Aligning Schools With How Children Naturally Learn

Christopher Chase

Introduction

In order for educational settings to be most effective and successful they need to be aligned with how children naturally learn. A child's innate curiosity, resourcefulness, creativity, playfulness, individuality, sociability, imaginativeness, enthusiasm, intelligence, and love of learning have to be respected and supported (Denning, 2011; Hopfenberg et al., 1993; Gray, 2013; Montessori, 1986; Robinson & Aronica, 2016; Senge et al., 2000). This isn't rocket science; it's just basic wise parenting and effective teaching. For tens of thousands of years our human ancestors learned from their parents, aunts, uncles and members of the local community. Apprenticeship relationships, self-directed practice and cooperative learning are ways that humans learn naturally, assisted by skilled elders, friends, parents, neighbors, artisans and peers (Chase, 2000; Gardner, 1991; Rogoff, 1990 & 1993).

Children's social and cultural environment is what supports their brain's innate ability to develop skills and learn (Bronfenbrenner, 1993; Chase, 2000; Comer, 1988; Dubin, 2013; Ford, 1992; Ford & Lerner, 1992; Hopfenberg et al., 1993; Kolb, 2014; Gardner, 1991; Rogoff, 1990). What modern research into *neuroplasticity* has shown is that children's brains are wired for learning from birth, and that supportive experiences provided by parents and teachers must be aligned with these natural ways of learning for a child's development to

proceed successfully (Chase, 2000; Ford, 1992; Ford & Lerner, 1992; Kolb, 2014; Robinson & Aronica, 2016; Senge et al., 2000). Nature and nurture work together *synergistically*, both sides playing essential roles. Even with something as complex as language learning, it is the child's brain that creatively constructs skills and organizes knowledge gathered during interactive social experiences, free play and repeated practice (Chase, 2000; Flavel, 1985).

Understanding How Our Brains Learn

Over the last hundred years, researchers in cognitive science, education and developmental psychology have discovered some extraordinary things about how the human brain works, how children's minds are naturally configured to develop skills, think creatively and continuously learn (Bruner, 1974; Chase, 2000; Ford, 1992; Ford & Lerner, 1992; Gardner, 1991; Gray, 2013; Montessori, 1966; Robinson & Aronica, 2016; Senge et al., 2000). Maria Montessori, John Dewey and Jean Piaget's insights into the *experiential* and *constructivist* nature of learning are now supported by empirical evidence, by actual images of human brains engaged in specific patterns of cognition. The ideas of progressive educators concerning learner autonomy, creativity and self-discovery now make even greater sense (Kolb, 2014).

Children should be able to do their own experimenting and their own research. Teachers, of course, can guide them by providing appropriate materials, but the essential thing is that in order for a child to understand something, he must construct it himself, he must re-invent it. (Piaget, 1972, p. 27).

Constructing complex knowledge representations and skill patterns is what the brain does best; it is designed for continuous growth and learns

from direct observation, practice and experience (Piaget, 1972; Ford & Ford, 1987). Since early childhood, our brains have constructed hundreds of unique skill patterns, what the developmental psychologist Donald Ford (1987) calls *behavior episode schemata*. These correspond to complex social, emotional, cultural and knowledge schema, mental models our brains construct that represent and organize information about the world (Ford, 1987; Ford & Ford, 1987).

There is a popular misconception that we each use only about 10% of our brains. That is not quite accurate. Actually, while we probably use less than 40% of the brain at any given moment, the patterns and regions of activation shift continuously throughout the day. These PET scans (below) taken by researcher Marcus Raichle (Ronan, 1993, pp. 208-209) can help to make this discovery easier to understand. For every kind of structured activity we engage in there is a corresponding *skill pattern* of cognitive activity in our brains—coordinating specific sensory input, thoughts, knowledge, emotions and movements of the body (Chase, 2000; Ford, 1987; Ford & Ford, 1987; Raichle, 1994; Ronan, 1993).

Hearing words　Seeing written words

Thinking of words to speak　Speaking words
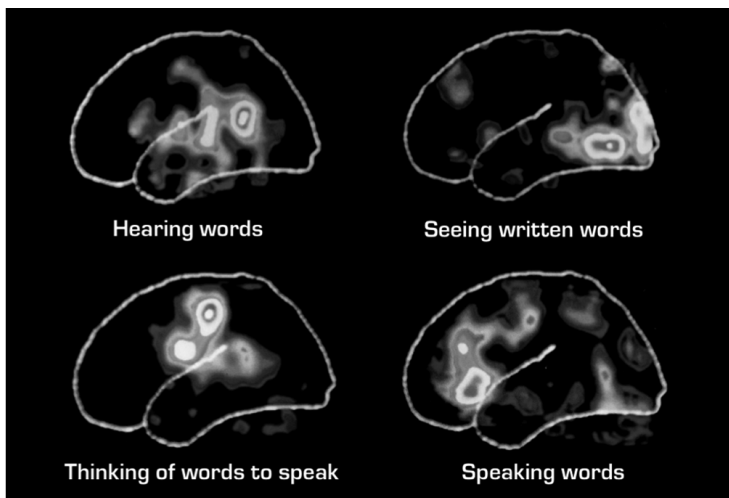
Our brains have constructed unique skill patterns for each activity we have repeatedly engaged in, such as reading, speaking, cooking, golfing, driving, bike riding, algebra problem-solving, violin playing, etc. (Ford, 1987; Ford & Ford, 1987). Every skill, worldview and ability we have was *self-constructed* from countless hours of experience, observation and practice—by carefully applying knowledge, methods and techniques—repeating actions over and over again until we developed progressively higher levels of comprehension and skill mastery (Ford, 1987; Ford & Ford, 1987; Ford & Lerner, 1993; Montessori, 1972; Piaget, 1972).

As one might imagine, this understanding has important implications for learning and education. Our brains are far more creative and flexible than any computer or AI program that exists in the world today. They are self-organizing adaptive systems designed to self-construct integrated knowledge/skill patterns (Ford & Ford, 1987). This is what scientists are referring to when they speak of the brain's *neuroplasticity*, its natural ability to grow new skills and continuously learn. Young children are "wired" from birth to master skills this way, intuitively. This is the process by which we all learned how to walk, ride a bike and speak our native language.

Formal school instruction will not be successful if the brain's natural self-constructive learning process is not respected and encouraged. In order for useful skills and comprehension to develop, a learner's self-directed practice needs to be supported, "knowledge" must be applied creatively, in meaningful situations (Chase, 2000; Ford, 1987; Montessori, 1972; Senge et al., 2000). It is only through repeated application of "information about something" that ideas are transformed into deep comprehension, creative ability and "real world" skills (Bloom, et al, 1956; Bruner, 1974; Chase, 2000; Ford, 1987; Gardner, 1991; Gray, 2013; Kolb, 2014, Montessori, 1972).

For this reason it is essential for children of all ages to enjoy and be interested in what they are learning, to concentrate their attention and

experience positive emotions while they are doing something (Chase, 2000; Ford, 1987; Gray, 2013; Montessori, 1972). As a person's skill level increases and they meet challenges (that require activation of those skills) the result is a highly enjoyable *flow* state of consciousness (Csikszentmihalyi, 1990), an optimal form of experience where focused attention and positive emotions arise when that specific activity is engaged in. The *flow experience* is intrinsically rewarding, sometimes transcendent. There is a sense of timelessness and deep connectedness with the activity and context, as our full attention is given to the task at hand.

　　This is how skills are mastered, the mind being stretched and exercised through real life experiences. Abilities develop, and then through creative application, repeated practice and free play, they grow further (Ford & Lerner, 1993; Gray, 2013; Montessori, 1972).　This is what happens when members of a rock band or orchestra play music, when a skilled swimmer moves through the water, when a group of friends is playing basketball or a child who loves to draw is drawing. Motivational researcher Carol Dweck (2015) describes such experiences as evidence of a *growth mindset*, a positive attitude toward learning that leads to even more practice time, greater skill development and eventual mastery.

　　Unfortunately, modern public schools were not built to promote creative flow experiences or the mastery of a wide range of useful life skills. Our current school systems were designed in the early part of the 20th century, using what some call the *factory model* of education. The purpose was to create good workers, teach children how to work hard, memorize information, follow instructions and obey authority (Denning, 2011; Gatto, 2001 & 2003; Gray, 2013; Montessori, 1972; Senge et al., 2000).

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Factory-style schools were modeled on industrial production lines and set up as selection and sorting systems for children. Teachers would provide information and then assess every child at the same time in order to locate those who scored highest on written tests—not to provide meaningful experiences, or allow for self-directed learning by students (Denning, 2011; Gatto, 2003; Gray, 2013; Montessori, 1972). The factory model of management is designed to provide rewards and punishments, to measure and sort children by grades and test performance, creating society's "winners" and "losers." Those who continuously fail may eventually "drop out" or leave school without coming even close to developing their full potential (Comer, 1988; Denning, 2011; Dubin, 2013; Gatto, 2003; Montessori, 1972).

In such a highly competitive environment many students will naturally feel discouraged, especially those who receive low test scores and are compared unfavorably with peers. They may feel anxiety and confusion, losing confidence and interest in school subjects (Comer, 1988; Dubin, 2013; Gardner, 1991; Montessori, 1972). Once a child "turns off" and no longer pays attention, he or she will be more likely to dislike school and experience boredom in classrooms. After that, many children will try to avoid a subject area rather than spend any extra time with it.

Back in the 1930s, the educator John Dewey (1938) described such experiences as being *miseducative*, inhibiting rather than encouraging further growth and learning. Unfortunately, this highly competitive and authoritarian model of education has dominated since the beginning of the last century, with millions of students all over the world dropping out of school or developing a dislike for learning (Chase, 2000; Comer, 1988; Gatto, 2003; Gray, 2013; Montessori, 1972).

Fortunately, not all education systems have been designed this way. For decades, Maria Montessori's schools have shown great success with a learner-

centered constructivist approach, encouraging self-direction, mastery, creativity and enjoyable *flow* experiences for children (Montessori, 1966 & 1972). Likewise, the Suzuki method of teaching music is based on the idea that students need to enjoy playing in order to motivate them to put in practice time. Suzuki (1968) also stressed the essential role of social relationships and parents as models of learning. Young children who see their mother or father happily playing the violin will want to join them and learn how to play too. Once children become older they are naturally drawn to play music with other children, not in a competitive way, but as a source of enjoyment. According to Suzuki, "What the children enjoy most is the group playing. They play with children who are more advanced than they are; the influence is enormous and is marvelous for their training. This is the real talent education" (1968, p. 96).

European apprenticeship models and traditional Asian arts instruction— such as in karate, tea ceremony and calligraphy—take a mastery approach, where learners are assisted, instructed and motivated during social interactions with more skilled adults and peers. All over the world, successful parents, coaches and teachers have long understood this essential relationship of social support, interest, skill development and motivation (Chase, 2000; Gardner, 1993).

When mastery, teamwork and skill practice are the focus, each child's innate potential to learn and grow is respected and given a chance to blossom. Adults are very careful not to compare learners to one another. There is less emphasis placed on external deadlines and tests, but more on practice, skill development, creativity and effort, putting in time—not watching it (Csikszentmihalyi, 1990; Dalporto, 2013; Gray, 2013; Montessori, 1966 & 1972).

That does not mean that external tests or competitions do not play a role; they can, but there is no rush, no expectation that all learners should develop

skills at the same speed. Test situations can motivate students when they are assessing skills already there, but it is demotivating if the purpose is to punish or make comparisons to others. What is absolutely crucial is generating interest and motivation, as these translate into concentration, effort and progressively higher levels of mastery (Chase, 2000; Csikszentmihalyi, 1990; Ford, 1992; Montessori, 1972; Suzuki, 1968). Current efforts to transform factory model schools into more creative learner-centered communities take this approach, and have been highly effective (O'Neil, 1995; Senge et al., 2000). Finland's successful national education model is a good example:

> The emphasis in Finnish schools is on cooperation, not competition. Nina Brander, a Finnish teacher with 17 years of experience, says this is a key to Finland's success. "In Finland we orientate more towards learning and working than towards marking and evaluating," she said. Schools aren't ranked and they're all equally funded so parents can rest assured that whether they live in a city or a small country town, whether they are wealthy or not, their child will get the same, awesome education. "We have an equal elementary-school education for all children," said Ms. Brander." (Dalporto, 2013).

What Finland has done can be implemented anywhere. During the late 1980s and early 1990s I worked with the research and development team of Henry Levin's *Accelerated Schools*, a successful school transformation project started at Stanford University. Levin's program was one among many innovative reform projects at the time that promoted learner-centered education by transforming social relationships, values, expectations and cultures in schools (Brandt, 1992; Hopfenberg, et al., 1993).

Beginning in the late 1960s, psychologist Howard Gardner developed

Project Zero at Harvard, incorporating his theory of *multiple intelligences* (Gardner & Hatch, 1989), which views children as possessing a diverse range of potential skills and intelligences. Also launched in the 1960s, Yale psychiatrist James Comer's groundbreaking *School Development Program* has consistently shown itself to be highly effective with poor and minority communities (Comer, 1988; Dubin, 2013).

Vicky Colbert's *Escuela Nueva* model of democratic education (Kirp, 2015), *Waldorf Schools* (Business Insider, 2017), *Baltimore School for the Arts* (Robinson & Aronica, 2016), Deborah Meier's *Mission Hill School* (Tom Valens, 2013), Peter Senge's *Schools as Learning Organizations* (O'Neil, 1995; Senge et al., 2000), *Montessori Schools* (Montessori, 1966 & 1972), *Circle of Courage: Native American Education* (Brendtro et al., 2002) and the *Reggio Emilia* method developed in Italy (Gandini, 1993), are examples of highly successful learner-centered approaches aligned with how children naturally learn.

While innovative learner-centered educational models require extensive collaboration and creativity, many successful parents and teachers have intuitively understood (and implemented) similar approaches. Across the span of human history, traditional trade apprenticeships, crafts-making and arts education had to be aligned with the natural way young people learned in order to be effective (Gardner, 1991; Rogoff, 1990; Senge et al., 2000).

Indeed, apprenticeship may well be the means of instruction that builds most effectively on the ways in which most young people learn. Such forms of instruction are heavily punctuated with sensorimotor experiences and with the contextualized use of first-order forms of symbolization, such as natural language and simple drawings and gestures. To the extent that they feature more formal notations or concepts, these are introduced to the learner directly in

the context in which they are wanted and the learner sees for himself the ways in which they may be applied. Here the differences from formal schooling are most salient. (Gardner, 1991, p. 124).

All of us have applied our brain's intuitive understanding of the learning process as we have mastered various skills over the years. Those who have raised families successfully have facilitated and observed this kind of learning with their own children. It seems to be common sense, because we know this from our own observations and experiences. Our brains evolved to learn this way, in meaningful situations where knowledge grows simultaneously (and continuously) with the mastery of skills (Chase, 2000; Ford, 1987; Ford & Ford, 1987; Gardner, 1991; Gray, 2013; Piaget, 1972).

Alas, during the last decade public education departments in the United States and other nations have ignored most of these innovative methods and creative learner-centered programs. They are up and running beautifully over in many Scandinavian nations (and at the elite private schools for children of the wealthy) but are no longer being funded, celebrated or emphasized for the public in the USA. With *No Child Left Behind*, *Race to the Top* and *Common Core* there has been greater emphasis on standardized curriculums, nationwide testing and data collection. Simultaneously, private charter schools were introduced as a way for investors to profit from public education funding (Chase, 2015; Sirota, 2011).

Now there seems to be a big push by both the financial sector and IT industry to promote *personalized learning* via digital devices, such as tablets, personal computers and smartphones (Hensinger, 2017). This focus on AI programs, computers and digital technologies is being marketed as a more learner-centered approach, yet ignores the way children naturally learn by interacting creatively in diverse social situations and real-world environments. Many parents and educators are also quite alarmed by what appear to be

attempts to collect and monetize student information that should be private (Chase, 2017; Hensinger, 2017; Talmage, 2017).

Children learn things every day of their lives and in a wide variety of ways. What is ignored by standardized testing and "personalized" learning technologies is that education is not something that happens the same way for each child, or that needs to be constantly measured and monitored. The very act of measuring can inhibit learning, especially when students are compared to each other and judged as superior or inferior in ability (Gatto, 2001 & 2003; Gray, 2013; Montessori, 1972).

Young learners throughout history have developed their skills independent of large institutions, testing and adult monitoring. To truly transform education in the 21st century, children need to be given social support, adequate resources and the creative freedom to learn (Comer, 1988; Gatto, 2001; Hopfenberg et al., 1993; Kohn, 2015; Montessori, 1972). Most importantly, they would benefit from a system designed to help all students maintain a lifelong love of learning.

> The goal needs to shift from one of making a system that teaches children a curriculum more efficiently to one of making the system more effective by inspiring lifelong learning in students, so that they are able to have full and productive lives in a rapidly shifting economy. This is a shift from running the system for the sake of the system ("You study what we tell you to study, when we tell you, and how we tell you, and at a pace that we determine") to a focus on the ultimate goal of learning ("Our goal is to inspire our students to become life-long learners with a love of education, so that they will be able to learn whatever they have to"). All parties—teachers, administrators, unions, parents and students—need to embrace the new goal. (Denning, 2011).

Christopher Chase

Transforming Schools from Institutions into Communities

Understanding how to continuously improve one's abilities and broaden knowledge (the process of lifelong learning) is far more important then getting the "correct" answers for artificial testing or technology situations. Children grow and thrive when given the opportunity to collaborate with others, participate in meaningful projects and develop skills in playful and creative ways that match with their interests (Gray, 2013; Hopfenberg et al., 1993; Kohn, 2015; Montessori, 1972; O'Neil, 1995; Senge et al., 2000). A great deal of learning and mastery happens outside classrooms. Children need time to practice activities (such as reading, drawing, sports, playing a musical instrument) independently and in the real world, in order for their brains and bodies to develop creative and useful skills.

Schools do not need to be competitive and punitive places, and there is no need for computer-based curriculums that focus primarily on data collection. Learner autonomy, choice, self-direction and privacy should be respected (Gray, 2013; Montessori, 1972). To help students be successful in their lives, both learner autonomy and positive social relationships need to be made a priority. Children learn teamwork skills by engaging in creative and meaningful projects with others. The Silicon Valley executives who send their children to Waldorf schools (Business Insider, 2017) understand this. Yet it is not the model their industry is selling to the rest of the world.

It is extremely invasive to constantly test and measure children, to use technology to collect data from them, compare them to one another, to expect them all to learn the exact same things (Chase, 2017; Hensinger, 2017; Montessori, 1972). This is not how children's bodies, hearts and brains were designed by evolution to learn. It is not how the most creative human beings in history developed their talents, or how most of us developed the skills and abilities that are most meaningful to us.

Whether reading books for pleasure, dancing, drawing, playing a musical

instrument, tending a garden, raising animals, putting together a school musical or playing a sport with friends—it is the practice time we put into activities we enjoy that leads to the highest levels of talent development and mastery. What matters most is that children enjoy becoming skillful, that learning is pleasurable and meaningful to them. This is common sense. It is also what research in learning and child development has shown to be true.

Testing a child's knowledge on paper (or by computer) does not tell us whether they know how to apply that knowledge creatively in meaningful and challenging situations. Knowing something for written examinations is meaningless if learners do not have the skills or experience to apply that knowledge effectively in the real world and in collaboration with others. The challenge of education now is to evolve an outmoded and mechanistic model of schooling. Love and respect for the self-directed learning of young people needs to be the "common core" of the equation (Montessori, 1972; Senge et al., 2000).

This then is the first duty of an educator: to stir up life but leave it free to develop. For such a delicate mission there is need, however, of a great art which will suggest the proper time and limits of one's interventions. This will prevent the teacher from disturbing or misdirecting, instead of assisting, a soul which is coming to life and which will live by virtue of it is own efforts. (Montesssori, 1972, p. 111).

As educator Ken Robinson has described (Robinson & Aronica, 2016), a *creative grassroots revolution* in public education is already underway, but it needs to be acknowledged, supported, nurtured and financed. Children grow and learn successfully when they are cherished members of communities, where the adults who guide them also respect their individuality and care

about them (O'Neil, 1995; Senge et al., 2000). There are no tests or AI programs that can measure or predict the future life potential of a child.

Authoritarian models of school management need to be dismantled or creatively transformed. It is a dehumanizing system of standardization and top-down control that is out of synch with children's natural ways of learning, which ignores the essential role of local communities and cultures in education (O'Neil, 1995; Senge et al., 2000). Children are most likely to thrive when they are highly motivated, confident, encouraged to be creative, learn how to work well with others, enjoy mastering new skills and feel socially supported (Comer, 1988; Gardner, 1993; Hopfenberg et al., 1993; Robinson & Aronica, 2016; Senge et al., 2000).

As described in this paper, numerous examples of innovative learner-centered education have been developed over the last hundred years. Rather then investing in tests and technology that create profits for investors and corporations, it would be wiser to provide a greater flow of resources into impoverished communities and to increase funding for successful innovative programs that already exist. When collaborative creativity, love, playfulness, curiosity, autonomy and joy support children's learning, anything is possible. That's what our ancestors knew and what all the research evidence tells us now. For as Aristotle put it, "Educating the mind without educating the heart is no education at all."

Note: Parts of this paper were originally shared as two blog posts written in 2014 & 2015, entitled "Understanding How Our Brains Learn" and "How Children Naturally Learn." The text has been merged together, expanded and edited, with citations added.

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