

# Psychodidactic Strategies to Facilitate the Flow of Logical Thinking in the Preparation of Academic Documents

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**Abstract**—The preparation of academic documents, such as thesis, articles and research projects, is one of the requirements of the higher educational level. These documents demand the implementation of logical argumentative thinking which is experienced and executed with difficulty. To mitigate the effect of these difficulties we designed a thesis seminar, with which we have seven years of experience. It is taught in a graduate program in Psychology at the National Autonomous University of Mexico. In this seminar we use the Toulmin model as a mental heuristic and for the application of a set of psychodidactic strategies that facilitate the elaboration of the plot and culmination of the thesis. The efficiency in obtaining the degree in the groups exposed to the seminar has increased by 94% compared to the 10% that existed in the generations that were not exposed to the seminar. In this article we will emphasize the psychodidactic strategies used. The Toulmin model alone does not guarantee the success achieved. A set of actions of a psychological nature (almost psychotherapeutic) and didactics of the teacher also seem to contribute. These are actions that derive from an understanding of the psychological, epistemological and ontogenetic obstacles and the most frequent errors in which thought tends to fall when it is demanded a logical course. We have grouped the strategies into three groups: 1) strategies to facilitate logical thinking, 2) strategies to strengthen the scientific self and 3) strategies to facilitate the act of writing the text. In this work we delve into each of them.

**Keywords**—Psychodidactic strategies, logical thinking, academic documents, Toulmin model.

## I. INTRODUCTION

At the higher educational level, one of the professional academic demands for students is the preparation of academic documents such as: thesis, research projects, articles for publication and essays. They are often constituted in large institutional requirements because they allow the accreditation of a degree and/or even the financing of a project. The elaboration of these documents implies putting into practice a logical - argumentative thought. As this involves certain difficulties, the students seem to resist this elaboration or they go through it with great hardship. In the case of theses at the undergraduate level, in Mexico only 10% of students choose it as the option to obtain the degree and of that 10%, 39% complete it [1]. The degree qualification in the postgraduate

systems, where the thesis is the mandatory requirement for the degree, shows that less than 50% concludes it and less than 10% does so in prudent times, that is, at least in two years after the completion of the credits of the program.

The low degree levels are related to: 1) the high workload involved, 2) poor communication with the advisors, 3) students' difficulties in academic writing, 4) little certainty in the students about what they want to investigate, 5) inadequate planning of the process from the institution, 6) arbitrary assignment of tutors, 7) disengagement between research seminars and student work, and 8) insufficient forums in which the student has the opportunity to present their work in front of an audience [1]-[6].

From our perspective, another possible factor is related to a "background" issue of a cognitive nature. Doing a degree thesis implies: getting involved in an epistemological-methodological process, getting involved in an argumentative dialogue [7] and, in a general way, in experimental and/or probatory activities. Its product is an extensive discourse where a hypothesis must be tested, the evidence made clear, appeal to the best arguments, design a method and require counterarguments and/or criticism. All this must also be exposed orally and in writing. It is an intellectually and emotionally complex process because it requires putting into action the most complex thought: the logical and the creative.

## II. PSYCHODIDACTIC STRATEGIES THAT CONTRIBUTE TO THE CONSTRUCTION OF AN ARGUMENT

For seven generations of postgraduate students, we have carried out an intellectual and affective accompaniment in the elaboration of their theses of degree during two semesters. This accompaniment is based on the use of Toulmin's argumentative model that we use as a heuristic that allows us to organize the different mental representations in the place of the model that corresponds to the construction of the plot of the document in question and also, a set of actions of the teacher towards the student which seems to function effectively in the

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accomplishment of this task.<sup>1</sup> They are actions of a psychological and didactic nature. This is why we call it psychodidactic strategies. They stem fundamentally from an understanding of psychological, epistemological and ontogenetic obstacles and the most frequent errors in which thought tends to fall when a logical discourse or the construction of a scientific argument is demanded. In this work, three groups of strategies will be emphasized.

#### *Strategies to Facilitate the Logical Flow of Thought*

The Toulmin model [9] and any other argumentative model demand the flow of logical thinking. This means paying more attention to the relationships between the statements we create, in which some are premises and others are conclusions (*p implies q*). Logical thinking would require that relations between *p* and *q* are coherent, relevant and congruent [10]. Assuming the architecture of the mind proposed by [11] on the existence of two systems of mental functioning, one intuitive and another analytical, the logical course implies a leap from the intuitive to the analytic system. The intuitive system operates under the principles of natural logic and allows us to function "comfortably in our daily lives", and although an erroneous reasoning is not necessarily derived [12], it tends to this because of the primacy of what is immediately available for our perception. In analytical or logical thinking, a thorough analysis of what is immediately perceptible is expected, assessing its necessity and sufficiency and attending, in most cases, to less perceptible and phenomenological properties. It also allows, as [13] argues, the ability of the mind to operate with mental representations that are not available, that is, to work with statements whose empirical referent may not exist. This jump implies for the intellect, a computationally more expensive discourse. Analytic discourse involves more time and a break with the apparent relevance of what is immediately perceptible.

Toulmin [9] puts data and inference as the first components of his model. One implies the other, it is the logical structure *p implies q*. In this structure *p* is either the premises (evidence, data, facts) and *q* the inference that results from it or them. The inference must be contained in the data and the data must be necessary and sufficient to sustain the inference that was made of them. In this first intellectual elaboration that the students do (make the data explicit and build an inference) we have detected a set of obstacles but also a set of psychodidactic strategies that facilitate this elaboration.

With regard to the evidence, it is necessary to:

- 1) Insist on the need to make explicit all the possible evidences that can sustain the inference made. We emphasize that the evidence comes from two sources, those that come from the own experience and those that come from other authors and investigations that have inferred something similar before the same data. This implies stimulating putting the data that were not made explicit before, in the document as they are necessary.

<sup>1</sup> One of the observations to the results of [8], in which emphasis is placed on the power of the model in the construction of the thesis scheme of the thesis, is that too much functional power was attributed to the model and the teacher's

- 2) Show that the evidence is of a different nature. Depending on the way that our discipline is understood where we live, we must go to the evidence that our community accepts as such. It can be words, statistical data, objects, drawings, images, actions, vestiges, experimental tests, concrete facts, photographs, video recordings, etc.
- 3) Engage the student with the grammatical form *p implies q*. This translates into reading the data suggested by the student and his inference and to note that there is this grammatical congruence between them. When this congruence does not exist, it is necessary to correct or eliminate it.
- 4) Submit relationships between data and inference to a group analysis whose members share similar conceptual and theoretical frameworks and can, therefore, validate the need and sufficiency of the available data, as well as the plausibility of the inference made.
- 5) Insist on the search for unavailable but probable evidence or support the inference only on the evidence that is available. For the first case the facts can be explained if there is evidence pointing to it, but sometimes it is not available. In the abductive reasoning at least, that probable evidence is linguistically elaborated and taking it as such generates the scientific commitment to find it; we must look for it until it is available. Otherwise, it can only be considered as probable and the inference must specify this dimension "Assuming *p* exists then *q*, but *p* does not appear yet then *q* is not yet valid". If the student does not intend to search for the probable *p* then it is necessary to infer or sustain an inference only with the available evidence. It must be recognized that if the evidence is not directly perceived, it is not a reason to discard its existence; for example when we explain the phenomenon of gravity by the existence of a force that is not perceptible. In the first instance it is necessary to consider its existence because with it the phenomenon is explained, then it is necessary to prove its existence.

With respect to inference:

Now we will focus on the *q*, which is the inference, also known in scientific methodology, as hypothesis and assumption. The fundamental quality of an inference is that its content can be perceived in the premises that give rise to it. In most cases, inference is a rational and linguistic construction of the epistemic subject in which it makes its representations explicit about the possible relationships that exist between the available data (which may not be easily discernible by others) and that would explain the phenomenon as a whole. In this case, it is important to "make the students see" that the inference is a statement that he would build from the way the data are being shown and in the way he represents them. Given this, the orientation is as follows: According to these data that you have in front of you, what do you dare to affirm? What do you conclude about them? Being in a context of building knowledge

style One of the most interesting hypotheses that resulted from this criticism was that the model by itself did not explain the success of the degree's efficiency but the didactic used by the driver of the course.

and having encouraged them to think about a topic that they like, there will always be something to say. Here the strategy is very simple: express what you think of the data you perceive. Build it with your own words, it must be an affirmation. Grammatically it is a sentence with subject, verb and predicate and in general, it reflects a causal relation.

To guarantee the logical course of thought in this case, the strategy is, first of all, to complete the formula  $p$  implies  $q$ . If we already have a set of premises then it is time to construct the inference. Then we proceed to an exhaustive review of the sufficiency and necessity of the premises to infer  $q$ . The questions addressed to the group must be: "do you consider that the evidence points adequately to the inference made? Who does not agree with the inference made and why?" In this case we appeal to the Aristotelian plausibility and to the criteria of coherence, pertinence and congruence defined above.

#### *Strategies to Strengthen the Scientific Self*

Toulmin's model as a heuristic requires students to have three intellectually complex phases: 1) the construction of a hypothesis or assumption to defend, 2) the specification of the evidence, 3) giving reasons that explain the "causal" relationships established in the hypothesis, for this last one they must resort to the theory and finally, 4) to think about the refutations of its assumption or hypothesis.

In general, students show, first of all, fear towards the task of thinking with the rigor of logical thinking, towards what it implies to construct their own scheme with the elements of the model. Expressions like "Aw, teacher, let's see if I can do it!", "this is a very complex job", "that's scary", not only are manifested in a verbal manner, but in a gestural one. Some make the gesture of "biting the nails," "tremble," "laugh with nervousness," and the decision of who will be the first to develop its scheme and expose it in front of the group is a dilemma. This suggests that the requirement to put logic thinking into practice tends to generate anxiety and fear. The strategy that in these cases we thought is appropriate to apply is to recognize, together with them, that it is indeed a complex but not impossible task. They are told that the mind, in their case, is ready for this task, that the analytical system is there and it is a matter of getting it going with the help of the others. That is to say, a deceitful discourse will be rectified by the non-fallacious discourse of the others. This part is interesting because here we assume that the significance of the logical principles and their rules will be imposed either in one or in another, facilitating and accustoming the other to correct reasoning.

Another strategy is to warn them that this process of constructing the plot is not a situation of evaluation of the intellect, nor a persecutory situation of the self. It is, first of all, an epistemological situation, where knowledge is built to establish a proposal with value for the discipline. To provide knowledge helps warning that who does not pursue this intention, is very likely to run from failure to failure. They are warned that in an epistemological situation, errors are valid. Incorrect reasoning, ambiguous proposals: "nothing happens". They are natural and the prelude to a more sophisticated,

probable thought; "something must be started", the normal thing is start from something rough, inelegant, intuitive, no matter what we will refine, it can be epistemologically relevant. We try to make the fear of the crude and intuitive of the beginnings lose, "nothing happens", "our lives will not go away", "somewhere we have to start". At this time the teacher should lead the individual and group thinking processes towards a fundamentally analytical listening and through it decipher what the proponent wants to defend and translate it, make it more explicit, help the proponent to a "more metabolized" elaboration of his proposal. We can represent it this way "according to what I hear and the evidence that you are presenting, it seems to me that what you want to defend is ...". These points are punctual translations of the "possible and true" proposal of the student. Frequently this strategy works, the student feels listened to and understood. This diminishes the uncertainty and the impossibility of explaining his representations. We approach the certainty, as affection, to intervene empowering the mechanisms of thought that allow to spin representations and turn them into verbal statements with coherent relationships with each other. It is essential for the teacher to trust in that, that the student is trying to build internally. imagine his/her representations and help him/her to order the initial chaos. The depiction of this representations by the other induces the student to endorse them with his own ones, trying to understand with the other. This is nothing more than sharing the own representations with the greatest possible similarity. Most likely, the translation of the other does not faithfully reflect his/her representations and it is necessary to make its own translation. The objective of a proponent, is that its own representations are shared with their interlocutor, in a plausible Aristotelian sense. At this moment, it is very important to detach the student from the deep-seated belief that these academic tasks are fundamentally evaluative events of their intellectual potential, which are persecutory of their academic self or its ideal. They are not trying to prove how smart and academically capable they are, but how close to a plausible knowledge they are. Given this, it is more productive to link them affectively with the idea of a proponent, a self that has "something to say" "a knowledge to propose" "a knowledge to contribute", giving value to the exclusivity we all have as epistemic subjects. The student's perception by nature is unique and could be interesting. It should be taken into account that after the student has been exposed to a set of theories and practices, especially at the graduate level, "something will have to contribute!".

There are several aspects that should govern our listening as advisors: 1) the student is a unique and thinking subject, who perceives the reality of a form and has the ability and ability to externalize it, 2) the perception of each person and the resulting representations of these perceptions represent at least one of the ways of understanding the phenomenon, therefore, it is valuable to make it known, 3) the inferences made by an individual can be the reflection of properties that are hardly perceivable by others. They can only be perceivable if the proponent releases them. Thanks to the inference made by a proponent we can have access to properties of things that went unnoticed by others.

With this, the value of the subject is highlighted as an epistemic subject, the scientific self is strengthened.

In Phase 1, which consists in developing the hypothesis, one of the manifestations of the most frequent behavior, in them, is the presence of a feeling of uncertainty as producers and builders of knowledge. Students have expressions such as "it is very complex to affirm something because it is likely that I am wrong", "to affirm is a thing of the authors, I lack a lot for that". This is surprising as they are graduate students. Other expressions are "surely my advisor will not like what I propose and I will bounce, so I will stick to what he says, as she has more experience than me", "I dare not say anything, I better ask my advisor and what she suggests I will accept." That is why the strategy consists in strengthening the epistemic subject.

#### *Strategies to Facilitate the Act of Writing the Text*

Once each representation is located in the scheme attached to the Toulmin model and the inference is correct and technically raised, it is appropriate to derive the content of the theoretical framework, the problem statement and the method to verify or prove the inference. The importance of inference is crucial here. The theoretical framework is a development of the categories involved in it, also the established relationships and method, as well as the procedure to verify it.

Once the index and method have been developed, the strategies to facilitate writing consist of 1) assigning a number of realistic sheets per section, 2) granting a fair and equally realistic time for the completion of each section, which is agreed between the teacher and the students, 3) grant freedom to fulfill this commitment, offer personal advice to those who may need it and promote self-confidence, 4) assign to each section the working condition of evaluation of the subject, and 5) respect the writing style of each student.

From our point of view these are actions that benefit the processes of knowledge production and the preparation of academic documents. They are strategies that allow the development of a complex, logical thinking from the understanding of the nature of the obstacles that prevent it and from certain forms of relationship with the other that allows "to get the best out of them".

### III. CONCLUSIONS

In this article we analyze some of the actions that seem to carry weight in the decrease of the resistances that are provoked by epistemological and psychological obstacles, they take place in logical thinking.

We have revealed a set of strategies that let both, teachers and thesis assessors act with sensitivity and also it allows them to know the reasons for which this thought seems inaccessible and fearsome. We perceive them as pedagogically and psychotherapeutically because they require an intentional exercise that mobilizes the natural manners of cognitive function, which are mostly incorrect when they are developed in a scientific path to give priority to other resources such as rational and affective. The actions enable a transition of intuitive intellectual positions to a more analytic one. Students go from knowledge receptors to knowledge producers.

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