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Engineering analysis of teaching practices and learning strategies guided by the principles of Cognitive Psychology and Information technology

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ABSTRACT

The plurality of educational, teaching and learning practices has been influenced throughout history by conceptions, principles and theories. The latter legitimized some practices but refuted and criticized others. The last ones at work would be psychosocial sciences. Indeed, with one of their branches that is cognitive psychology, they are charting lately, rules of conduct and principles of operation in the field of teaching and learning. If with this conceptual field, the will is to better place the student at the center of the education system, to make him more active in the learning process, the teacher should find in the principles of cognitive psychology; a source of inspiration to implement teaching strategies that take into account psycho-cognitive mechanisms, acquisitions and learning in the student. However, the analysis of teaching processes among teachers, and the methods of acquisition of students, suggest the existence of certain discrepancies between on the one hand the teaching methods among teachers and the mechanisms of collection, organization and memorization of information among students. In other words, there is a disconnection between the principles of cognitive psychology and learning teaching practices.

To do this, we looked at a population of students and their teachers with a professional bachelor's degree in teaching in physical and sports education, and then we tried to do a qualitative and quantitative analysis of the teaching methods used by teachers on the one hand and the methods of collecting, organizing and memorizing knowledge among students. It is a testimonial in the form of a semi-directive questionnaire for teachers and a multiple-choice questionnaire for students. It should be noted in passing that the collection of information took place in purely theoretical disciplines, and could only be done after a training sequence, in this case at the end of the first semester. This allows students to step back and analyze their practices and those of their teachers. Analysis of the results revealed the existence of teaching and learning processes as varied as pedagogical, teaching and learning streams. This allowed us to conclude that the theoretical currents that justify teaching and learning practices are still eclectic, and far from the new theoretical approaches, in this case, cognitive sciences. This also allowed us to see the discrepancy or even the discrepancy between the basic principles of cognitive psychology and the teaching practices put in place by teachers, as well as the practices of managing studies and learning by students. At a time when the current of cognitive psychology is becoming hegemony, at least in the discourse, learning teaching practices are at odds. These results call into question the real factors of failure, pointing the finger, the mismatch between saying and doing, between concepts and their uses. This also allowed us to note the diversity of practices in academia, despite the unity of teacher training, but also the existence of conceptual fields that can guarantee the unity of processes and mitigate the diversity and heterogeneity of populations.

Key words: Engineering analysis, Teacher practices, Cognitive psychology, Design strategy and Information Technology .

1. INTRODUCTION

1.1 The context of work

At a time when failure is emphasized in schools and universities, there is a search for potential remediation through, among other things, the unification of teaching and learning processes, programs and practices. But there are disparate processes and practices, often based on personal convictions on the teacher's side as well as the students. In other words, everyone conceives his way of working based on these personal experiences and aspirations, without referring to valid theoretical bases [1].

In this context, pedagogical and teaching approaches must be cross-cutting and are called upon to coordinate pedagogical activities, avoiding compartmentalized teaching of disciplines and being a working tool to unify entries. Currently, theoretical data on cognitive psychology dominate the field of learning education. This pedagogical current has better elucidated the processes put in place at the level of the nervous system; which has made learning more streamlined. This discipline has better elucidated the means by which a person appropriates information, analysis, stock and returns it at the right time [2]. This current also gives us information on the means to be put in place by the teacher to make this learning profitable. On the other hand, current research notes that: 80% of journals and publications focus on education sciences and topics related to psychosocial and cognitive sciences. And that in the field of research: 70% focus on topics related to the field of social psychology and more specifically to cognitive psychology. Finally, 65% of university teachers report having

published training or mentoring research in the field of cognitive psychology. However, there was a finding of failure, especially in the early years of university, despite reforms on education and training.

1.2 Question of research and problematic

In science that should unify teaching and learning practices, a number of fundamental questions need to be asked: What is the place of cognitive psychology in teaching and learning practices in academia? Is failure in academia attributed to the eclectic nature of teaching and learning practices or the difficulty of implementing guidelines and recommendations of a theoretical framework that reflects the sciences of social psychology. Faced with the state of failure in our education system and eclectic teaching and learning practices, there was talk of rethinking the legitimacy of student and teacher practices in the face of theoretical data. Especially those that have proven themselves in recent decades to know; social psychology sciences cognitive psychology.

1.3 Questions to ask

A key question arises in the implementation of the teacher's teaching process, and student-learning, is there an implementation of the principles of cognitive psychology. Other secondary but no less important questions: what teaching and teaching methods, what learning methods should be used to contribute to the fight against academic or academic failure? Can failure be explained by the absence of unique practices and the absence of a theoretical framework that legitimizes them? Should we start from the analysis of practices, or draw directly from the theory to find the answer to these questions

1.4 Purpose of the article

The purpose of this article is to make an analysis of teaching and learning practices. It is a question of identifying methods that allow the student to manage his learning, to organize the content and knowledge provided by the teacher. How they classify them, how he memorizes them and at the end what steps he takes to bring them out at the right time. It is also a question of detecting in the teacher the methods and practices he implements to transmit the contents of knowledge. It is also a question of whether these teacher practices are compatible with the student's learning needs. Comparing the practices of teachers and students, with certain basic principles of cognitive psychology, will allow us to elucidate certain factors that explain the student's success or failure, but also to explain the failures of the teaching process in the teacher. In the end, to give some guidelines as to the remediations to be made to the education system with.a view to a possible recovery.

2-THEORETICAL AND CONCEPTUAL FRAMEWORK

The theoretical framework for this article falls within the scope of cognitive psychology; science that emanates from social psychology and attempts to explain the modalities of processing and transferring information.
Science is also interested in the cognitive processes put in place by the learner as well as the path of information. A science that provided a plausible explanation for the factors of failure and success inherent in the person in a learning situation, but also

for the role played by the teacher and the trainer in this context [5].
At the same time, the sciences of cognitive psychology have provided guidelines for effective learning practices that can be put on the learner to streamline these practices of memorization, collection and restitution of knowledge. To implement teaching practices to support learners in the implementation of cognitive, metacognitive and regulatory strategies more tailored to their personal profile [6].

3-METHODOLOGY

3.1 Study population

The study population includes: 24 teachers; practicing within the university and: 153 students in the first year of university, belonging to two courses of bachelor's degree teaching in physical education and sports.
The research was carried out in theoretical modules in the Department of Physical and Sports Education. This student population is most confronted with the situation of failure. This is explained by a sudden and undirected transition, from a school pedagogy often transmissive, to university pedagogy. In the latter case, the student should be more autonomous in the management of his studies and learning and be less dependent on the teacher.

3.2 Materials and Protocol

This article emphasizes the descriptive and exploratory, analytical and comparative side of teaching practices among teachers and student learning. The aim is to collect information on teachers through their students, on teaching and teaching practices and on teaching strategies put in place by teachers. And, to collect data on the study and learning strategies put in place by students in this population. The results obtained will be compared with the basic principles of cognitive psychology [7]. (Table 4). The study was conducted in theoretical modules such as: Anatomy Physiology Psychology, Language and Terminology and the History of physical and sports activities(APS)

3.3. Measured Parameters

Teacher.practice.**analysis.grid(Table1)**

For teachers: the Kolb cycle was chosen; related to the stages of strategic education [8]. This will allow us to compare teachers' practices.against.strategic.teaching.principles.
This grid relating to Kolb's learning cycle gives a succession of steps to be in the logic of strategic teaching, itself inspired by the orientations of cognitive psychology. This grid includes the following steps: 1- Knowledge Recall 2- Pre-requisite evaluation 3- Presentation of the sequence program 4 - Recall of the keywords of each sequence 5- Feed-back on each sequence 6- Passage from theory to practice 7 - Implementation test and transfer 8- Involvement of students in the stages of the process.

3.4 Process of Analysis of Practices Students (Table1 and 2)

For students: The synthesis of different learning strategies

according to several authors was used to evaluate the implementation of strategies by students. Its authors include Weinstein and Mayer 1986 and O'Malley et al 1990 Boullet et al 1996. [9] [10].

This grid includes the different study and learning strategies that students can implement.

Table 1: Educational Strategies Analysis Grid - Study and Learning Strategies Analysis Grid

Inspiration Strategies Analysis Grid of Weinstein and Mayer 1986 and O'Malley et al 1990 Boullet et al 1996

items	under items
✓ Study strategies	✓ 1-Before the course ✓ 2-Hanging the course ✓ 3-After the course
✓ Cognitive strategies:	✓ 1-How to summarize the content ✓ 2-How to memorize course content
✓ Metacognitive Strategies	✓ 1-Can you explain the strategy used ✓ 2-Is this strategy effective
✓ Emotional strategies	✓ 1-What are your training goals? ✓ 2-What are your goals for the module. ✓ 3-What are your goals for the course
✓ Resource Management Strategies	✓ 1-What is the workplace ✓ 2-Which tool you're reviewing ✓ 3-With whomyoureview

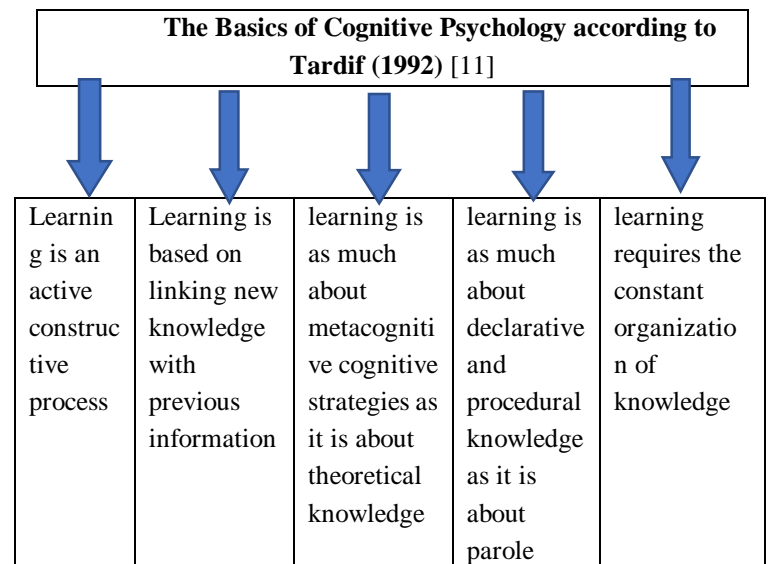**Table 2:** Study and Learning Strategies Analysis

Measured parameters	
The grid inspired by the learning cycle of Tardif and Kolb	**Weinstein Grid and Mayer, O'Malley 1990 Boulet 1996**
Teacher	Student
• Recalling knowledge • Evaluation of prerequisites • Introducing the sequence program • Recalling the keywords of each sequence • Feedback on each sequence • Moving from theory to practice. • Implementation test and transfer.	• **Study** Strategies: Before the Lesson • During the lesson after the lesson • **Cognitive** strategy: how does content remember? • **Metacognitive strategy** :p you explain the method used? • **Emotional** Strategies: What are your training goals? What

• Involvement of students in the process	are your goals for the module? • **Resource Management** Strategies: where do you work, by what means, with whom?

Table 3 :Grid: These results will be compared with the basic principles of cognitive psychology. (Table 4)
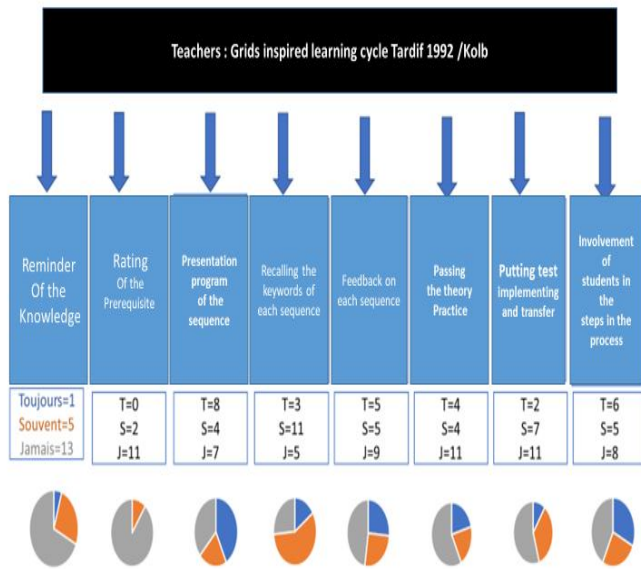
Student: the grid of study and learning strategies.				
Study strategy	**Cognitive strategy**	**Metacognitive strategy**	**Emotional strategy**	**Resource management strategy**
Before class	How to memorize content	Can you explain your memorization method	What are the objectives of the training	Or you're working
During the course			What are the objectives of the module	By what means
After the course			What are the objectives of the course?	With whom

Table 4: The Main Principles of Strategic Education that state that

The Basics of Cognitive Psychology according to Tardif (1992) [11]				
Learning is an active constructive process	Learning is based on linking new knowledge with previous information	learning is as much about metacognitive cognitive strategies as it is about theoretical knowledge	learning is as much about declarative and procedural knowledge as it is about parole	learning requires the constant organization of knowledge

4- RESULTS AND ANALYSIS

4.1 Analysis of Teacher Practices

Figure 1 : Results and Analyses of Strategic Education

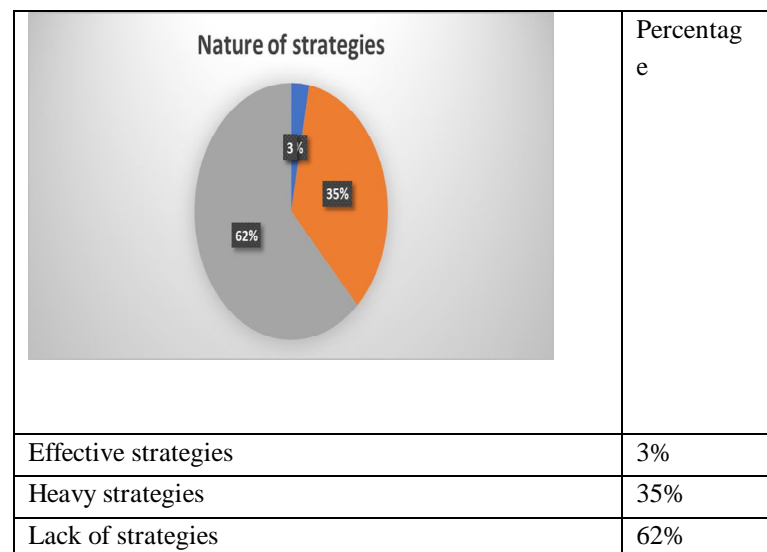Toujours = Always .souvent= Often   jamais = Never.

Analysis of teaching practice results (Table 4) shows that: teachers rarely recall knowledge before the start of each intervention 1% which calls into question the consideration of students' requirements. This step is the basic condition for **considering the person in a learning situation.** The absence of the evaluation of these same requirements 0%, calls into question the willingness of the teacher, the introduction of feedback that allows the student to update this knowledge and regulate his strategies of study and learning. The presentation of the work plan will be able to facilitate the student's concentration, which positively indicates the implementation of 3% emotional strategies. The results show **that teachers are focusing on this sector.** Recalling keywords is not a common practice among teachers, making it difficult for students to take notes 3%. This sector makes it difficult to continue the course and organize knowledge. This step is crucial for good content ownership.

Feedback after each sequence would be able to facilitate the memorization process by releasing short-term memory and activation of long-term memory 5%. The deficiency of this component is noted in the results. It should also be noted that teachers rarely make the link between theory and practice, since their interventions remain academic and presented too theoretically 4% [12].

Teachers rely on an automatic transfer of knowledge, without doing so explicitly. Hence a very low percentage at the level of this item 2%.

The involvement of students in the stages of the teaching process is moderately mentioned but remains quite far from the requirements of the principles of cognitive psychology, which aims at the total involvement of students throughout the teaching process.6% [13].

4.2 The theoretical fields of teaching and learning to which teachers   refer

Each of the teaching practices identified in the questionnaire refers to; one or more theoretical fields of learning and teaching. These are shown in the chart in Table 5. The least dominant approach is the cognitive approach. It is only 10%, far behind intermediate, approaches; constructivists with 22% and traditional approaches transmissive not to say behaviorists, with 68%. This shows the theoretical foundations on which teachers are based to set up the teaching process. They are therefore far from the requirements of the guidelines of the principles of cognitive psychology. The latter today provides the basis for educational success in North American and Northern European countries.

	Percentage.
New Cognitive Approach	10%
Constructivist Intermediate approach	22 %
Traditional transmissive approach	66 %
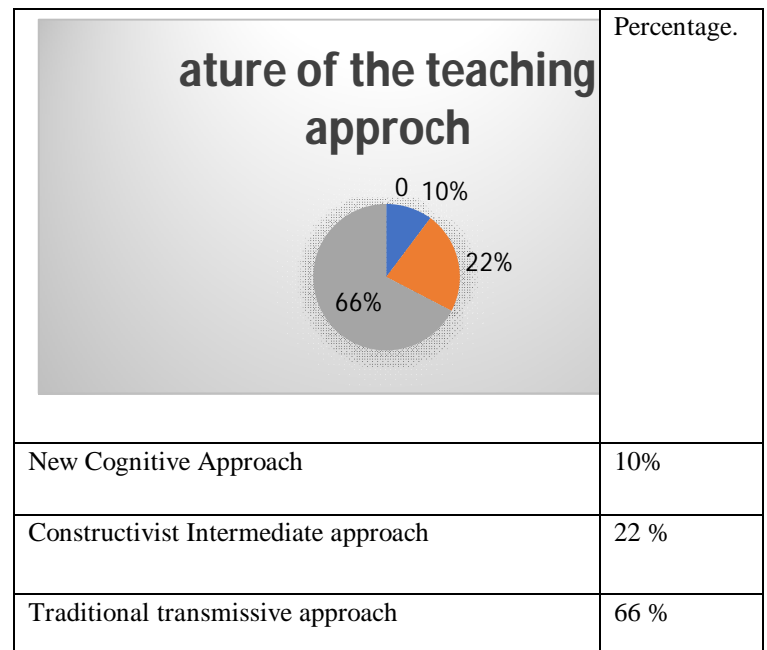
Figure 2 : Dominant Approaches to Education

	Percentage
Effective strategies	3%
Heavy strategies	35%
Lack of strategies	62%

Figure 3: Results and Analysis of Study and Learning Strategies

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The analysis of students' practices in terms of study and learning strategies has already been the subject of an article and allowed us to focus on how to organize studies before or after the course. We also analyzed the degree of use of cognitive, metacognitive, affective and resource management strategies. In this article, we tried to rank students in terms of their strategic characteristics, based on the uses of the strategies they implement.

The analysis of the graph in Table 5 , allowed us to identify three profiles:

1- The category of strategists: it represents 3% of the sample size. That's.a.very.small.percentage.

This category uses strategies that are in line with the principles of.cognitive.psychology.

These strategies can be acquired through informal training or accidentally discovered. In any case, there is a cause-and-effect relationship between the use of study and learning strategies and,academic,outcomes.

2- the heavy strategist category: it represents 35% of the workforce under review. This population does use strategies, but more often than not in line with the principles of cognitive psychology.

These students work hard and in an organized manner, without relying on a rigorous and scientifically validated theoretical framework.

3- the category of a-strategists: this population is the largest. It represents 62% of the total population under study. This category learns randomly, not organized. The emotional side outweighs the cognitive and metacognitive side. The results of their studies are random and not stable.

5-CONCLUSIONS AND SUGGESTIONS

The purpose of this production is to focus on teaching and student practices and to compare them with the founding principlesof.cognitive.psychology.

The latter have proven their effectiveness in teaching and learning and have enabled the success of several education systems in the countries that have adopted them. In the context of our study, we wanted to show the extent to which teacher and student practices are based on the principles of cognitive psychology, and to see later whether these practices could explain some of the factors of failure in academia. Through this work, we also wanted to show that the master effect and the student effect exist, and may explain certain factors.of.failure.and.success.

However, this work has allowed us to focus on the discrepancy between teacher and student practices and the theoretical framework that is supposed to organize their practices. We found that teachers' practices are far from the principles of cognitive.psychology

and teachers base their practices on theoretical currents that are no longer on the agenda or that do not ensure effective learning with students and do not involve them in the learning process, principles that are very dear to the social psychology. The currents of cognitive psychology that have proven their

worth, are very rare in teacher sin. Students on their side do not put in place effective strategies to manage their studies and learning.

Teachers' practices in terms of knowledge transmission, learning guidance and evaluation are based on a pragmatic framework often linked to references accumulated during multiple experiments. These practices are far from the principles of cognitive psychology that have yielded conclusive results in the processes put in place for sustainable and transferable,efficient,learning.

Students' practices in terms of organizing studies, synthesizing data, organizing them and rendition at the time of evaluations are far removed from the theoretical framework. The student's failure can also be explained by, among other things, the non-teaching of strategies that allow the learner to take charge of himself and to succeed in autonomy. Finally, success in terms of learning to teach requires streamlining practices, but also questioning practices that do not take into account the learner.

To go beyond this framework is our way through the unification of the formations. Updating training considering the theories that have made many education systems proud, in the image of North American and European countries North. By setting up continuous training to recycle old profiles Peer evaluation also remains an alternative, where the teacher is constantly evaluated after a learning sequence by other teachers and students. Set up a strategic education in which the student can develop and implement cognitive strategies, and metacognitive and a process to regulate these same strategies. All overseen by a theoretical framework based on data from social psychology. To go beyond the teaching paradigm and supplant it with that of learning.

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