

Neurobiological, Transformational and Disquisitional Learning

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Abstract

The role of traumatic learning in teaching is examined. Departing radically from 2000 years of Platonic teaching tradition, the authors argue for a single, neurobiologically-based theory of learning (NL). When applied in the classroom, the authors observed and report emergence of an effective, non-traumatic, curiosity-based, discovery-driven, mentor-assisted, transformational form of neurobiological learning (TL) and a second, codiscovery-based disquisitional form (DL). The authors conclude that NL, TL and DL could provide the necessary and sufficient foundations for a general, unified educational theory applicable in classroom, small group, tutoring and distance learning situations. Such a general education theory would provide new perspectives towards integrative health education.

Index Terms - Neurobiology, Neurobiological, Transformational, Disquisitional,

Education, Learning, Teaching, Trauma.

Introduction

For over 5,000 years, health practitioners have been trying to assist and augment integrated, personal healing; those with interest in public health and health education have striven to understand the causes of and ultimately influence the progression of injury (morbidity) and death (mortality) (Goldberg 2002). In fact, intense and unremitting focus within this area has resulted in the containment and, in some instances, eradication of such grievous conditions as puerperal fever, milk-related diseases of childhood, polio, smallpox, peptic ulcer disease, smoking, alcohol consumption, substance abuse, domestic violence, gun control, and most recently death itself. Yet, interestingly, the oldest and perhaps most all-encompassing human nemesis, violence, including psychological trauma and its side-effects, continues to elude us.

Current efforts have been directed at controlling access to instruments of violation (consider, for example, the importance placed on finding weapons of mass destruction in Iraq); the immediate treatment of obvious, physical results of trauma; containing the various modalities of criminal retribution; obtaining political and judicial justice; estimating and paying monetary remuneration for physical damage, mental pain and hardship as well as lost work potential; and the handling of convicted and repeat perpetrators. Add to this that integrative medicine and health practitioners dealing with psychological recovery from trauma have come to appreciate that what is learned traumatically is never really forgotten (Janik 2004). That is, victim-learners and perpetrator-teachers are engaging in a particularly *effective* form of learning - one that is not only incredibly persistent, but also highly resistant to change, has an inherent ability to self-replicate, and can mutate rapidly depending on individual, social, world and spiritual contexts far beyond the original learning event or weapon

employed (Janik 2004, 2005b, 2005c).

Interestingly, this familiar specter often reappears in education in the guise of what educators call 'effective teaching.' Hidden within many teaching theories and methods is an effective, albeit traumatic, and increasingly institutionalized core involving the impression of one person's (the teacher's) *ideas* into another's (the learner's) psyche as effectively, efficiently and, nowadays, profitably as possible. In fact, it is not uncommon at educational meetings for effective teachers to be asked to demonstrate various 'teaching techniques' that invoke effective, traumatic learning with or without realizing the full extent of their actions. Furthermore, increasing numbers of contemporary 'business of education' philosophies are being introduced emphasizing and sometimes demanding profit, effectiveness and efficiency within teaching that inevitably invoke and reinforce traumatic teaching and learning throughout the most impressionable years of life and in the case of public education, often throughout a learner's lifetime (see Bok 2003). It is as if, after suffering the death of his mentor, Socrates, Plato intentionally broke from Socratic tradition, and formed the first formal Western 'schools' of education - thus institutionalizing traumatic teaching - that trauma has co-evolved both with and within human society, until it has now matured to the point of becoming the vector of a full-scale, 2000-year pandemic.

If, in fact, traumatic learning is so effective, pervasive and underscores so much of effective teaching today, then, we reasoned, an understanding of how it actually occurs within the physical brain and body could provide critical insight into education and learning in general. Furthermore, in attempting to identify traumatic learning components and processes, we hoped to find evidence of a unified learning theory underlying the many 'fashion' educational teaching and learning theories, all of which appear of partial, but limited effectiveness. Our work focused on identifying physical,

neurosensory and neurobiological processes involved in effective, albeit traumatic learning - what we eventually collectively called neurobiological learning (NL)

We soon found ourselves turning attention from Platonic-based, primarily ideational, often British-American teaching and learning theories to the more Socratic, neurosensory grounded learning theories and methods of the physician-neurolinguists Gall (1758-1828), Bouillard (1796-1881), Broca (1824-1880), Wernicke (1848-1905), Jackson (1834-1911), Kussmaul (1822-1902) and Freud (1956-1939), as well as educators and linguists like von Humboldts (1667-1835), Schleicher (1821-1868), Muller (1823-1900), Steinthal (1823-1899) and Lenneberg (1921- 1975) interested in the neurobiological foundations of learning - the so-called German School of neurobiological educators. Our immediate aim was to incorporate medical-clinical knowledge of the psychological processes of trauma and recovery from trauma along with contemporary anatomical, pathological, experimental and medical imaging information to more correctly understand the fundamental, neurobiological elements and processes involved in effective learning (Janik 2004, 2005b, 2005c). It was our intention that this effort would ultimately lead to an effective alternative, non-traumatic form of learning - what we called hopefully a 'second learning pathway' that would be applicable to learning in general, including professional, continuing and public integrative health education (Janik 2005b, 2005c).

Something Amiss in the Land of Oz

There has, for quite a long time, seemed to be something fundamentally wrong with education in America and the world. In the 1960s, British educator, C. P. Snow spoke of a widening 'gulf of mutual incomprehension' between the scientific (physical) and literary (ideational) communities (1998). Snow attributed this to an evolving 'scientific-industrial revolution,' wherein worker-students required rigorous knowledge limited to that which was necessary to efficiently, effectively and profitably

perform a specific, productive task. Snow's genius was to look, albeit cursorily, underneath this 'politically-correct' explanation of his time, and identify a larger, deeper, at the time unidentifiable schism - one Snow considered a fundamental flaw in Western education. This deeper problem ultimately resulted in the loss of 'creative zest' - a physical 'dis-ease' postulated to be of epidemic proportion. If this problem were just better understood, he claimed, it would be within the grasp of contemporary educators to fix (Snow 1998).

Snow's solution was to espouse a new kind of education in which science "has got to be assimilated along with, and as part and parcel of, the whole of our mental experience" (1998: 16). This new kind of education would be, by nature, *more* effective, by capitalizing on "love," "affection" and "creative moments" - the elements that, in his opinion, made solitary human existence tolerable (Snow 1998: 6).

Two 'Unrelated' Epidemics of No Small Consequence

At about the same time, 'calls to arms' were sounding about other, seemingly unrelated social problems of 'epidemic' proportion: child abuse and neglect, accidents and injuries in young adults, sexual abuse against women, domestic violence, homicide, and more recently, war, genocide, despotism and terrorism. Humanity seemed to be awakening at least to the effects of violence. Like the 'problem of education,' these effects were sometimes felt to be symptoms of some elusive, deeper and more profound problem.

In the United States, it might be assumed that the Department of Education (DOE) and its private alter ego, the National Education Association (NEA), would be tasked to direct their resources to resolving the 'loss of creativity' problems in public schools, and perhaps the National Institutes of Health (NIH) along with the American Public Health Association (APHA), Medical Association (AMA), College of Preventive Medicine (ACPM), Holistic Medical Association (AHMA) and Association of Integrative

Medicine (AAIM) would become lead agencies in investigating the elusive source of these apparent disease epidemics.

Efforts have indeed been made, but as yet, most have been directed at documenting, describing and quantifying the existence, extent and growth of these symptoms, or summarily addressing the 'problem' in the absence of a deeper understanding of the cause. In education, the primary emphasis of the US government has been to 'leave no child behind' (behind what exactly?), while NEA has attempted to define and implement 'better' (more effective and efficient) teacher education and curricula. Although they do identify a variety of teacher inadequacies and student misbehavior as important issues, neither lists 'curiosity' or the growing lack thereof in their comprehensive, online 'Quick Click Select a Topic' A to Z Index or 'Issues in Education' list respectively (U.S. Department of Education 2005 and NEA 2005). Similarly, the current political solution as reflected in the 'No Child Left Behind' Act, with its focus on credentialing, curriculum, effectiveness, efficiency, testing and evaluation, reflects no real insight into the unresolved, 'deeper' problem. Similarly, NIH still has no single institute or thrust to address violence or trauma in all of its guises and manifestations (National Institutes of Health 2005). Of APHA's 24 discipline-based Sections and 7 Special Primary Interest Groups listed online, only within Maternal and Child Health is the issue of violence mentioned directly (American Public Health Association 2005). In fact, among AMA, ACPM, AHMA and AAIM's online Aims, Ethics, Practice Policies, Public Policies, Position Statements and Patient Education Statements there is generally no or at best limited mention of epidemic violence and trauma as we have begun to define it (American Medical Association 2005, American College of Preventive Medicine 2005, American Holistic Medical Association 2005, American Association of Integrative Medicine

2005). Furthermore, few of the public education efforts by these institutions reflect a knowledge or appreciation of the extent or perversity of this epidemic of violation. Some, in fact, utilize traumatic elements and methodologies to train professionals and 'get the word out' more effectively!

Some inroads on the other hand have been and are still being made. For example, among professional and academic educators, 'loss of creative zest' is not infrequently identified as an educational problem of some importance (Montessori 1966), just as violence, violation and trauma, as a whole, has been proposed to be a 'preventable' public health problem (Foege 1995). Furthermore, certain violent behaviors have been noted and reported to spread through populations in a way analogous to the spread of microbial disease (see Patten 1999 and his 'concept of behavioral contagion'). More interesting, violence, violation, trauma or traumatic learning are slowly but increasingly identified as a 'final common denominator' of these phenomena (Muckart 1991).

An Intersection of Unlikely Events

Restating Snow's 'problem:' Ethical educators and institutions try to teach efficiently, effectively, profitably and non-traumatically. Yet, this is an oxymoron in that 'non-traumatic teaching,' while acknowledged, is at the same time generally held to be inefficient, ineffective and costly. Overt traumatic teaching techniques are generally discouraged, though often indirectly and inadvertently employed in varying guises in order to achieve greater learning efficiency. Contemporary teaching, in fact, is so completely entangled in this paradox that it has led some to view the situation as 'damned if you do, and damned if you don't.'

Interestingly, the very thing most professional teachers seek assiduously to avoid - violence, trauma, violation - describes most people's effective learning experience from birth to death. Otto Rank, in his classic work on perinatal psychology

spoke of intrauterine ecstasy interrupted by the “agony of biological birth.” We are, in fact, born traumatically. Once the power of traumatic learning is impressed within us, we continue to learn traumatically day to day, simultaneously repressing and reenacting traumatic events in a feeble attempt to recapture the energy used to repress the traumas; resolve unwanted side effects, erase the experience, and ultimately avoid what we have learned traumatically to fear most in our lives: the assumed intolerable pain of an inevitably traumatic death (Rank 1924).

Birth trauma, however, effects not only the newborn (who retains little conscious memory of the birth event), but also the adult mother (who retains at best only incomplete cognitive memories of the actual agony of childbirth). It is important to note that traumatized mothers are the initial and often primary source of behavioral imprinting, language acquisition and early learning paradigms - the penultimate, effective, traumatized teacher (Janik 2005c). When viewed in this manner, it may seem amazing that, given its ubiquitousness, humans can find any non-biased place from which to recognize violence, trauma, violation - traumatic learning *in situ* - as it occurs throughout life.

Traumatic learning and teaching are, in fact, ruthlessly effective, efficient and historically profitable, but are accompanied by debilitating side effects that include ideational inflexibility, grandiosity, anxiety, depression, repetition compulsion and increasing numbers of unwanted neurosensory-triggered behaviors that insidiously replace curiosity (Janik 2004, 2005b, 2005c).

Yet another classical side effect of traumatic learning is the *expenditure of psychic energy* to repress pain, triggers, unwanted behaviors - anything that might suddenly and consciously direct the learner’s attention back to the feelings and emotions associated with lack of control, violation and traumatic learning events. This expenditure of energy, which we define as depression, is held to limit what a learner

is willing and able to sense, discover and thereby assimilate. In other words, a neurobiologically-based process should exist whereby traumatic learning inhibits and eventually eliminates neurosensory-based curiosity, and, at the same time, individual volition (Teicher 2002 and Janik 2005b, 2005c)

What Neurobiological learning is NOT

By 1999, about two years of investigating NL in an English for Special Purposes (ESP) classroom at Intercultural Communications College in Honolulu, Hawaii, USA, that the human brain is NOT:

- * a simple one-to-one, grammatical or structural-rule-to-neuron system; or
- * organized top-down or bottom-up, or based on semantic, lexical, grammatical, structural, psychological, emotional, formal or cognitive logic.

Furthermore, learning within the human brain does NOT:

- * begin at birth (though it appears to be reformatted at this time)
- * operate like a 'blank tablet,' a 'language virgin,' or appear to be based on a preconceived, universal grammar;
- * occur in any one particular way, nor does it occur in the same way in infants, children, adolescents or adults;
- * necessarily become more effective beyond the first few repetitions, nor from increases in instruction, teachers, classrooms, schools, syllabi, curricula, administration support or money;
- * process or proceed in exactly the same way in males as in females;
- * return, after onset of puberty to the state of ease experienced during infancy and early childhood; or
- * increase or decrease innate intelligence after puberty at least until acquired neuro-anatomic disabilities limit such (Janik 2004).

What Neurobiological Learning IS

What could be said at that time was that learning within the brain:

- * is based on neurosensation including five 'classical' neurosenses (smell, sight, taste, hearing, tactile sensation) and at least two additional senses (kinesthesia and internal time consciousness);

- * occurs in stages, steps or levels and is most effectively stored, recalled and utilized when sensed object-data are associated with other object-data and feelings, grouped with other associations into interpretive, and where possible, symbolic forms, given meaning within a personal, social, world and spiritual context;

- * occurs in any way possible, using whatever learning resources are available to the learning at any particular stage, step or level of learning (though, in general, sensed object-data tend to be stored in proximity to like object-data which in turn describe statistically similar areas of the brain);

- * occurs pre- and postnatally in association with an imprinteur, whether real or imagined;

- * proceeds in a manner largely determined by the learner's perception of the birth event, imprinteur reactions, and the learner's hormonal state;

- * accelerates and reformats during distinct learning periods based on neurobiological principles such as neural usage, recruitment, displacement, pruning and truncation, that are bounded by distinct periods of myelination;

- * is quickly lateralized (usually reflected by 'handedness'), which accelerates localized neural usage, speed and dedication (similarly, less utilized neurons and interneural connections are constantly pruned);

- * develops differently in males and females;

- * determines perceived semantic, lexical, structural, psychological, emotional, cognitive and logical rules, as well as truth, in and of themselves have little determinative learning power (they do, however, provide a certain 'comfort' during pre-

discovery chaos and reflection).

- * can and does occur continuously in virtually any setting;

- * is more effective when the learning object is introduced peripherally such that learners must expend energy to centralize it, rather than centrally;

- * is strengthened by rich sensory, emotive and kinesthetic association;

- * is based in rhythmic-motor (cerebellar) as well as auditory-visual and visual-spatial (cerebral) symbolism.

- * is, postpubertally, particularly effective when personal cognition as well as social, world viewpoint and spiritual metacognition lend further meaning to what has interpretively or symbolically learned;

- * involves virtually all body systems and is amenable to quantitative physical measurement and investigation; and

- * is determined to be 'true' or 'real' when richly associated with feelings, emotions and kinesthesias which are amenable to change with further experience (Janik 2004, 2005b, 2005c).

Chasing the Tiger

Applying these tenets in the ESP classroom, by the end of 1997, learner's monthly Test of English as a Foreign Language (TOEFL, a trademark of Educational Services Inc, Princeton, NJ) scores had increased threefold over published international averages, and student interest, as measured by attendance and preferential selection of the program by ICC students had increased tenfold (Janik 2005a).

More interestingly, student interest quickly moved from proscribed, central learning topics and objects to student-selected, central learning topics incorporating peripheral learning objects selected from authentic, relevant, American, first-year, college level reading and listening materials (e.g. the James A. Michener book and

later movie, 'Hawaii,' and 'Science News' magazine). Furthermore, learners identified and developed a common interest in 'what it would be like for an international student to study at an American college.' Coincident with these two key changes, the curriculum collapsed into a brief overview syllabus with a greatly expanded, diverse set of learning resources in which necessary college learning objects (e.g. critical reading and writing elements) were constantly being introduced peripherally. Learners, to our delight, enjoyed discovering the various peripheral learning objects and pointing them out to instructors. *In effect, the learners knew what they needed, individually and collectively, and proved adept at self-selecting central topics amenable to the introduction of peripheral learning objects using resources that they knew would progress them to their goals.* Using a control, we found that in a classical classroom setting, such resources, introduced centrally, met resistance (Janik 2004, 2005a, 2005b, 2005c).

Of greatest interest, however, was, as we slowly attempted to pare away traumatic learning elements and techniques, study naturally evolved towards a curiosity-based, discovery-driven, mentor-assisted transformational form of learning (TL) *as long as the instructors relied on supportive demonstration, what we call mentorship, rather than teaching* (Janik 2005b, 2005c).

Transformative Learning

While a study still in progress, it is possible to present some of our more interesting observations regarding the evolution of TL theory in the classroom.

First, it seems to us that TL (effective, non-traumatic learning) appears neurobiologically to utilize a 'second learning pathway.' While the teaching form of NL appears to invoke a common amygdalic-hypothalamic-thalamic-based traumatic learning pathway, TL may be utilizing a hippocampal-thalamic-cingulate-based non-traumatic learning pathway (Janik 2004, 2005b, 2005c). We are in the process of

organizing a medical imaging study to look more closely at this hypothesis.

TL requires and reinforces curiosity. This appears to be true in that learner transition from traumatic (traditionally taught) to non-traumatic learning seems to take, on the average, one to two months, and a small number of learners have seemed uncomfortable or even unable to make the transition (Janik 2004, 2005c). We believe this is due to a unique characteristic of curiosity-based, discovery-driven learning - that of prediscovery dysesthesia. That is, we have observed that discovery is uniformly preceded by a difficult, often stressful (dysesthetic) period. According to classical teaching theory, pre-discovery dysesthesia should decrease and eventually disappear with repetitive exposure and student command of learning. In TL, the prediscovery phase appears to be uniformly necessary for the 'pop out phenomena' (and thereby discovery) to occur (Janik 2004, 2005a, 2005b, 2005c). Our indicator of 'success' around prediscovery dysesthesia therefore is the development in learners and mentors of a gradually increasing tolerance and eventual recognition, appreciation and welcoming of prediscovery dysesthesia as a herald of discovery as modeled *by the learner's mentor*.

With TL, there appears to us to be a Law of Learning Conservation. That is, learning opportunities are never lost; everything sensed is in fact a learning opportunity. But what if learners, for any reason, do not engage in curiosity-based, discovery-driven, mentor-assisted transformative learning? We have found, in fact, that some learners have become so accustomed to being given questions and answers - being taught or entertained - that they no longer naturally engage their curiosity, a situation exactly like that identified by Snow.

We encourage all 'newcomers' to TL to question everything - especially any ideas, theories, hypotheses or statements of fact provided by the mentor. Classical teaching says that this will result in classroom management chaos and demonstrate

negatively the teacher's lack of subject knowledge and ability to teach. Our experience, on the other hand, clearly indicates that this is where transformative learning begins. Vygotsky and Montessori astutely observed that when curiosity is engaged, student control, topic control (e.g. curriculum) and classroom management become unnecessary hindrances to discovery and learning (2002 and 1966 respectively).

Most interestingly, we found, as we pared away what we perceived to be traumatic teaching elements and techniques, that classical testing and evaluation were, in fact, counterproductive to effective, transformative learning. In fact, over the years, there has been a growing movement to utilize testing and evaluation as effective learning tools. Yet, testing and evaluation are, by their nature, largely non-volitional and thereby traumatic. Over time, we found Delphian-style capstone projects an outstanding way of non-traumatically evaluating both learner and mentor efficacy especially in small group learning situations. 'Delphian-style' refers to the use of progressive class consensus, rather than fixed, external values, to measure learning; 'capstone projects' utilize elective learner participation in a 'final project' that demonstrates each particular participant's ability to use and apply (rather than simply identify, name and/or ideationally understand) learning acquired by a particular group, at a particular composite level, with regard to a particular topic.

Evaluation, on the other hand, devolved into two process-driven components: After completion of the capstone project, learners provide feedback to mentors by electively answering four open-ended questions: (1) What will you always remember about this class? (2) What one thing did you like BEST about this class? (3) what one thing did you like LEAST about this class? (4) Write a suggestion about how to make this class or instructor better. Second, mentorship quality is also reflected in the nature and extent of each mentor's voluntary participation in peer-reviewed,

professional activities - something we have come to regard as a 'natural' outcome of learner and self-applied mentorship.

It quickly became clear to us that mentorship was the 'glue' that binds TL and makes it work. However, the definition of mentorship within TL is somewhat different from contemporary concepts of mentoring within teaching. For example, TL mentoring is equally effective whether the mentor knows the 'answer' to learner questions or not (Janik 2004). In fact, we have found that not knowing an 'answer' can be more effective, given that it (1) creates a pivotal opportunity to demonstrate curiosity, prediscovery and discovery to learners; (2) provides learners an opportunity of observing and imprinting these processes 'in action;' (3) allows them to test whether discovery really works; and (4) provides an opportunity to observe and want to experience the joy that discovery eventually encompasses (see Janik 2005c). It is this last piece that, we believe, makes transformative learning, when experienced, as powerful and persistent as traumatic learning without the liability of traumatic side effects.

Looking Back to the Future

Currently, with approximately 300 NL/TL program graduates, our long-term followup indicates that roughly 80% of neurobiological learners interested in studying at an American college or university have had the opportunity of studying at the baccalaureate level or above at one of their top five choices of institutions, and of these students, fewer than 1% have had to leave academic study in America because of poor academic performance. This is in opposition to 'traditionally taught' ICC TOEFL students, roughly 40% of whom are expected to gain immediate entrance to any baccalaureate level program in the USA, 75% of whom are expected to not complete their first year of study (numerous 'traditionally taught' ICC TOEFL students have, however, succeeded in gaining access to American community colleges at the

associate and pre-baccalaureate English Second Language level.

Given the program's academic and corresponding financial success, not long after demonstrating non-traumatic neurobiological learning in the TOEFL ESP classroom, questions regarding the 'unusual nature of the eclectic teaching style,' the applicability of NL to other learning venues (e.g. conversational, self-study, tutoring and distance learning situations), as well as the transportability of NL programs to other locations and institutions were immediately raised (Janik 2004).

At this time, we have trained, to our satisfaction, one of four interested, classically-trained 'teachers' in NL theory, methodology and application; a second is in the second year of training (Janik 2005a). We are currently in the process of devising an internet-browser-based study guide and an NL certification program to further assist this process. In addition, NL TOEFL learning resources are being bundled for transfer and implementation at another site.

Several years ago, the first author wrote, produced and offered a hybrid NL distance learning version of the NL TOEFL course entitled "TOEFL by Internet," which while less than academically and financially successful by ICC standards, has prompted us to re-examine TL over distance in terms of a disquisitional approach that involves integrating local mentors into NL/TL-based distance learning efforts.

Currently, transfer of NL/TL theory and methodology into the beginner-level 'conversational' as well as 'advanced' level academic classroom setting is in process (see Janik 2005a).

A special note about classically-trained teachers who have not been immediately successful in acquiring NL theory and methodology to our satisfaction: One, an experienced Ph.D., and the other, who held a double Master, reported that the transition from teaching to mentorship at a late stage of professional development was exceedingly difficult. One, interestingly, remains interested in NL theory and

methodology, but, at the time of this writing, only tangentially.

Our work thus far leads us to believe that TL is applicable in the classroom, in tutoring situations and, in a disquisitional format (DL) over distance, although many interesting details of theory, method and application deserve further investigation. NL, and by derivation, TL, well appear to provide the long sought, unified educational theory necessary to reorient education and project it over distance to truly attain effective, non-traumatic learning without walls, the next logical step in humankind's reach beyond ideational, geopolitical and ultimately planetary boundaries.

Summary

It is our hope that this cogent though simplistic overview will stimulate interest within practitioners, researchers and educators to participate in the search to understand, contain, and eventually overcome one of the most damaging epidemics of 'disease' - violation, violence and attendant traumatic learning - in order to open a door to a new, effective, non-traumatic form of learning, and ultimately, life.

Transformational learning (TL) is to us just as 'exciting' and 'addicting' as teaching and traumatic learning; however, TL has a distinctly different character and 'feel,' and most importantly, we believe, different result. It is, for example, not only more coherent, but also more physically engaging and more socially, politically and spiritually relevant. Because of its very nature, it will always be contemporary. It is more malleable - like the scientific method, constantly changing the 'meaning' of what is learned as new discoveries are made. In terms of application, it is admittedly 'scary' for some classically-trained teachers, ultimately perhaps because within it exists the seed of individual freedom: the ability to see truth not as an absolute reflection of any teacher's own ideas or ideals, but as a reflection of what each individual learner needs, wants and desires in a contemporary, physical world.

Reviewer's Note: As I was reviewing the final draft of our paper, I found myself pondering its somewhat unusual format and style. It then occurred to me that I was experiencing transformative learning! This was, of course, not my purpose. Yet, as I checked and rechecked it for errors, I caught myself rereading parts that I found interesting, even intriguing, and my natural curiosity taking over. It wasn't my intention or expectation to try to learn anything new; yet, I found myself discovering, in a very relaxed manner, new ideas I hadn't thought and without the usual burdens and expectations I have often felt in classical teaching and learning situations. That's when it struck me that I was experiencing peripheral learning in a non-traumatic manner exactly as described in the paper. Now I realize that this may be yet another important effect of NL, TL and DL - that the processes involved can be experienced even when presented in a report. Similarly, I realized that NL, TL and DL may effect the format and style reporting in new ways. - W.G.

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