

USING WORKING MEMORY AND DEVELOPING CRITICAL THINKING IN THE REFLECTIVE LEARNING AND TEACHING PROCESSES

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“Research does not (cannot) identify the right or best way to teach, nor does it suggest that certain instructional practices should always or never be used. But research can illuminate which instructional practices are more likely to achieve desired results, with which kind of learners, and under what conditions.”
Myriam Met.

ABSTRACT

This paper attempts to provide reflection upon day to day teaching exercise and proposes a methodological procedure to engage students thru working memory and critical thinking development in the target language during the learning process. It suggests a procedural method consisting on Programming Units, Physical Responses, and Transition to Behavior (PURF, TPR & T2B) to meet Bloom’s taxonomy accordingly. It also refers to the role of the EFL teacher as a facilitator who uses a wide variety of resources including technology; similarly the active role of the learner framed within experiential learning theory is mentioned.

KEY WORDS

Learning process, working memory, critical thinking, experiential learning, peer observation, programming units, physical response, transition to behavior.

Professional development, understood as the skills and knowledge a professional gains to optimize performance at work, traditionally includes learning opportunities, such as college degrees and coursework, or attending conferences or training sessions. However, its meaning needs to be spread to a more extensive and reflective process. The school of teachers at University of Cundinamarca in Girardot, and more precisely the English Faculty has been implementing professional development as an opportunity to reflect upon our own practices, but taking into account, shaping and putting into action successful experiences from our own practices and from other contexts. One of the processes being implemented is peer observation, which consist on an heterogeneous group (a field teacher, an invited teacher, a pre-service teacher and the Program Director) observing a class using a rubric with specific descriptors and performance indicators.

Product of reflection and professional development exercise, there are several aspects we have improved as a Team, such as the unification of the micro-curriculum, evaluation practices, performance indicators and the inclusion of experiential learning activities (based on Experiential Learning Theory) to most of the grammar topics. However there are still many aspects to improve and start working on such as the role of both: in service and preservice teachers. This paper attempts to provide reflection upon day to day teaching exercise and pro-

pose a methodological procedure to engage students thru working memory and developing critical thinking in the target language. The method used was direct observation in at least two opportunities during each academic term, and it implies an announced observation and an unannounced one. Data was collected by means of a structured rubric for observations, the teacher's journal, interviews and formal questionnaires for teacher evaluation.

On the instructional field, and product of peer observation in the school of teachers at UdeC, it was found that one of the most prominent aspects to reflect upon is the role of the teacher as a mediator rather than an irradiator. To better understand the scope of this concept, as early as 1998 during the Bologna conference when discussing on the role of teachers in a digital era, it was stated that the role of the teacher at university was not to inform, but it would vary and depend on historical and cultural traditions, institutional characteristics, conceptions of teaching and learning, individual experience, type of learners' personality and learning styles. The role of the teacher therefore must be the product of a reflective exercise, which necessarily requires of the means and ends of research in order to change the title of merely being a teacher and rather become a professor.

In order to go in that direction, teachers need to stop thinking that learning is to pick up pieces and bulks of information, and that the teachers' job is to irradiate knowledge or give pieces of their subject knowledge to students. To break down with this bad habit, it is of paramount importance to understand knowledge no longer as a possession, but as a cooperative construction. Such a construction necessarily starts by articulating teaching practices to particular needs, passing thru reflection on the contextual experience in an ultimate attempt to construct more general concepts, views of the world and problem-solving situations that change learning methods, modify and impact on the learners' life and the conditions of their local context. Such an exercise requires from the professor self-awareness, time to read, to plan and to plot their interactive sessions using relevant technology mediation.

We are currently living in the so called information and technology society, in which amounts, variety and rich sources of information are available at any time anywhere and by anyone; therefore the possibility of using technology to present, edit, organize and manipulate information is increasingly getting more common, easier, faster and more didactic than ever before. The teacher cannot continue insisting that his or her own method is the only one or even the best one for instruction. Neither, the lecture and the textbook are sufficient references any more. The teachers and learners need to produce their own instructional materials according to the needs of the context, but simultaneously built instructional tools from a wider range of sources, as part of their articulation to the rest of the world. In the learning process, there is no longer such a secret formula or unique proven effective and efficient method; rather, learning takes place in public as product of cooperatively constructed experiences as first suggested by Karl Weick (1993)

The core aspect being discussed is not about "discovering hot water" about how to teach or mentioning something new none has said before; it is already there and teachers know it better. However, for some teachers and preservice teachers, all the previous considerations are not facts but statements on the paper; classes are still dead boring, lecturers take the word and sit on it, and when not done by the teacher, classes are assigned to students and reduced to recite what a famous scholar wrote on a twenty pages document, with a poor or not at all enrolment of the audience and a total absence of the context. Power point is still the preferred tech tool to support presentations, follow by a "prezi" and five to ten minutes long you-tube

videos. But the constant questions that arises are: how much do those practices impact the learners?, are those practices worth attending?, is that media the most effective to impact, hook them up and get students involved?, and does it make them think and come out with problem-solving solutions relevant to their context and appealing to their day to day life?

To answer the previous questions we need to focus on the “how” rather than the “what” of the nowadays learning process: on the one hand, we need to review how to hook up students and gain their attention; for such purpose we will review what working memory implies, and how it operates. On the other hand, we will approach the experiential learning process by means of using different ways to trigger working memory in order to foster and develop critical thinking.

Working memory is the cognitive ability to hold a discrete amount of information in mind, in an accessible state for utilization in mental tasks (Hill, 2010). Working memory refers to the whole theoretical framework of structures and processes used for the temporary storage and manipulation of information, of which short-term memory is just one component. It is also necessary to distinguish working from long-term memory, which is a system for permanently storing, managing, and retrieving items of useful information for later use. Working Memory, according to Peter Doolittle (2013), is what makes us live in a non-coma state, and it has the mighty and ephemeral power to multitask up to four simultaneous activities for a period that lasts no less than ten and no longer than twenty seconds.

Memorization is the attempt to store information in a procedural way, and although it is not learning itself, it plays such a relevant role in the learning process. To approach memory it is necessary to highlight the fact it could be either kind or three of them at the very same time: Episodic, Semantic, and Procedural. Episodic is memory we use for keeping track of sequences of events; Semantic memory is used for facts and rules’ storage, it is the product of episodic memory; and Procedural is memory we utilize for processes or to retrieve the immediate process: how to do things (Doolittle).

Despite the fact that learning begins with confusion or when a new experience contradicts semantic memory, learning takes place only when the person is able to alter semantic memory structure to accommodate the new experience (Doolittle). When seen as a problem solving opportunity, confusion triggers critical thinking and leads into new knowledge. The challenge for the teachers therefore consists on finding ways to help students have experiences that foster the development of semantic memory structures.

From an experiential learning perspective, stimuli comes from inner as well as from outer individual’s worlds, and it takes shapes, forms, colors, sensations, memories, music, sounds, voices, smells, tastes, etc. Individuals are exposed to multiple stimuli in fractions of seconds. Ideas fly back and forth, the same way the come they go by if not catch, stored and pulled from working memory.

Humans are image processor machines; just to exemplify it better let us think of grandma’s photo albums: there are thousands of stories and memories those pictures evoke with just a blink of the eye; or without going back that far, think of your facebook, why do you have one? how often you check it? Do you first read comments or rather check for pictures? A traditional saying states that an image is worth a thousand words, and to judge by the previous examples it is true. The fact is we do not think in words but images; we evoke the contextua-

lized signified source rather than the signifier (Saussure 1959). Even in the bible, it states that God made man in his image and according to his likeness (Gen 1:26–28). But, along with images we enjoy music, sounds, and multiple effects; those are in fact the aspects film makers know well, they have mastered and therefore they produce movies that make us feel fear, cry, laugh, etc. So images combined with any other effect is one of the best triggers to impact individual’s working memory and get them hooked up into the first teaching step.

The second step is to take immediate action once the teacher has gained the audience. As learner, the individual needs to be conscious that learning is about him or her, that it takes place now, and that it is right here so he or she is necessarily involved. Based on the initial exposure or gain we, teachers, need to get them, learners, to take immediate action and do something; first that makes sense to them, and second that is appealing to their day-to-day reality and context so it becomes something relevant. According to Doolittle, we are meaning making machines, therefore if we process we learn and if we are not processing life, we are not really living; thus, the teacher needs to make students live their real life while learning, that short and sweet.

Humans, as a species, have succeeded because have learnt from nature based on day-to-day experiences and relationship among them and the environment. Humans build generalization by observing instances, and as children do, we learn by imitation and repetition. The learning we do naturally is not memorization, but the process of building semantic structures from experiences. Learning styles is secondary, because it deals with the ability to directly access semantic memory rather than use it. According to Weick, Learning is sense-making, a process in which new information is integrated into a grand network of understanding, and the more the three kind of memory are involved, the more effective it is.

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Experiential learning is not a new concept either; however, and as it is linked to individual’s inner and outer worlds, it is a relative and dynamic process which encompasses different aspects that necessarily differs from one to another learner and context. Experiential learning is flexible as a spider web and it can be funny, painful, individual, social, sad, happy, etc. those are just possibilities product of the different combinations that the following illustration depicts better.

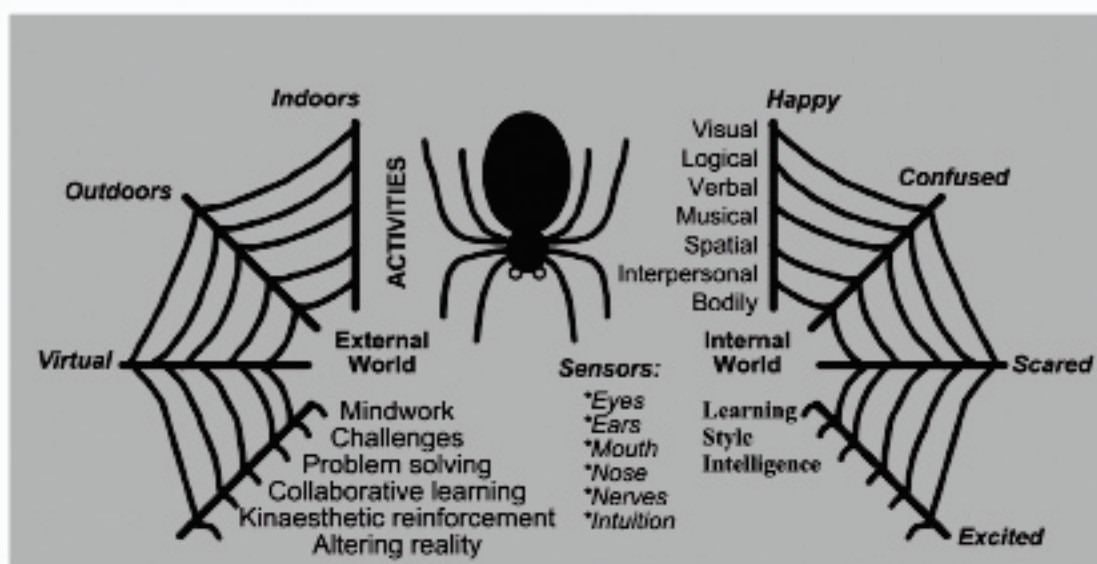


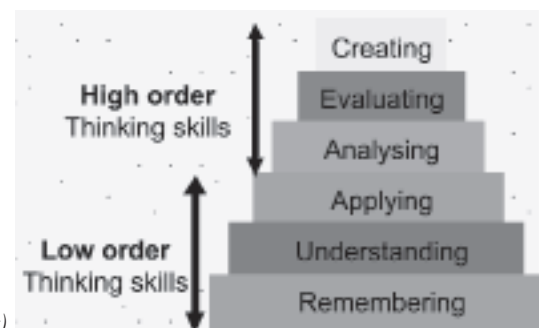
Fig 1. Experiential Learning Web

Wilson (2003) defined learning as a relatively permanent change of knowledge, attitude or behavior occurring as a result of formal education or training, or as a result of informal experiences. Similarly, Kolb (1984) explained that learning is the process whereby knowledge is created through the transformation of experience. Experience and learning would thus appear to be closely intertwined and almost inseparable, like a DNA chain, in many respects, experience and learning mean the same thing. In the experiential learning web (Fig 1) learning as an experience is a flexible sense-making process of active engagement between the inner world of the person and the outer world of the environment. Rogers (1996) took this concept further and stated that experience forms the basis of all learning.

Traditional teachers think that by going straight to the rule and avoiding the student mistaking by means of experiencing first, they help the learner; what is false and misleads to rote memorization rather than learning. That is also traditionally termed as “rule transfer learning” a process aimed to produce lambs (professionals) but not leaders (transformers). Current world teachers are to find ways to help students have experiences that help them develop semantic memory structures that leads into critical thinking and knowledge transformation. Making mistakes is the product of a creative thinking process and it proves that the student’s brain stablishes other connections and attempts non-conventional ways of solving problems.

Developing critical thinking skills is a process of paramount importance for learners at the time of facing real problems and coming out with academic products or solutions; especially when those problems are the ones they struggle the most with. Critical thinking is taking nothing for granted (Cottrell 2011). To be critical does not mean to be negative, but to critically establish connections, analyze and evaluate ideas in the light of evidence. Critical arguments are used to help students approach solutions to problematic situations by identifying and judging the strengths and weaknesses of possible solutions. Critical thinking essentially consist on developing a detective-like mind as in the novels by Arthur Conan Doyle (1859 – 1930) to link cues and hints and come up with possible hypothesis. When using critical thinking University students, preservice teachers, and learners are expected to examine, question, investigate, find support, as well as uncover academic counter arguments with ideas, concepts, questions and theories that they will encounter in each subject, and not just accept them as presented by the teacher in a rather passive un-enquiring manner, but rather suspect and doubt from them.

When learning a foreign language and along with it the development of critical thinking, progress is gradual and the learner takes time to develop skills and move from one to another stage. Following Bloom’s taxonomy (1956) for increasing difficulty in the learner process, we have six stages grouped into two main categories: low and high order thinking, which are briefly depicted here.



F2: Bloom’s Taxonomy. (Source: google images)

LOW ORDER THINKING

1. Remembering

Verbs associated with activities at this thinking level include: recognize, list, describe, identify, retrieve, name, locate, find.

2. Understanding

Verbs associated with activities at this thinking level include: interpret, exemplify, summarize, interfere, paraphrase, classify, compare, and explain.

3. Applying

Verbs associated with activities at this thinking level include: implement, carry out, use, execute.

HIGH ORDER THINKING

4. Analyzing

Verbs associated with activities at this thinking level include: compare, organize, deconstruct, attribute, outline, structure, and integrate.

5. Evaluating

Verbs associated with activities at this thinking level include: check, hypothesize, critique, experiment, judge, test, detect, monitor.

6. Creating

Verbs associated with activities at this thinking level include: design, construct, plan, produce, invent, devise, make.

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The challenge for the teacher consists on designing a micro-curriculum aligned with the school institutional educative project (PEI, in Spanish), the municipality's development plan, and consequently according to the guidelines stated by Ministry of Education. In short the challenge for the teacher lies on curricular implementation of a model suitable to a specific context and foreign language proficiency level.

To help teachers combine the four different aspects discussed in this document: innovation, experiential learning, working memory and critical thinking, I bring here a bundle framed within the natural approach and termed as: Programming Units, Physical Responses and Transition to Behavior PURE, TPR & T2B by Richard Fowler (2012).

Fowler quoted the natural method to explain the order in which skills are developed when learning a language. First it is the listening skill which takes place, followed by the speaking, next it is the writing and finally the reading ability. Fowler suggests that learners need to be exposed and enrolled, without grammar explanations, in the natural development of oral skills (listening and speaking) prior to writing and reading. In this sense, low-order thinking activities would directly correspond to the developing of listening and speaking, whereas high-order activities would logically correspond to the development of writing and reading skills. It does not mean that a single skill is developed in isolation and total absence of the others, but rather that one is emphasized at a time.

Following I briefly depict the five strategies suggested by PURF for learning oral skills without writing or grammatically explaining and their relationship with direct experience and working memory.

- **Osmosis:** this means there should be a constant and consistent use of the target language, not the native language; except for basic instructions or the stating of goals and expectations. Colin (2010) states that life is unpredictable and therefore it presents many opportunities for learning from experience: either painful or enjoyable, experiences remain for us for the rest of our lives and become referential points we would consider before acting again in a similar manner or under a similar situation.

- **Modeling:** using puppets or human models as strategy to provide examples of exchange in the first and second person (I-You-We), first it should be modeled, then the learner will be led to duplicate the model. For instance (TPR) uses modeling to elicit actions. In this step students get actively and physically involved, which favors learning by means of multiple styles and intelligences. Baddeley & Hitch (1974), who originated current view of working memory, proposed two supportive systems that serve the creative thinking process by being able to either passively hold or actively rehearse information. These two systems are termed the phonological loop and visuospatial sketchpad, they hold verbal information and visuospatial information respectively. More recently, Baddeley (2001) amended the model by including an interface, the episodic buffer, which allows the working memory system to communicate with long-term memory. It means that once an episode is mastered it is store in the long term memory.

- **Use of Gestures:** parts of the body like your hands should be used to illustrate something better, or a facial expression or a pointer to show a word or an action in a visual. Ong (1982) asserts that human beings communicate thru countless ways making use of all their senses: touch, smell, taste and specially sight. He highlights that some non-oral communication is exceedingly rich such in the case of gestures which express emotions and sensations sometimes impossible to be put into words.

- **Teacher Involvement:** the teacher should adopt an attitude of searching for a response so that the learners are encouraged to assist in the learning process. The teacher does not know everything but facilitate the process for students to access knowledge successfully.

- **Use of Cues or Choices:** this can be used to learn vocabulary, adjectives of description, actions, verb tenses, sentence construction, and more. Unsworth and Engle (2007) have recently conceptualized working memory as an interaction between two modules: 1) a primary memory storage buffer that maintains up to four chunks of information for a limited amount of time, though it can focus on fewer chunks; and 2) a cue-dependent search system that retrieves data from longer-term memory, which they term secondary memory. They have postulated that all information is initially stored in primary memory, but whenever this system reaches capacity, information is automatically moved to secondary memory.

According to this model, individual differences in working memory ability are directly related to the efficiency with which a person can search the secondary memory system via cues, the most prominent of which are temporal and contextual cues.

PURF is a suitable model to any communicative situation that programs basic conversational responses to questions like “who, what, where, when, why, whose”. It uses a choice strategy to elicit responses to questions but always should be given in complete sentences. This activity allows progressive programming of the basic variables of the language like gender, syntax, and semantics: (masculine-feminine, singular-plural, placement of the adjective, correct word order, etc.). It also provides the basis for a simple conversation in response to questions, in which the learner is able to recite a true set of sentences as in the following example.

This is Mary. That is a book. That is Mary’s book. Her book is new. Mary closes her book. The book is on Mary’s desk. The book is not under Mary’s desk.

- **PURF in a Nutshell**

1. The teacher gives a learner a question, then provides two OPTIONS as the response. These must be stated in complete sentences, and the response must be in a complete sentence.

2. The teacher then repeats the same question to the same learner but instead of two choices, teacher gives the WRONG response, plus the word NO for negatives and the student must remember the correct response.

Note: incorrect grammar such as wrong gender wrong pronoun etc. should never be used as choices.

3. The teacher then repeats the same question to the same learner with NO CHOICE at all, and the learner must be able to answer in a complete sentence, not a fragment though.

4. The teacher then repeats the correct response and tells the entire class to repeat it together. This cements the learning process for that example.

- **TPR**, originally termed by Asher (1969), is particularly relevant for low-order thinking skills in remembering, recognizing, listing, describing, identifying, retrieving, naming, locating, finding, exemplifying, summarizing, paraphrasing, classifying, comparing, explaining, carrying out, using, and executing. TPR activities lead learners to acquire, use and master common daily words. The development of TPR should take place in an increasing difficulty progression and only one grammar category should be worked out at a time: verb only, verb + object, verb + adverbial, verb + preposition, etc.

- **T2 in a Nutshell**

1. Give a command to a student and MODEL the response.

2. Give the same command to second student and MODEL the response.

3. Then give the same command to a third student without the model. He can do it. Skip around the class.

- Transition to behavior (T2B) is an activity that helps learners develop conversational skill through elaborated responses to questions with prompted choices at a higher order thinking level. Verbs usage associated with T2B includes: analyze, compare, organize, deconstruct, attribute, outline, structure, integrate, evaluate, check, hypothesize, critique, experiment, judge, test, detect, monitor, create, design, construct, plan, produce, invent, devise, make. T2B should takes place when the learner already has an oral competence and is able to communicate in the foreign language. Advanced vocabulary, semantics, syntax, word order, collocations, phrasal verbs, correct verb tenses are all strengthened during T2B.

- **T2BinaNutshell**

1. The teacher uses a very short video or a visual (projector or smart board) and asks questions using elaborated choice responses that demand from students concentration and high-order thinking, students need to respond in complete elaborated sentences.

2. The teacher directs 3-4 students to provide 2-3 true elaborated statements about the story on the visual.

3. The teacher gives a writing task as a quiz that tests the ability of learners to deconstruct, outline, evaluate and reconstruct in writing. Reading tasks are also subject to T2B tasks.

**Note: the procedure used for T2B is the same one used in PURE.*

CONCLUDING REMARKS

Quoted by Sebeok (2001) Saussure defined the sign as a form made up of something physical, which he termed the signifier; and of the image or concept to which the signifier refers to, which he called the signified. He then called the relation that holds between the two significations. Saussure considered the connection between the signifier and the signified an arbitrary one that human beings and or societies have established at will. This quote proves language as abstraction of reality; and provided reality is so diverse and considerably varies from one to another context and subjects, language should therefore encompass as many possibilities as subjects and contexts might exist. In this direction, the process of learning a language is a complex one and demands from the teacher to facilitate situational cultural agreed context or atmospheres in which experience takes place; likewise it requires from the learner to use as many strategies as he or she possible can. Far from suggesting a unique effective method, what this paper does is to combine four different aspects, which are relevant to this moment and context: innovation, experiential learning, working memory and critical thinking.

From a teacher's training perspective it has been depicted that peer observation is not a process for stating how good or competent the teacher might be, but rather to contribute to the day to day reflective facilitation process in an attempt to bring formative evaluation into practice in a cooperative manner in which all the actors are involved. Reflection is also the source of questioning and therefore research start there.

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