

# Neurobiological and Transformational Learning

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**Abstract**—*Departing radically from 2000 years of Platonic teaching tradition, the authors argue for the existence of a single, neurobiologically-based theory of learning (NL) underlying the more than forty contemporary teaching and learning theories. This new, 'brain-based' learning theory is derived from clinical experience with psychological recovery from trauma coupled with contemporary medical imaging information on how the brain learns 'effectively.' The role of trauma in teaching is examined. When applied in the subsequent language acquisition classroom, the authors observed the emergence of a 'non-traumatic,' curiosity-based, discovery-driven, mentor-assisted, transformational form of neurobiological learning (TL) and provide select observations of interest. The authors conclude that NL and its derivative, TL, may be the foundations of the long-sought 'unified educational theory,' the next logical step in humanity's slow but steady movement beyond traumatic, institutional, national and ultimately planetary boundaries of education.*

**Index Terms**—*Neurobiology, Neurobiological, Transformational, Teach, Trauma, Brain-based, Learning.*

## 1. INTRODUCTION

Medicine and public health have successfully resolved many 'classical' epidemics, such as puerperal fever, and milk-related disease. More recently, they have begun addressing peptic ulcer disease, heart attacks and stroke, smoking, alcohol consumption, gun control - even longevity. Yet, interestingly, one of the oldest human nemeses, violence - in medical terms, psychological trauma - and its widespread consequences, although acknowledged, continue to elude us [1,2]. Even more interesting, is the recent appearance of this specter in the guise of 'effective' teaching within educational institutions - in short, the institutionalized impression of the ideas of one person (a teacher) onto another (the learner) as effectively and efficiently as possible [2-5].

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## 2. THE LIABILITIES OF EFFECTIVE TEACHING

That teaching may have limitations or even liabilities is not a new idea. The presence of myriad educational theories (over 40 just within linguistics alone), each applicable to a limited domain is alone highly suggestive [4]. That parents, schools, educational boards, states, societies and nations are currently engrossed in issues of assessing teaching curriculum and quality, speaks further to this issue. C. P. Snow in his now famous work, *The Two Cultures*, identified within contemporary higher education a disturbing 'loss of creative zest' [2, 5, 6]. To these, we add that effective teaching, as practiced in many educational institutions today, by its traumatic nature invokes traumatic learning along with its attendant side-effects: exhaustion (repression, depression and 'burnout'); obsession with learning contracts, curriculum and lesson plans; overemphasis on student and classroom management; compulsive need for quality assurance; and the maintenance of a constant level of anxiety and often fear through testing and evaluation [2, 5].

If 'effective' contemporary teaching is, in fact, traumatic and so ubiquitous, where does it come from? Why are we so blinded to its traumatic nature?

## 3. THE ORIGIN OF TEACHING TRAUMA

Otto Rank, in his seminal work, *The Trauma of Birth*, provided the first clue: Traumatic inculcation and learning are imprinted experientially in humans at birth [6]. Teaching, when most 'effective,' copies, invokes and reinforces effective survival learning reflex patterns assimilated from birth [2, 4, 5, 7]. Given the ubiquitousness of the birth event, can there be any wonder that educators, teachers, learners and parents are at the least partially blinded to trauma, teaching, traumatic learning and their effects?

Ever since Plato broke from Socratic tradition and formed his famed Academy and institutionalized 'traumatic' teaching, it has co-evolved both with and within us [4, 5]. 'Effective' traumatic teaching has become pandemic to the extent that it is difficult these days to conceive of a non-traumatized control group!

Nonetheless, we theorized that in attempting to

co-understand the processes of 'effective' traumatic learning involved clinically and within the human brain, we might be able to construct a fundamental, theory of effective learning that might underlie the many educational theories and methods [4, 5].

#### 4. THE GERMAN SCHOOL OF EFFECTIVE LEARNING

We therefore turned our attention from Platonic-based, primarily ideational, British-American learning theories to Socratic-based, neuro-sensory, medical-physically-based, learning theories in the German tradition and proceeded to investigate what we call neurobiological learning (NL) [2, 4, 8, 9]. Following in the footsteps of the physician-neurologists 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 educator-linguists interested in the neurobiological foundations of learning such as von Humboldts (1667-1835), Schleicher (1821-1868), Muller (1823-1900), Steinthal (1823-1899) and Lenneberg (1921-1975) - the so-called 'new' German School of neuroanatomical linguists, our hope was that incorporating contemporary medical-clinical knowledge of the psychological processes of recovery from trauma along with concomitant medical imaging information, would eventually lead us to a second, *non-traumatic* form of effective learning [2, 4, 5, 8].

The first author, in his academic monograph, *A Neurobiological Theory and Method of Language Acquisition*, described what may be the first cohesive theory of NL, complete with natural laws (tenets), attendant methodology, and a description and evaluation of its in-classroom application at Intercultural Communications College in Honolulu, Hawaii, USA [2, 4, 5].

#### 5. A SECOND LEARNING PATHWAY

One result of classroom application of this work was the slow evolution of an alternative, non-traumatic, 'second learning pathway.' Curiosity-based, discovery-driven, mentor-assisted, and distinctively transformational in nature, we called this derivation of NL transformative learning (TL) [2, 4, 5]. We are now pleased to present some of our more interesting observations in applying TL theory in the subsequent language learning classroom at our institution.

##### 5.1 Peripheral versus Central Learning

In rethinking the classroom neurobiologically and transformationally, it quickly became apparent that we could not expect to 'teach' learners near-native grammar, structure, discourse, communication and interpretation.

We could, on the other hand, strengthen individual curiosity, pre-discovery, discovery and critical thinking skills *in the subsequent language*, introducing semantics, lexis and discourse peripherally [2, 4, 5]. The result was that learners became largely free to choose their own learning topics. When, during use in our subsequent language classrooms, learners brought up semantic, lexical or discourse questions, it required energy on their part to centralize, define and communicate their questions in the subsequent language, pursue an answer and make an individual or collective discovery. This alternative pathway appeared equally, and in some instances more effective than traumatic introduction of a central learning object [2, 5].

##### 5.2 Learning Contracts, Lesson Plans and Curricula

The overall result was a substantive reduction in reliance on learning contracts, curricula and daily lesson plans at the expense of greatly expanded teaching resources. Interestingly, the internet proved to be an excellent learning resource, at least within this framework, providing innumerable peripheral learning opportunities. In this manner, NL/TL learning occurred around 'authentic,' physically-based student experiences rather than teacher ideas.

##### 5.3 Expanding the Neurosensory Repertoire

NL events proved well grounded in the five classic senses (smell, vision, hearing, touch, taste) to which, over time, we added two more: kinesthesia (internal body sensation) and time consciousness [2, 4, 5, 10, 11, 12]. The later in particular imparts perception of change over time (rhythmicity in association with kinesthesia, for example, in dance, one of the classical learning forms) [11, 12]. Expansion of the neurosensory repertoire has opened up a wider variety of appeals to learning. We believe that the richness of NL/TL theory in application (as in this example) supports our thesis that it represents a useful, productive and fundamental education learning theory.

##### 5.4 Pre-Discovery Dysesthesia

A particularly interesting observation is that discovery was uniformly preceded by a difficult, often stressful (dysesthetic) period of pre-discovery [2, 4, 5, 10, 11]. According to classical teaching theory, pre-discovery dysesthesia should lessen and eventually disappear with repetition and increasing command. NL/TL, on the other hand, posits the pre-discovery phase as uniformly *necessary* for the 'Pop Out Phenomena' (and thereby discovery) to occur [2, 4, 5, 13]. Our indicator of success around pre-discovery dysesthesia became the development of a gradually increasing tolerance and eventual recognition, appreciation and acceptance of pre-discovery dysesthesia as a prelude to discovery *as modeled by the mentor*.

### 5.5 Neurobiological Truth

In NL vocabulary, our goal changed to that of 'welcoming' pre-discovery and learning to 'trust' that one's curiosity and searching would be rewarded [2, 4, 5]. As a result of this process, we found that discovered 'truths' developed as a holistically plastic rather than ideationally concrete phenomenon. Learners tended to relate the measure of kinesthesia experienced during discovery, at least to some extent, with a sense of felt 'trueness.' This is quite different from classical teaching.

### 5.6 Characterization

In traditional teaching terms, NL/TL has been characterized as serendipity, event-driven, content-based, reconstructionist and even eclectic [2, 4]. These same observers, however, often comment on the unusual way our learners 'use' mentors. Our learners relate to the *mentoring process* rather than learning contracts, teacher ideas, lesson plans or curricula.

### 5.7 Mentoring

It quickly became clear to us that mentorship was the 'glue' that binds TL and makes it work. NL/TL-based mentoring is, however, somewhat different from the contemporary concept of mentoring within teaching. For example, mentoring under NL/TL is equally effective whether the mentor knows the answer to learner questions or not. In fact, not knowing an answer (1) creates an opportunity to demonstrate curiosity and inquiry, (2) provides learners an opportunity to observe the pre-discovery, (3) allows them to test whether discovery really will take place, and (4) observe and want to experience the joy that discovery eventually brings.

### 5.8 Law of Learning Conservation

With TL, there appears to us to be a Law of Learning Conservation: Nothing is lost; everything becomes a learning opportunity [2]. This brings up a question that invariably surfaces among new NL/TL mentors: What if my learners do not engage in learning? Some 'newcomer' learners might have become so accustomed to being given questions and answers - to being entertained or 'taught' - that they no longer engage their natural curiosity [2, 4, 14].

We encourage all, but especially 'newcomer' learners to question everything. Everything - especially anything said. Classical teaching suggests this would result in chaos and be a demonstration of the teacher's lack of ability to control students and manage a classroom. Our NL/TL mentoring experience, on the other hand, clearly indicates that *this is where learning begins*, and when curiosity is engaged, student control and classroom management become unnecessary hindrances to discovery.

### 5.9 Testing and Evaluation

In implementing 'volitional' NL/TL learning, the

issue of student testing and teacher evaluation always surfaces. Testing and evaluation are, by their nature, largely non-volitional and thereby traumatic. Some might say that it is their traumatic nature that makes them effective teaching tools [2, 4]. Despite an a priori resistance to the incorporation of testing and evaluation in the NL/TL classroom, it was of great interest to us to compare NL/TL learning and classical teaching outcomes. Over time, we found Delphian-style capstone projects an outstanding way of non-traumatically 'testing' individual and small group learning. 'Delphian-style' refers to the use of progressive class consensus, rather than fixed, external values to measure learning; 'capstone project' describes elective learner participation in a 'final' project that demonstrates each participant's ability to use and apply (rather than identify and understand) the learning elements used by a particular group, at a particular level with regard to a topic.

Evaluation, on the other hand, 'devolved' into two parts: After completion of a Delphian 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? and (4) Write a suggestion about how to make this class or instructor better. Second, mentorship is held to be reflected in the nature and extent of each mentor's voluntary participation in peer-reviewed professional activities - a 'natural' outcome of self-applied mentorship.

## 6. UNIFIED LEARNING THEORY

Given the broad swath of NL and TL, we felt free to incorporate whatever 'fashion' theory, method or technique that worked in any particular situation. This may or may not seem surprising, but to us it was interesting how easily other educational theories and methods could be implemented non-traumatically yet effectively *within an NL/TL framework*. Without the NL/TL framework, this is not usually the case. We regard this as further evidence that NL and perhaps even TL may truly underlie other 'effective' teaching theories and methods.

Our mentoring group at ICC come from diverse academic and educational training backgrounds, yet, I think it fair to say that as a group we have become increasingly convinced that curiosity-based, discovery-driven, mentor-assisted, transformational learning (TL) has a distinct, and, we surmise, significant, central role to play in contemporary education. Furthermore, we believe NL/TL capable of providing a rich theoretical framework not only in the classroom, but within tutoring and even distance learning venues [2, 4, 5]. Towards the latter end, we have developed, implemented and are now evaluating a distance learning application first implemented at ICC in 1997 that we call 'TOEFL by Internet.'

## 7. CONCLUSION

NL and its derivation, TL, we believe, may represent the long sought after unified educational theory not only of the post-methodological educational era, but also of the 'next generation' of education - that of 'digital' education, without walls, over extended times and distances - the next logical step in humankind's slow but steady transition beyond geopolitical boundaries and even those of our planet.

## ACKNOWLEDGMENT

The authors thank the owners, staff and students of Intercultural Communications College (ICC) for their generous and wholehearted participation in this extended experiment in non-traumatic, effective learning.

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