boy had an older brother who, in the weeks before this story was written, had been reading and talking about a novel in which there was an Ebola outbreak in the Congo. The author himself had admired and read about Jane Goodall. Some of the names of explorers were people he knew, others were not. Some of the names are prosaic and some exotic. He seems to glide back and forth between descriptions that are loosely based on what he knows about how the real world functions, and much more fanciful characterizations (such as the name of their destination). When given a chance, it is typical of children this age to tell a story in the same way that they play, making it up as they go along. One idea leads to another. The process of constructing the story is at least as compelling to the narrator or writer as the finished narrative itself. Because this story reflects that absorption with process, one can almost see how the author's mind switches back and forth between different ways of construing the world. He uses the narrative form to weave together different kinds of knowledge and ways of thinking.

While this richer, more dynamic view of children has implications for researchers and those who read such research, it also has important implications for educators.

A Focus on Curiosity

There are, of course, already many teachers who have a rich, dynamic view of children—teachers who know that play is essential to cognitive development, that through the processes of play and storytelling, children make sense of their world, and that it is essential for young children to have the chance to move rapidly between different orientations and ways of thinking. At one particular school where I have worked extensively, the Hayground School in Bridgehampton, New York, the teachers have used such a view of children to guide their teaching methods. One of the interesting issues that crops up for those teachers is that using a richer, more dynamic view of children demands different signs of progress than those associated with more conventional schooling practices (tests, ability to do more of certain skills, or know more about certain topics).

The teachers at Hayground agreed that math scores and the number of worksheets children completed did not offer a good measure of success (theirs or the children's) because those measures did not fit their models of children. They decided to come up with different criteria that better reflected their models of development. One of the characteristics that interested and concerned them most was curiosity. They felt that when children remained or became curious, and learned how to use various academic skills to satisfy their curiosity, the best kind of learning occurred. Their discussions about curiosity reflected a common sense that curiosity is pervasive in very young children and less apparent in older children. They felt less certain about whether it is a quality that must simply be allowed to exist in school settings, or whether curiosity requires more focused guidance from adults. Was curiosity a goal of their educational practices, or a valuable quality, intrinsic to children, which led to learning? Their discussions also went back and forth about whether there were stable, individual differences in children's level or kind of curiosity.

Their discussions led me to wonder what psychologists know about curiosity. It turns out that the investigation of the development of curiosity has a slender and spotty history. In 1960, Daniel Berlyne, the first psychologist to conduct experimental research on curiosity, argued that it is a form of arousal which people are compelled to reduce. He also provided evidence that people learn material better when the material satisfies their curiosity. In other words, curiosity does indeed lead to better learning.

While many psychologists view curiosity as an important, if not the most important, engine for learning, curiosity rarely fits into our implicit models of school learning. Curiosity can be a somewhat unpredictable quality—it might not lead you to learn what someone else wants to teach you, and it might not lead you to learn it in the most efficient way. A wonderful story illustrating the unpredictable and sometimes indirect nature of curiosity and what it leads to was told by Richard Feynman, a Nobel laureate in physics. As a young professor at Columbia University, Feynman often spent time with his graduate students, sitting around a table at lunch in the dining hall, talking and having fun. One day the chairman of the physics department, having seen the young professor at one of the student lunch tables, twirling a pie plate on his finger, called Feynman into his office and told him he needed to focus more on doing research and publishing articles, and to spend less time clowning around with the graduate students. As Feynman tells the story, "twirling that pie plate is what led to the work for which I won the Nobel Prize." The curiosity that both initiates and fuels important work often begins in a less structured and goal-oriented way than teachers may think.

Piaget (1969) claimed that curiosity is often sparked by the urge to explain something unexpected (for example, when a child wants to know why a cork she has dropped into water floats instead of sinking like the other objects). But children also express curiosity about complex and/or unfamiliar materials (for instance, when a child pokes around in a pile of mud and stones). Not long ago my son told me that he and his college roommate, a physics honors student named Ian, had recently been talking about the ant infestation in their college house. At one point during the ant conversation, Ian looked thoughtful and said, "And you know, when you bite down on the ants they release a black inky substance." My son, somewhat taken aback, replied, "How do you know that?" Ian looked at him matter-of-factly and said, "Well, I realized I had no idea how they tasted, so yesterday I picked one up and bit it. That's how I know." That kind of open-ended curiosity, the urge to simply find out more about the unknown, is an essential component of sustained inquiry in all domains. Yet few schools emphasize such inquiry when they are thinking through their curriculum, and surprisingly few teachers make such open-ended inquiry a top priority.

When we asked teachers to circle the five educational goals they most valued from a list of 25, a majority circled curiosity. But when teachers were asked to list their top five educational goals (without providing them with a list to choose from) almost no one wrote down curiosity. Teachers may passively endorse curiosity, but we have evidence that they do little to actively promote it.

In one study, we recorded students and teachers in kindergarten and fifth-grade classrooms over a period of several months, at different times of the day. We expected to find that the kindergarteners expressed curiosity more often than the fifth-graders. We also thought we might see stable individual differences between children (some children might consistently explore no matter where they were in the classroom or what activity they were engaged in, while others rarely would). Finally, we expected to see more expressions of curiosity among children in certain activities or areas of the room and little in others. We were wrong. We found almost no signs of curiosity in either age group, in any activity or part of the room. There was little exploration of objects, little exploratory gazing of any kind. But most remarkably, to us, children asked very few questions, except about rules or the social dynamics. Children wanted to know how long they had to finish a task, whether they could or could not use a certain toy, and where the line was for snack. They also asked one another questions about friendships and allegiances (Did Molly go with you to practice? Are you going to eat lunch with Jack?). They almost never asked another child, or the teacher, questions about anything they were studying or working with in the classroom (When the ice melted, what happened then? Why did the Neanderthals walk so far? What would happen if we spilled all the marbles out on the floor?) and only very rarely speculated (I'll bet if we put the big ones on top it will fall over, or if you put all the 3's in a line, you'll solve it).

The lack of physical exploration and question asking baffled us, so we began to examine what might account for the paucity of visible curiosity. The children in both age groups spent most of their time in highly regimented activities, with clear concrete goals (fill out a worksheet, follow a rhyme, solve a puzzle, complete a word test, finish an assignment), almost always set by the teacher. Both individual and group activities were scripted from beginning to end, with little time between such activities, and little unstructured access to materials. Even activities that seemed to lend themselves to curiosity and elicit interest drew few questions from the students.

What might account for that? Our data suggest that teachers ask more questions than their students. This is true even during hands-on science activities, which, though designed to encourage active participation, are tightly scripted and leave little room for unexpected questions. For instance, in one fifth-grade classroom, the teacher had set out an activity meant to show the children something about how Egyptians first invented wheels. She gave small groups of children a long slab of wood, some small wooden wheels, some blocks to transport on the slab of wood, and a string with a small measurement tool that, when attached to the slab, could measure the distance and time the slab was traveling when pulled. The children were also given a worksheet on which they were to report how easy it was to pull the slab when the number of wheels were added and subtracted.

Children were eager to work with the materials, and the room seemed lively with activity. The teacher moved about the room, offering hints and suggestions about how to pull the slab, so that the children could fill out the worksheets. She made frequent comments commending the kids on achieving the goal of filling out their worksheets. At one point a child started to fiddle around with the materials, pulling the string in unexpected ways, moving the wheels, and adding other small objects to the slab. The teacher replied, "Kids, I'll give you time to experiment at recess. Now it's time for science." This anecdote highlights a common source of confusion: getting children involved in hands-on activities does not necessarily mean they will have opportunities for expressing and/or satisfying their curiosity.

Even when teachers introduce less tightly structured goal-oriented activities, they don't always leave room for children's questions. For example, in one kindergarten class included in our study, the science teacher brought in a clear plastic bag filled with water and some marine life. The children were quite excited about what was in the bag. One child suggested that the green stuff floating around was "allergies," while another corrected her, saying, "No, it's algae." The children gathered in a circle with the teacher at the head of the circle and holding the bag, which she was soon going to empty into the aquarium. During the subsequent 15-minute discussion, she asked every single question—"What do you think is in here? Why do you think fish need food?"—and so forth. The children attempted to answer some of her questions, and not others. They were attentive and engaged during this discussion, watching the teacher's face and looking with great interest at the transparent bag of water and marine life. But they did not ask any questions, nor did they offer speculations. It seems clear that this was due in great part to the fact that the teacher asked all of the questions.

The idea that there is something about classrooms that discourages children from asking questions finds support in a wonderful study by the British researchers Tizard and Hughes, who observed a group of preschoolers in their homes and then, as they began preschool, in their classrooms (1984). They found that two- and three-year-olds asked a wide range of questions while at home with their parents, who often responded to those questions with clarifications, explanations, and invitations for further speculation. However, when Tizard and Hughes followed those same children into their preschools, they recorded far fewer questions.

Such research suggests that if children are to express and satisfy their curiosity in school, teachers might need to reconsider how and when they promote inquiry and exploration. They might need to be more deliberate in actively encouraging question asking. They might need to rethink how and when the school day offers children opportunity, time, and guidance as children pursue answers to their own questions. Curiosity, though intrinsic to young children, may not be all that resilient. In fact, research has shown that children are quite vulnerable to situational cues when it comes to exploring an object, and are particularly responsive to adult feedback (Coie, 1974). It may be that for curiosity to develop during school-aged years, teachers must nurture and guide it.

I'd like to propose that we view curiosity as a goal of education, rather than as a quality teachers should avoid squelching. The five-, eight-, or 12-year-old may need to see curiosity modeled for her, she may need help in identifying questions that dig deep, and she may need encouragement to persevere in satisfying her curiosity.

Peeking into Pandora's Box

I named this paper "Open Pandora's Box" because I liked the image of a child peeking into something to find out what it holds. I suspect that psychologists, and some teachers, have avoided looking into the child's mind and finding anything complex or messy, preferring to think the child is, or should be, simple, orderly, and predictable. I want to encourage teachers to allow children to peek into Pandora's box. I also want to encourage psychologists to peek into the Pandora's box of the child's mind.

But the myth of Pandora has a dark side—most of what Pandora uncovered when she peeked into the box was awful. Curiosity may be a scary thing for parents and teachers to encourage, because they may be afraid of the bad things it will unleash. But when Pandora unleashed those bad things, she also unleashed hope. While it may be worrisome for grown-ups to encourage curiosity, if we do, good things will emerge. Encouraging curiosity may lead to vitally important kinds of development.

When we encourage children to be curious, the learning process can seem messy, inefficient, indirect, slow, and wasteful—but if guided and supported properly, it can lead to probing thought, intellectual zeal, and drive to find out—exactly what children most need to become well educated.

The irony here is that the metaphor of the young scientist has inadvertently led us to restrictive educational practices that limit a child's intellectual growth. It has not always led us to educate children to be real scientists, who ask unexpected and often counterintuitive questions, persist in their efforts to answer those questions, allow themselves to go down blind alleys and dead ends, and consider alternative answers.

Curiosity is not something we should merely make room for or allow. In children over three, we may need to actively guide and encourage it. It is up to psychologists and teachers to figure out ways of eliciting and then nurturing curiosity and its satisfaction. Children's early years are characterized by a compulsion to find out, a strong urge to both map out and transform reality, and the tendency to move back and forth between different ways of thinking. The models that guide our teaching should reflect the richness and dynamism of the child's mind. We need to work with children, not against them—so children can grow up to be pie twirlers and ant eaters.

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References

Berlyne, D. (1960). *Conflict, arousal and curiosity*. New York: McGraw Hill.

Coie, J.D. (1974). An evaluation of the cross-situational stability of children's curiosity. *Journal of Personality, 42,* 93-116.

Gopnik, A., Meltzoff, A., and Kuhl, P. (1999). *The scientist in the crib.* New York: Harper Collins.

Harris, P. (2000). *The work of the imagination.* Malden, MA: Blackwell.

Lillard, A. (2001). Pretend play as twin earth: A social-cognitive analysis. *Developmental Review, 21*(4), 495-531.

More U.S. children being diagnosed with youthful tendency disorder. (2000, September 27). *The Onion, 36*(34). Retrieved December 27, 2000 from http://www.theonion.com/content/node/28223/print

Piaget, J. (1955). *The child's construction of reality*. London: Routledge and Kegan Paul.

Piaget, J. (1969). *Psychology of intelligence*. New York: Littlefield, Adams.

Rousseau, J.J. (1979). *Emile: Or, on education*. (A. Bloom, Trans.). New York: Basic Books.

Tizard, B., and Hughes, M. (1984). *Young children learning*. London: Fontana.

Wooley, J. (1997). Thinking about fantasy: Are children fundamentally different thinkers and believers from adults? Child Development, 68(6), 991-1011.

Wynn, K. & Chiang, W. (1998). Limits to infants' knowledge of objects: The case of magical appearance. *Psychological Science, 9*, 448-455.

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The Child Development Institute was established in 1987 to develop programs for early childhood and elementary school teachers, administrators, child development professionals, and the community at large. We take a progressive perspective in which the child is viewed as an individual in the social context and education is broadly conceived as an opportunity for nurturing humanistic social values and awareness of the world, as well as social, emotional, imaginative, and intellectual development.

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