Hypothesis Formation, Paradigms, and Openness

By Conrad P. Pritscher

Abstract:

A part of hypothesis formation, while necessary for scientific investigation, is beyond direct observation. Powerful hypothesis formation is more than logical and is facilitated by mind-opening. As Percy Bridgeman, Nobel laureate, said, science is: “Nothing more than doing one’s damnedest with one’s mind, no holds barred.” This paper suggests more open schooling helps generate more open hypothesizing which helps one do one’s damnedest with one’s mind. It is hypothesized that a more open process of hypothesis formation may help schools and society forge new ways of living and learning so that more people more often can do their damnedest with their mind. This writing does not offer a new paradigm but rather attempts to elaborate on the notion that new paradigms are difficult to form without openness to what was previously quasi-unthinkable. More on these topics and issues is included in the author's *Reopening Einstein's Thought: About What Can't Be Learned From Textbooks* - - to be published by Sense Publishers in June 2008.

A researcher hypothesized that the color of classroom walls determined noticeable differences in the speed with which 3rd grade students memorized multiplication tables through 12. Although there are many noticeable colors, he chose 30. After testing all 30 colors, he concluded that the color of classroom walls did not determine noticeable differences in the speed with which 3rd grade students memorized multiplication tables.

I mention the above fictitious story to note that a part of hypothesis formation, while necessary for scientific investigation, is beyond direct observation. Neither science nor honed judgment led the above researcher to form the color of wall hypothesis. If we hypothesize that there are an infinite number of hypotheses, thought experiments would reveal there are an infinite number of numbers, and there can be an infinite number of hypotheses. As Percy Bridgeman, Nobel laureate, said, science is: "Nothing more than doing one's damnedest with one's mind, no holds barred." We wouldn't be doing our damnedest with our minds if we attempted infinite hypothesizing. This paper suggests more open schooling helps generate more open hypothesizing which helps one do one's damnedest with one's mind.

What educator would not want his students to do their damnedest with their minds? Of an almost infinite number of places to start doing one's damnedest with one's mind, let us start with an idea of Immamuel Kant: "Thus the order and regularity in the appearances, which we entitle nature, we ourselves introduce" (Critique of Pure Reason A125). As we can notice a "puzzled expression", we cannot, simultaneously describe or explain in detail, the facial configurations which comprise the puzzlement (Michael Polanyi, Tacit Dimension). As a result, we can know more and more than we can tell. As mentioned by Thomas S. Kuhn: scientific advance is "determined by social change

rather than impersonal reason." Kant's and Kuhn's ideas coupled with Michel Foucault's notion that "we can resist the image conferred upon us by the controlling order and so forge new ways of living" is a start to consider hypothesis formation and improved schooling. It is hypothesized that a more open process of hypothesis formation may help schools and society forge new ways of living and learning so that more people more often can do their damnedest with their mind. How do paradigms relate to ones doing one's damnedest with one's mind, no holds barred?

This writing does not offer a new paradigm but rather attempts to elaborate on the notion that new paradigms are difficult to form without openness to what was previously quasi-unthinkable. Quasi-unthinkable notions are not logical impossibilities such as square circles. Quasi-unthinkable notions are unthinkable within old and more rigid paradigms and mindsets. Around the time of Copernicus, it was unthinkable that the earth was not the center of the known universe. Doing one's damnedest with one's mind is difficult without mind-opening. Mind-opening helps one consider rare qualities and partially unknown quantities, permits quasi-thinkable notions and opens one's mind to the possibility of new paradigms. I mention quasi because we all know what infinities are and what infinitesimals are, as we know that the sum of the even numbers equals the sum of the odd numbers plus the sum of the even numbers. The mathematician, Georg Cantor, found that some infinities are bigger than others (see The Infinite Book). I mention these matters not to obscure thought but to note that some of the events we already know (and take for granted) are still fuzzy because of the possibility of connecting more to those known events.

Physicists now hold that only 4% of the universe is matter as we know it; the other

96% is dark matter and dark energy (73% dark energy and 23% dark matter). Physicists don't know what dark matter and dark energy is other than to say that they play a part in our expanding universe. Experiments are now under way in deep mines and particle accelerators to attempt to determine what they are. Einstein's cosmological constant, his fudge factor, which he thought at one time to be one of his biggest mistakes, now is seen to be accurate in helping make sense of the accelerating expansion of our universe and the possibility that expansion is related to this dark stuff.

It is said that a sign hanging in Einstein's Princeton office said: "Not everything that counts can be counted and not everything that can be counted counts." We all know that mind-opening is important for learning and a free society yet we frequently do not consider that "open" in a Webster's Seventh Collegiate dictionary 1963, is defined with 93 lines of words. At what number of lines of definition would we no longer call it a definition? While no one has yet seen a "mind," we infer one exists since we have seen time and time again that a whole can often be more than the sum of its parts. While we have seen parts of "time" but not "time" and parts of "experience" we have not seen "time" or "experience."

Notions such as open, mind, self-direction, global knowledge, experience, and time are difficult to define. Our western culture has taught us within a "western" paradigm, that when something can't be defined, we are stupid about it. Yet we can have notions of elements of open, mind, self-direction, global knowledge, experience, and time that we know but cannot fully say.

What does all this have to do with learning and schooling? Einstein said: "Is it any wonder that the modern methods of instruction have not yet entirely killed a holy

curiosity of inquiry, for this delicate little plant, besides stimulation, stands mainly in need of freedom." He also thought that education was liberal education and that the purpose of a liberal education was: "to help one think something that can't be learned from textbooks." Much of what appears in many journals today is similar to what will soon be found in textbooks, so Einstein's dictum would apply to professional journals as well as textbooks. This Journal, *JUAL*, may be different.

While the word "freedom" requires only 20 some lines to define in *Webster's Seventh Collegiate Dictionary*, "free" and "freed" require another 60 lines. We all know what open and freedom mean but we have difficulty in clearly describing them. What I am suggesting is that Michael Polanyi's tacit dimension of knowing more than we can tell, seems to be a powerful notion related to paradigm and hypothesis formation. As one can know more than one can tell, our current paradigms encourage us to push aside concerns that aren't easily defined. Older paradigms, still in use, embody the notion that we should think we are stupid about something that we cannot easily and clearly define. Remnants of René Descartes' "clear and distinct ideas" are still with us, and they may be retarding generations of hypothesis and paradigm formation. Descartes' clear and distinct ideas are often closed and fixed. Openness was not the concern it is today.

These preliminary remarks may be helpful in noting that some nonscientific elements are a part of hypothesis formation and part of one's doing scientific investigation. Rather than report on ideas that are clear and distinct (that which has been easily and adequately tested) I would like to suggest that we open our research to studying events such as "wisdom" as per the Berlin Wisdom Paradigm research by Baltes and Staudinger (reported in the American Psychological Association's APA journal-

American Psychologist, January, 2000). We know that knowledge can be communicated, but not wisdom. These preliminary remarks may be helpful in our taking some additional risks, during a period of accelerating change, in the process of forming hypotheses. New hypotheses, and maybe even new paradigms, may be a first step in a wider acceptance of free schooling where students are able to decide for themselves what will secure or endanger their freedom. A writer (March, 2008 Discover magazine) about Einstein's qualities mentioned daring, implying that the badly needed breakthrough research may arise more easily when the researcher is somewhat daring. How does hypothesis formation and newer paradigms fit with the needed breakthrough research?

We need to replicate what others are finding, and we may hypothesize that we have done that replicating excessively at the expense of doing breakthrough research which now seems to be in short supply, especially in the field of education. We may avoid some complex and difficult to measure hypotheses because we may appear foolish to our more "stable peers" unless some Einsteinian daring is included in our research. Einstein thought that the valuable ideas, at first, often seem to be unusually weird and maybe even ridiculous.

Mary Beth Marklein reported on January 23, 2008 that a recent survey conducted by Peter D. Hart Research Associates, said universities need to look for new ways to demonstrate student success. (What is reported, I believe, could accurately be said for schooling at all levels.) She referred to success in terms of student self-direction, global knowledge, and intercultural competence as well as critical thinking and communication skills. I highly agree that these are the kinds of measures that need to be made if schools and universities are to be "successful".

In my work as a university educator over many years, I rarely found self-direction and global knowledge as goals in course syllabi. Narrow course goals (excessive specialization) may prevent learning self-direction, openness, and global knowledge. I also found that even when more traditional schools had general goals, such as developing a love of learning and inquisitiveness, when classroom sub-goals (often narrow) were achieved, the achievement of many of those sub-goals prevented the development of love of learning and student inquisitiveness. Will we need daring in forming hypotheses and in using paradigms if we are to achieve goals reported by Marklein?

An inquiry oriented (mind-opening) professor facilitates processing so as to help learners become more aware, more self-directing, more open, and approach global knowledge. This movement toward self-direction includes some training but many university students may already have been trained, within older paradigms, to desire to keep being trained (continue to be told rather than think for oneself). It is easier for one to know when someone tells one, "one knows," rather than to do the thinking and concluding for oneself that one knows without somebody telling one, "one knows." "Training" requires less thinking than "education". (A future article may attempt to demonstrate that simply noticing larger wholes may take more illumination than conceiving.)

There is an endless amount of information to any field of study. A wise teacher, Kahlil Gibran said, does not give students wisdom, "but rather, leads you to the threshold of your mind." If it is from the threshold of one's mind that one becomes self-directing, open, and globally knowledgeable, it would seem wise to lead a student to the threshold of the student's mind. Has educational research shown us how to accomplish that?

Most professors teach the way they were taught. The hypothesis: "Professors who learn to lead one to the threshold of one's mind are more powerful learning agents than those who only disseminate information" (except for some courses which primarily "train") is probably testable. Professors who lead one to the threshold of one's mind often have imaginations that go further than those who primarily "train."

Todd May, the Lemon—Calhoun Chair of Philosophy, Clemson University—says: "We need to consider the possibility that the world—or, since the concept of world is too narrow, things or being or what there is—outruns any categories we might seek to use to capture it.… This is not to say that our particular categories are lacking something that other, better categories would give us. Our imagination must go further than that" (*Gilles Deleuze, An Introduction*, 2005).

I suggest we go "further than that" when we have professors who help us stretch and open minds so that one can think something that cannot be found in textbooks as Einstein suggested. Thinking something that can't be found in textbooks is often daring. Many mind-opening professors learned mind-opening on their own since their university coursework probably did not teach mind-opening. Most professors were more often taught to train rather than educate. The center of education is self-direction according to John Dewey and many other acclaimed educators. Today, in traditional schools, students can, in a polite way, resist excessive training. But a student must be polite when resisting or flunk according to the application of the common grading schemes which seem to inhibit powerful learning.

Does industry want daring leaders? The CEO of General Electric, Jeffrey Immelt, in December 2007 during a television speech, mentioned curiosity first on his list of three

characteristics of leadership. While one can be inquisitive without being daring, I suggest that daringness helps one find out more about one's curiosities. With a nudge from schools and universities, we could greatly increase curiosity and imaginative behavior to help change "trainers" to "educators". Would a paradigm shift be needed for that to be accomplished? It seems that our common paradigms helps us conclude that professors who get paid and evaluated on the basis of their "training" rather than on the difficult to measure basis of "self-direction/mind-opening", will train more than educate. They may even lose their jobs if they're daring.

Nipun Mehta (charityfocus.com) reports that Paul MacCready, winner of human powered flying machine contest, won because of his naïveté/inexperience, and the President of Teach for America said inexperience was a major cause of success of Teach for America teachers. Experts in wing designs had preconceptions which prevented them from noticing superlight wings could be built. The old idea that if the bumblebee knew its wings were too small for its body, it wouldn't be able to fly, applies. New paradigms tend to help open minds to the possibility of doing what was impossible under older mindsets. MacCready didn't know he could not build superlight wings as the experts knew, so he built them. A beginners mind, like MacCready's, is relatively uncluttered and does not know what it can't do. MacCready has a conventional list of rules for innovation:

- Goal - Recognize unmet need; adapt goal to realities
- Positive attitude - Enthusiasm, motivation, "of course"
- Capability/Detail - Get deeply involved; welcome assistance
- Innovate - Lots of approaches; experiment

- Enlist the subconscious - Daydream to facilitate intuitive leap
- Make it real - Connect to practical so it benefits someone
- The dominant factor - Persistence, luck, more persistence
- The final rule - Don't follow rules

When a student is being trained, as most school and university students seem to be, the training often consists in following rules. Experts often follow rules. With courteous nudging and resistance to being primarily "trained" to follow others' rules (narrow course requirements), a student may dare to help educate oneself. I sometimes wonder if it is teachers and professors who are fearful of not conforming to older, more closed paradigms that are preventing development of self-direction, and mind-opening.

The American Psychological Association deserves praise for reporting investigations of open avenues which facilitate self-direction and which were previously not explored. Subjects such as feeling, consciousness, and wisdom are now being given attention. Attention itself now needs more attention. Intending to attend to attention is a first step. If one gave more attention to one's present experience, one may notice one's thinking is often overly dependent on requirements/rules given by others who have been deemed to be authorities. The deeming to be an authority is usually done within the framework of fixed paradigms. Some fixed paradigms do not permit breaking fixities. Modified paradigms may be needed to break fixities. Remember the rule of not following rules when it comes to education/self-direction. Self-direction makes one one's own authority. Becoming one's own authority, unsanctioned by authorities within a field, is difficult. An authority doesn't become one's own authority when that authority is not received from one's self. In other words, if one does not know they are their own

authority, until someone else tells them, then they are not their own authority. Many may agree with the old adage that one who is his own medical doctor has a fool for a patient, but mainly "free schoolers" agree with the idea that he who is his own educator is on the road to self-directing wisdom.

As Thomas Jefferson said, the purpose of education is to help one decide for themselves what will secure or endanger one's freedom. If one does not know until some authority tells them that they know that they know, one is not self-directing.
Some rules we create for each other frequently improve communication and knowledge. A few old rules may prevent new paradigms from emerging. A candidate for the Presidency of the American Psychological Association circa 2005, said near the year 2025, our fund of knowledge will be doubling every 17 days (American Psychologist, January 2004).

There's no question that we need knowledge and training. I wonder if we are training students with knowledge they have not discovered for themselves--knowledge obtained only when one is told what is the case, and not through open inquiry. Such knowledge accumulation may interfere with developing wisdom. If freedom and self-direction relate to providing conditions whereby the student can decide for oneself what will secure or endanger a student's freedom, then we will have gone a long way in being open to new paradigms if and when they arise. It is possible that a lack of openness could contribute to the process of paradigm formation becoming static. New paradigm formation may help generate new hypothesis formation. Both paradigm and hypothesis formation seemed to benefit from additional mind-opening. Some daring may be necessary for mind-opening.

Technological change rapidly occurs and we can expect, as Ray Kurzweil predicts, that machines will be as mentally capable as humans in less than 20 years, and, in less than 30 years, he predicts they will be 1000 times more capable (The Age of Spiritual Machines, 1999). We can also expect much more of the unexpected. Additional mind-opening not only helps us expect the unexpected; it also helps one accept more of what is unexpected.

Readers of *JUAL*, *Education Revolution*, and other more open journals are probably the type of researchers who are already pushing the expansion of paradigms to include new, more open, and freer ways of being and learning. With the new fMRI brain scans we have a new measurement tool. Sharon Begley, Science Columnist for Newsweek, recently wrote a powerful article about fMRI scans and brain functioning.

Mind functioning is known through brain functioning. Hypotheses for which we previously did not have instruments to measure may now be available. Measurements surrounding these difficult to define areas may continue to open minds and prompt learners to become more self-directing.

Suppose a professor hypothesized that students would increase their self-direction if the professor and students would increase their tendencies to let things happen, rather than making them happen. This unusual goal is difficult to define, yet it may relate to the possibility of stem behavior somewhat similar to stem cells. Stem behaviors, it is hypothesized, generate other appropriate/needed behaviors in a wide variety of circumstances, especially classrooms.

A psychologist friend, Dr. James Guinan (personal correspondence, October 2005) offered the following 12 “behaviors”. I call these stem behaviors because I believe they

tend to generate a variety of other powerful behaviors that help one become more open and self-directing.

1. increase the tendency to let things happen, rather than making them happen.
2. have frequent attacks of smiling.
3. have feelings of being connected with others and nature.
4. have frequent, almost overwhelming, episodes of appreciation.
5. have the tendency to think and act spontaneously, rather than from fears based on past experiences.
6. have unmistakable ability to enjoy each moment, and to make the best out of each experience.
7. lose the ability to worry.
8. lose interest in conflict.
9. lose interest in interpreting the actions of others.
10. lose interest in judging others.
11. lose interest in judging self.
12. be compassionate to self and others without expecting anything in return.

These stem behaviors, while frequently difficult to keep in mind and do, can be learned by "doing" them. Some "doings" may be "not doings." As Gandhi said: "There is no way to peace. Peace is the way." There may be no way to increasing the tendency to let things happen other than through being open to allowing them to happen. This requires attention. We will not attend to certain matters unless we are open to attend to them. This may imply ridding oneself of old habits by strongly intending to get rid of old

habits, and by developing the new behavior of increasing the tendency to let things happen, rather than making them happen. Letting things happen may occur by concentrating on letting things happens first for one minute, then two minutes, then, three etc. We learn to stop doing something by stopping. We learn to do something by doing it.

If you have great disbelief in the power of, for instance, faking a smile to create a genuine smile, you are invited to try doing it. Better yet, try hard, fake laughing for 30 seconds and see what happens, if you want to laugh more. I have, individually and with groups, faked loud laughter for 30 or more seconds and watched, in myself and others, genuine laughter appear. The initial fake laughter is only fake in the sense that it is a tool to generate the real thing. I believe the same is true for smiling. Fake smiles can generate real smiles after a relatively short while. I am further suggesting that an fMRI scan may be used to note brain functioning/minding during these periods of smiling. Schools may employ radically different mindsets if more people were open to try some of these kinds of stem behaviors.

The laughing experiment mentioned above can be even more effective if all students (in a classroom) lay on the floor with number two student's head placed on the stomach of number one; number three's head on the stomach of number two; four on three, etc. The laughing moves the stomach and therefore the head of the person on it. The process is facilitated when the first student says "ha!" The second student says, "ha ha!" The third student says, "ha ha ha!" The fourth, "ha ha ha ha", etc.. Try it. The whole of the experience is more than the sum of its parts. As Aaron Copland said: "The whole problem can be stated quite simply by asking, 'Is there a meaning to music?' My answer

would be, 'Yes.' And 'Can you state in so many words what the meaning is?' My answer to that would be, 'No.'" As Plutarch said: "Music, to create harmony, must investigate discord." We will not get between words and action leading to self-direction and mind-opening if we only use words.

If you can imagine mathematicians doing mathematics before the invention of zero you will note that much computation would have been impossible without the invention of the placeholder, zero. Without a zero, we would not have time to do some of the complex computations which zero allows. Zero was invented around 750 C.E. in India and about the same time in Central America. It was not brought to the west until about 1200 C.E. It was not used widely in the west until near 1600 C.E. I mention zero because in this period of very rapid change, educators may need what might be thought of as the educator's equivalent to a mathematician's zero.

What would happen in classrooms if we had the power to do that which was previously unthinkable. Old paradigms need not interfere with our thinking if new possible tools for measuring are available through the use of tools like the fMRI. Old paradigms need not interfere if we notice they are not fixed and are themselves processes which are continuously evolving as one's education is one's continuous reconstruction of one's experience.

Zero was not evident for many people for many years as were plasma and the Bose-Einstein condensate not evident as forms of substance beyond solid, liquid, and gas until very recently. Some physicists involved with string theory are positing dimensions beyond height, width, and depth.

A hypothesis which may be tested is the difficult to define "openness to experience".

"Openness to experience" may be an educators' equivalent to the mathematician's zero. As the Berlin Wisdom Paradigm denotes aspects of wisdom, so too may we wisely develop an educator's equivalent to a mathematician's zero. An fMRI may help test hypotheses surrounding "openness to experience". We do not now have that educator's equivalent to a mathematician's but I believe a growing number of educators agree that an event or process like it is much needed.

We may even be able to develop one or more educators' zeros within the present paradigms. Todd May, in his Gilles Deleuze, *An Introduction 2005*, writes about the new difference way of knowing rather than only knowing within the old paradigm of identity. The new Deleuze/May notion says that we know something not through its isolated identity, but rather through how it is different from something else. It seems to me that this kind of new way of knowing can help us make more connections which can allow one to more easily open one's mind. New connections can help us form new hypotheses and paradigms. Perhaps it will be easier to be "right" and more difficult to be "wrong," within the new difference paradigm of knowing (a more open way of knowing).

May is the one who said: "We need to consider the possibility that the world…outruns any categories we might seek to use to capture it.…Our imagination must go further than that." Going further than that may help us, as Einstein said, to view the purpose of education as: that which helps one "to think something that can't be found in textbooks" (or journals). As Einstein said: "Imagination is more important than knowledge." Imagination requires attention. Openness to receive, precedes attention. As has been said, there is no way to openness, openness is the way.

Notes

Hypothesis formation, paradigms and openness are more easily formed if you allow yourself, sometimes in a mildly daring way, to be foolish for a few seconds of the day. Dale Carnegie many years ago wrote about the value of allowing yourself to feel foolish for 2 minutes a day (How To Stop Worrying and Start Living, Bantam 1952). Some of these ideas (and more) are included in the writer's not yet published: *Reopening Einstein's Thought: (About What Can't Be Learned From Textbooks)*.

Not long ago, and still today in the minds of some, the canons of scientific investigation did not allow for investigating the investigation of the investigation (the continuous reconstruction of experience). I mean that in the sense that one could not continue investigating their investigations for fear of infinite regress and confusion. That is changing in the minds of some including some chaos researchers and open physicists. Also included are some researchers studying neuroscience and neural plasticity. Greater openness allows researchers to explore areas difficult to define and some researchers are accepting more uncertainty. As we become more open, we can find that what we thought was so, is not so. The need for security, during uncertain and rapidly changing times, has been met through allowing for more uncertainty and more insecurity. That is something similar to knowing that as one knows more, one knows less and less. It is now commonly known that only 4% of the universe is matter and energy as we know them.

One mathematician defines mathematics as: "the study of invariance under transformation." That implies that mathematics is the study of how that which does not vary, varies. This definition was given over 40 years ago but what is one to think when the solid field of mathematics includes in its reports that Georg Cantor has found that

some infinities are bigger than others?

Look for the publication of *Reopening Einstein's Thought: (About What Can't Be Learned From Textbooks)* for additional elaboration of some of these ideas. My *Quantum Learning: Beyond Duality* (Pritscher, Rodopi, 2001) also amplifies some of what is included here.

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