

## **Language Teaching in the Year 2010 – Applied Linguistics**

### **The First Seoul International Conference on Phonetic Sciences**

**SICOPS '96  
Samsung Convention Hall  
Seoul National University  
Seoul, Korea  
October 24 - 26, 1996**

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### **Language Teaching in the Year 2010 – Applied Linguistics**

**Because of the wide use of new technology in brain research concerned with word processing, researchers in applied linguistics are just beginning to understand how language is acquired and the teaching approaches which complement that process. The technology that promises to enlarge our current theory about phonetics, phonology and speech pathology is positron emission tomography (PET) and magnetic resonance imaging (MRI). While currently used in medical research, the applications for the professionals concerned with teaching have yet to be defined.**

**Some of the interesting findings coming out of research studies at the Cyclotron Radioisotope Center at Tohoku University, Sendai, suggest that cultural and ethnic differences may not be a factor in how individuals process information. This study, a replication of the original, single word design completed in the USA, was concerned with the imaging and sequence of language production as seen in Japanese and English bilingual speakers during the task of reading and verb generation of kana and kanji words. The lack of significance differences found on the task performance would suggest that the Japanese student has no anatomical barrier that would limit the acquisition of English as a foreign language. It may be that the “how and when” of language instruction are the critical factors in language teaching.**

**Other factors that impact on the efficiency of teaching and retention of subject matter are concerned with gender difference and anxiety. MRI studies have documented different anatomical structures in females compared with males. This also has been observed in more subjective tests, e. g., facial recognition and evaluation of emotional tone. The greater neural connectivity evident in female brains may give the female a greater advantage when learning a language task. Activity in the frontal cortex may be an indicator of anxiety level, which now can be measured and quantified.**

**This slide presentation will examine the brain imaging of the site and sequence of language production in bilingual speakers, provide a better understanding of exactly how speech occurs, look at the most appropriate time for language introduction in terms of the neurobiological context, examine gender differences, review how memory forms and the significance of anxiety factors in language acquisition.**

**Participants will be asked to analyze current teaching strategies to determine if they contribute to learning. If research data is implemented, the classroom of 2010 may be very different.**

### Language Teaching in the Year 2010: Findings and Applications

Looking over the program options at this conference, it is apparent that the Phonetic Society of Korea has put together an outstanding group of linguists who represent the tenor of thought in phonetic science. It also reflects the unfolding trends in that historically, there has always been a strong emphasis on phonetics, reading-translation-writing and more recently, oral communication. Focusing on oral communication is the current thrust in Japan. Our educators have realized that for all of the years of English education, our young adults can't speak well. What's been missing? Perhaps it's our failure to give appropriate recognition to new research borne of the findings of the Decade of the Brain, the title of legislation in America. In the USA, we have declared the 90's as the Decade of the Brain. Much money and congressional support have gone into the effort in order to explore and understand brain functioning in all aspect. This understanding will enable us to enter into an era of true, multidisciplinary efforts. Such is the focus of my presentation.

My purpose is to introduce you to the technology used in brain mapping, positron emission tomography (PET) and magnetic resonance imaging (MRI). This scientific effort is also known as brain imaging and has unlocked many of the secrets associated with word production. From these early findings, I would like to point to some applications to our particular field, as well as make some predictions.

#### Brain Imaging

Using visual graphics, enables comprehension of how the brain probes, communicates and controls all of our physical functions in addition to our mental and emotional responses. Now we can capture a thought in progression or watch a word unfold from its perception to production. The sophisticated new technologies that have spawned the birth of brain imaging technology are PET and MRI. These technologies are the primary tools used to examine functional human neuroanatomy. It uses quantifiable neuroimaging procedures that enable the computer to "read the brain." They are noninvasive procedures that can be used on children and adults. (Silva, 1992). These complex procedures will be simplified once you see the slide explanation.

Applications: One of the more interesting studies has been the USA study of localization of language, the components of seeing, hearing, thinking and speaking (Peterson, S. E., Fox, P. T., Posner, M. L., Minton, M., and Raichle, M. E. 1988.) Another is the Tohoku University study in Sendai, Japan which compared the ways that bilinguals (Japanese and native English speakers) processed nouns and verbs as found in Kana/Kanji (Silva, W. In press, 96.)

The bottom line of the Petersen, et al, study is that we know where language originates in the brain and in what sequence. Once, neurologists thought that language evolved in a straight line or a linear model. Now we know that language production may begin in the occipital lobe if the subject is seeing, but that immediately there are many parts of the brain that are activated in varying capacities, even as we see. This "old theory" led speech therapists to develop treatment plans that focused on one modality e. g., auditory or visual perception. We realize now that language becomes memory via the elaborate inner actions of the synaptic connections. Permanency is established and maintained through a teaching approach that used what is known in America as V.A.K.T. (visual, auditory, kinetic, tactile). The efficient teacher of language would be smart then to employ VAKT strategies, if she wants the lesson to become permanent learning.

The findings of the research team at Tohoku School of Nuclear Medicine, the Cyclotron and Radioisotope Center, found no difference in the way in which bilingual's process kana/kanji in terms of localization of function. This does seem to debunk the myth in Japan that the Japanese brain is different and can not learn English. It may also suggest that there are no variables in brain functioning that prohibit different races from learning a language. However, there is a paucity of research in this area and it is premature to generalize to predictions.

### The Role of the Neurotransmitters in Learning

While the PETs/MRIs are the vanguard of brain research currently, the emerging data from the way neurotransmitters work must be noted. It is at this site that learning becomes permanent. Research has demonstrated that the brain learns and remembers throughout life by constantly changing its network of trillions of connections between neurons as a result of stimuli from the environment. These synapses grow stronger with learning and weaken when not used. **Applications:** While the data in this field is very new and proliferating, it would suggest that what we eat, the adequacy sleep and the frequency of our exercise and sexual experience, could be profound stimuli, responsible for optimal, biochemical functioning. As a teacher, I would be more concerned about my student's dietary habits, their daily exercise the state of their emotional health as opposed the their possession pencils and paper. The situation is similar to running a computer: Without the right software, it "ain't gonna run." This research field may also point to the supreme value of the teacher as the primary engineer of knowledge acquisition. (Kandel, Eric R., Schwartz, James, H. and Jessell, Thomas, M. 1991)

### Timing of Bilingual Education

It is a common belief that it is important to start language education early. But how early? The work of Harry T. Chugani, M. D., a pediatric neurologist from UCLA, California provides some insights. Chjugani mapped the growth and decline of synaptic connections from birth through adolescents using PET. He documented a remarkable proliferation and decline from birth to adolescence. The research suggests that children generate double the amount of energy of an adult brain between the ages of 3 - 11. The neurological system develops progressively at first and then regressively as the maturational agenda unfolds.

**Application:** It is apparent that preschool is the time to initiate language instruction.

### IQ and Emotional Intelligence

Daniel Goleman, a psychologist from California and author of "Emotional Intelligence," (EQ) feels that his research shows that these attributes, IQ and EQ are separate entities. Goleman asserts that an emotionally intelligent person has the following characteristics: is self aware, knows their own emotions, can manage their emotions, can motivate oneself, and is able to recognize emotional reactions in others and is capable of handling relationships (Goleman, Daniel, 1995). The exciting thing about this is that the EQ can be diagnosed and quantified through PETs/MRIs. Neuropsychiatrists have demonstrated that most emotional states, e. g., depression, behavior disorders have a biochemical basis. Not only can it be diagnosed and measured but the "cure—medication," can be monitored through the recovery phase. The EQ of an individual becomes a concern to a teacher when she encounters an ADD child.

Perhaps the significant contribution to the educators or therapists is the clarification of the diagnosis of hyperactivity or impulsivity which expresses the attentional deficit disorder (ADD), a common problem in the USA. In lay language this child is "on the go" constantly and seems to be "driven by a motor" (Hallowell, E. M. and Ratey, J. J, 1996). This is an very difficult behavior trait to deal with under any condition. Neuropsychiatrists indicate that EQ disorders are treatable via an analysis of the frontal lobe, the seat of our emotional center.

### Gender Differences

In discussing ADD and learning in general, Hallowell and Ratey identify the role of testosterone in gender differences:

*The difference in boys' and girls' behavior and ability to learn might be due to early difference in the development of the brain. The presence in utero of testosterone in males slows the development of the frontal lobes, which are responsible for inhibiting our many impulses, whether they be impulses to move, to act, to speak out nosily, or to have tantrums.*

*In contrast, the lack of significant levels of testosterone in girls creates a more mature left hemisphere and more robust frontal lobes. Indeed, the frontal lobes of girls are responsible for many more jobs than the frontal lobes of males. Speech, visual guidance skills, fine motor movements, and language skills appear localized in the frontal lobes of girls, whereas the same skills in men appear dependent on posterior regions of the brain. It also appears that that girls might have more connections between the left and right hemispheres of the brain, which allows the two hemispheres to communicate better.*

*..... The mature left hemisphere allows girls to use words and sentences easier and earlier than their male counterparts. And the more efficient communication between hemisphere might make girls with or without ADD better at regulating their behavior than boys. (Halloway, E. M. and Ratey, J. J., 1996).*

**Applications:** *Gender difference would suggest that we need to be careful about selection of teaching materials for boys versus girls, the placement of each and the ratio of both within a group.*

Some Afterthoughts.....

Let us become more aware of the evidence that at first may seem to challenge our pet theory. Only as we embrace the new, sort through the data, can we begin to incorporate and modify our teaching strategies. I have changed and would like to tell you how.

If I should be around in the year 2010, I know how differently I would operate my classroom. First, I would be concerned about students' general health and well being. Next, I would open my class with a run outside or around the gym. Then I would scan their EQ and strive to become a strong motivator. My classes would have to be interesting and alive. I would preferentially seat those with an inadequate EQ so they experience more support. After that I would rearrange my group so that girls outnumber the boys. And of course, my skills would only be available to preschool children

Shalom, .....

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