UNIVERSIDADE ESTADUAL DE CAMPINAS

Faculdade de Engenharia Civil, Arquitetura e Urbanismo

JOSÉ CARLOS REDAELLI

AVALIAÇÃO DE DIFERENTES ESTRATÉGIAS DE APRENDIZAGEM ENTRE ALUNOS DA GRADUAÇÃO, PÓS-GRADUAÇÃO E ESPECIALIZAÇÃO DA ENGENHARIA CIVIL-ÁREA DE TRANSPORTES: APRENDIZAGEM AUTORREGULADA

EVALUATION OF DIFFERENT LEARNING STRATEGIES AMONG UNDERGRADUATE, GRADUATE AND SPECIALIZATION STUDENTS FROM CIVIL ENGINEERING-TRANSPORT AREA: SELF-REGULATED LEARNING

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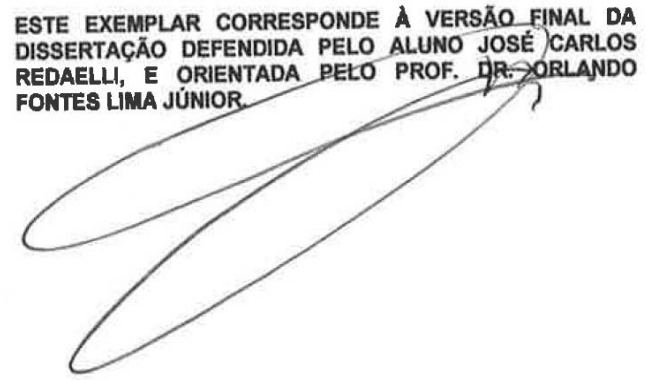
***Supervisor/Orientador*: Prof. Dr. ORLANDO FONTES LIMA JÚNIOR**

ESTE EXEMPLAR CORRESPONDE À VERSÃO FINAL DA DISSERTAÇÃO DEFENDIDA PELO ALUNO JOSÉ CARLOS REDAELLI, E ORIENTADA PELO PROF. DR. ORLANDO FONTES LIMA JÚNIOR.



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A ata da defesa com as respectivas assinaturas dos membros encontra-se no processo de vida acadêmica do aluno.

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I lovingly dedicate this dissertation to my mother, Elvira Basaglia Redaelli. Her emotional support and unconditional love has kept me alive in all aspects of my life until today.

(in memoriam)

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Resumo

A demanda atual para o trabalho da engenharia civil, área de transporte, requer novas habilidades, conhecimento e métodos efetivos de aprendizagem. Esta pesquisa avalia o uso potencial de estratégias de aprendizagem em 247 alunos da graduação, pós-graduação e especialização, idade 17-54, do curso de engenharia civil, área de transporte, da Unicamp, Brasil. As disciplinas foram respectivamente, “Introdução à Economia”, “Modelagem de Sistemas de Transporte e Logística” e “Gestão de Cadeia de Suprimento e Logística”. Os instrumentos foram um questionário sociodemográfico, e uma escala de Avaliação de Estratégias de Aprendizagem. A escala foi aplicada num pré e pós-teste no grupo de controle em 2010, para identificar a frequência de uso de estratégias cognitivas, metacognitivas e disfuncionais. Em 2011, aplicou-se a mesma escala e ocorreram intervenções sobre o uso de estratégias durante o semestre. Os alunos foram orientados sobre o uso de estratégias seguindo o modelo de aprendizagem autorregulada, envolvendo o conteúdo das aulas e gerando tarefas. Uma nova intervenção foi realizada em 2015 em alunos da graduação da disciplina “Economia dos Transportes”, focando a estratégia Mind Map para tomar notas. Um Grupo focal discutiu as práticas de estudo e em particular o uso desta estratégia. Em 2011 houve valores mais altos para consistência interna da pontuação das estratégias metacognitivas e totais, e valores mais baixos, para a pontuação das estratégias disfuncionais. Uma análise transversal comparando o pré-teste e pós-teste de cada semestre do ano mostrou que para os cursos de especialização, as médias das pontuações das estratégias cognitivas e totais no início do semestre de 2011 foram mais significativamente altos (P=0.023 e P=0.019 respectivamente) do que as do grupo de 2010. Uma análise transversal foi realizada entre os três cursos em 2010 e em 2011 para comparar o uso de estratégias. Os alunos da pós e especialização tiveram as pontuações mais altas. Em 2015 o grupo focal evidenciou baixo uso de estratégias. Esta pesquisa é inédita mostrando oportunidades para melhorar os cursos nesta área. As futuras pesquisas devem considerar que estes alunos fazem parte da geração Y, e se caracterizam pelos estilos de aprendizagem, que certamente entrarão em conflito com hábitos e estilos de quase todos os professores.

Palavras-chave: Desempenho do aluno, Estudo autônomo, Métodos de ensino

Abstract
The current demand for civil engineering work, in transport area, requires new skills, knowledge and calls for effective learning methods. This research evaluates the potential use of learning strategies in 247 undergraduate, graduate and specialization students, age 17-54, of Civil Engineering, transport area, Unicamp, a University in Brazil. The disciplines were respectively, “Introduction to Economics”, “Modeling of Transport and Logistic Systems” and “Supply Chain and Logistic Management”. The instruments were a social demographic questionnaire, and a scale of evaluation of learning strategies. A pre and post-test scale was administered to a control group in 2010, to identify students´ cognitive, metacognitive and dysfunctional learning strategies usage. In 2011, the same scale was administered and interventions in learning strategies were done during the term. The students were oriented about the use of some strategies following the cyclic self-regulated learning model, involving the contents of the classes and providing homework. A new intervention took place in 2015 with 58 undergraduate students, Transport Economics discipline, with focus on Mind Map strategy as notetaking of the classes. A Focus Group meeting discussed the different ways these students studied and specifically this strategy. In 2011, there were higher values for internal consistencies for the metacognitive scores and total scores, and lower values for the dysfunctional scores. A pre-test cross-sectional analysis comparing the post-test showed that for the specialization courses, the cognitive scores and the pre-test total scores average for the 2011 group were significantly higher (P=0.023 and P=0.019 respectively) than the 2010 group. A cross-sectional analysis done among the three courses in 2010 and in 2011 to compare the use of strategies had the highest scores for the graduate and specialization students. In 2015, the focus group showed that the students had low use of learning strategies. This research is unprecedented showing opportunities to enhance the courses in this area. Following researches should take into account that these students are part of generation Y, which are categorized by learning styles, which will certainly conflict with almost all teachers’ habits and teaching styles.

Keywords: student performance, self-study, teaching methods

FIGURE LIST

TABLE LIST

Summary

1. Introduction

The current demand of the work market for civil engineering, specifically in transport area, requires new skills knowledge, and calls for effective methods and strategies for teaching and learning. These can result in improvements in environments with less structured problems, increasing socio-environmental constraints, new materials and technology, and necessity of synthesis and critical capacity. This research shows the implementation of self-regulated learning strategies in undergraduate, graduate and specialization students in Civil Engineering, transport area, of Unicamp, a University in the state of São Paulo, Brazil.

In the environment of a traditional school, the students tend to depend on their teachers[1] for the acquisition of information and hope to receive the learning material to motivate them. It is accepted that the teachers should have the control about what, how, when and how much will be learned. In this environment, the teacher has the responsibility for conveying the contents, while the students should find a way to understand, store and activate the knowledge. These lead to a condition in which the students do not have enough opportunity to organize and control their own learning (BOEKAERTS; NIEMIVIRTA, 2005).

On the contrary, the self-regulated learning refers to an active learning that is guided by the motivation to learn, metacognition (awareness of knowledge and own beliefs), and strategic action (planning, monitoring, and assessment of personal performance, and take own actions). Researches support that the optimum academic development is strongly tied to the extent the students use the self-regulated learning. Teaching self-regulated learning to students not only contributes for the formal education, but also prepare them for the lifelong learning (ZIMMERMAN, 2002).

Self-regulated learning, the core of this research, has become a key construct in education lately. It has played an outstanding role in learning and in performance inside and outside of school (ZIMMERMAN, 1998).

[1] The word “teacher” used in this text has the same meaning as “lecturer, instructor, coach, tutor, and educator”, related to teaching.

Considering the relevance of teaching-learning for civil engineers, the American Society of Civil Engineers (ASCE) published the following documents of great importance for the area; “Civil Engineering Body of Knowledge for the 21st Century” (BOK), prepared by the Body of Knowledge Committee of the Committee on Academic Prerequisites for Professional Practice; and “Vision for Civil Engineering in 2025”, prepared by the ASCE Steering Committee. Both documents contain implicit or explicitly attitudes and abilities which are present in the Social Cognitive Theory (SCHUNK, 2012) and self-regulated learning, modeling (ZIMMERMAN, 2001).

BOK, developed by ASCE, means the necessary depth and breadth of knowledge, skills, and attitudes that an individual needs to practice civil engineering in the 21st Century”. The BOK committee was formed in October 2005, for the second edition in response to stakeholder input and recent developments in engineering education and practice.

The BOK report states that, through formal education and experience, it is necessary to accomplish 24 outcomes in different levels of achievement, such as, level 1 – Knowledge; level 2 – Comprehension; level 3 – Application; level 4 – Analysis; level 5 – Synthesis; and level 6 – Evaluation. Regarding Lifelong Learning (outcome 23), the levels needed are from one to five, i.e. Knowledge, Comprehension and Application, which can be accomplished through bachelor’s degree, and Analysis and Synthesis, which can be accomplished through prelicensure experience (ASCE, 2008). Inside social cognitive theory, ZIMMERMAN (2002) states that making students self-regulated learners prepares them for the lifelong learning.

The BOK report agrees that university is the core of any education program. The faculty member is the first representative of the profession, and as such, the first role model. Future engineers must be well prepared if they want to earn and keep the respect as professionals. The Interactions between teachers and students can have good effect on education. The two main reasons that the students switch from engineering to another course are poor teaching and inadequate advising (ASCE, 2008). Following the same line, social cognitive theory explains the importance of models coming from teachers, as well as the reciprocal interactions among people, behaviors, and environments (SCHUNK, 2012).

The BOK committee approved of the seminal work of Ernest L. Boyer, Scholarship Reconsidered: Priorities of the Professoriate (ASCE, 2008). BOYER (1997) states the importance of research, synthesis, practice and teaching to acquire knowledge, and that scholars are true lifelong learners, acquiring knowledge continuously. The bridge between the teachers' understanding and the student's learning is very relevant and this requires that faculty also be learners, always expanding their own knowledge and understanding, and integrating disciplines. Similarly, ZIMMERMAN (2001) explains the importance of self-regulated learning and that this leads the students to be metacognitive, motivation and behaviorally active participants in their own learning processes.

The BOK report says that many researches show that when engineering faculty are effective and teachers are enthusiastic, the student learning increases. In the current educational system, the civil engineers do not become effective teachers when they take a Ph.D., neither via experience in civil engineering practice. That leads to an appropriate teaching pedagogy and education training, which will mean an increase in the effectiveness of faculty in creating excitement for learning. This is a challenging job; effective communication with students; an ability to address clear understanding; an awareness of learning styles; and an ability to relate to students in both positive and inspirational ways. The teacher must persuade students by active involvement in the individual student's personal learning process. Student learning increases when the teacher is highly effective (ASCE, 2008). Following the premises of social cognitive theory, one of the sources of self-efficacy is persuasion; a very important feature that teachers should have before their students (BANDURA, 1971;1977a); personal learning process means self-regulated learning where the students are responsible for their courses of actions for their learning (ZIMMERMAN, 2001).

The BOK report states that the professional has to assume that they are becoming more self-directed in the work life and beyond. It means that they have to be responsible for their personal and professional development, i.e. to set goals and create plans to achieve them (ASCE, 2008). ZIMMERMAN (2001) states that the individuals must be responsible for their own learning, setting up goals and self-regulated learning strategies to achieve them.

The BOK report suggests that the professional should reflect on what has been faced so far, concerning successes and failures, and what, in the spirit of outcome 23 (lifelong learning) has been learned. A plan should be developed meaning that goals for personal and professional development should be set and finding strategies that will enable you to achieve the goals; then act. The professional should share goals with the supervisor, colleagues, friends, family, and others (ASCE, 2008). SCHUNK; ZIMMERMAN (1998) explain the cyclic self-regulated learning model, involving forethought, realization and self-reflection phases, a way to plan, accomplish, and check goals.

The involvement in lifelong learning, to obtain knowledge, understanding, or skill throughout one's life, is highly relevant because of increasing quantity of technical and nontechnical knowledge required by civil engineers. What the professional learned in undergraduate programs are not enough for the career. It is important to regulate the self-directed learning, and create their own learning plan. Self-directed learning is a mode of lifelong learning. Mentorship should play a key role in the process of lifelong learning. Civil engineers must have the ability to learn how to learn (ASCE, 2008). This subject is a critical part of self-regulated learning (ZIMMERMAN, 1998), and in triadic reciprocity (personal determinant meaning cognition, skill, affect and expectation; socio-environmental determinant; and behavioral determinant) and mentoring (SCHUNK, 2012).

The document "The Vision for Civil Engineering in 2025" was created in 2006 when participants, including international guests held actively the Summit on the Future of Civil Engineering. A varied group of civil engineers, engineers from other disciplines, architects, educators, association and society executives, and other leaders, including participants from eight countries outside the United States attended this Summit. The purpose was to express an aspirational global vision for the future of civil engineering conveying all levels and facets of the civil engineering community. They dealt with preceding problems and opportunities and intra-disciplinary, cross-disciplinary, and multidisciplinary collaboration on projects and in research and development. They highlighted not only continuing education but also on what a basic civil engineering education must further deliver (ASCE, 2007).

The Vision report shows that the body of knowledge needed to practice effectively civil engineering at the professional level is beyond the traditional bachelor's degree. Education must combine technical excellence with the ability to lead, influence, and integrate. The skill needed for civil engineers refers to the ability to do tasks such as using a spreadsheet; continuous learning; problem solving; critical, global, integrative/system, and creative thinking; teamwork; communication; and self-assessment. The civil engineer is knowledgeable. They understand the theories, principles, and/or fundamentals of collaboration on intra-disciplinary, cross-disciplinary, and multi-disciplinary tradition; as well as the management of tasks, projects, and programs to supply expected results while satisfying budget, schedule, and other constraints, among other fundamentals. Civil engineering education has been reformed. This modification was partly because of the recognition that academia and industry need to work together and partner in the delivery of baccalaureate, post-baccalaureate, and lifelong learning educational activities. In both cases, when the participants had to answer the question, "What will be different in the world of 2025?", and when they had to draft some shared aspirational visions on ideas and information, they answered "life-long learning" to keep up with knowledge transformations (ASCE, 2007). In self-regulated learning, students are helped to prepare for their formal education, and for their lifelong learning (ZIMMERMAN, 2002). In addition to triadic reciprocity and mentoring (SCHUNK, 2012), all of these comply with the above Vision statements.

The ministry of education of Singapore has identified increasingly relevant competencies for the XXI Century, concerning students, as a confident, resilient, independent, critical individual, discerning in judgment, and effective communicator; a self-directed learner meaning ownership of learning, lifelong learning, responsible for own learning; an active contributor, innovative and pro-active individual (SINGAPORE, 2013). All these features are found in self-regulated learning (SCHUNK; USHER, 2013; SCHUNK; ZIMMERMAN, 1998; ZIMMERMAN, 2001;2005;2008; ZIMMERMAN; BONNER; KOVACH, 1996).

Problem solving and learning involve cyclic processes, which call for both cognitive strategies, and regulation of efforts. Students who fail in engineering may assign their failures to the lack of abilities to learn engineering rather than to use

effectively cognitive strategies. Their frustrations from disappointments may eventually lead them to quit engineering. Jackson State University gives the following reasons resulting students' failing or dropping out of engineering: (1) absence of motivation and interest in learning engineering; (2) absence of good learning routines, strategies and efforts in their studies; (3) absence of pairs and faculty members for help seeking. There is a need in engineering schools to help their students develop cognitive abilities and effectively regulate their learning efforts during the learning and problem solving processes. Considering the above statements, Jackson State University developed a civil engineering program using the cyclic self-regulated learning model, to facilitate the addressing of engineering concepts to the students. Self-directed feedbacks were used in the program for the application of learning strategies and self-reflection. Some self-assessments and tests were part of the program. Some instruments were administered to evaluate the effectiveness of the proposed program, including pre and post-test questionnaires for measuring change of students' academic dispositions and the quality of students' tests. The students had the chance to learn how to use different learning strategies, and follow up more consistently their academic learning, make adjustments for improvement and eventually increase their abilities towards self-confidence and self-regulation. Despite many researches, self-regulated learning is not well known by the community of engineering education (ZHENG et al., 2012).

Inspired by the outcomes needed for civil engineers learning, recommended by BOK and Vision reports (ASCE, 2007;2008), and by the needs of XXI century competencies, this research was developed concerning the Civil Engineering Students, transport area. It was divided into two steps; the first step is called "Study 1", and the second "Study 2". It took place in a Brazilian university, Unicamp. The first step of this research (Study 1) describes a different learning approach for civil engineering department students, transport area, following the premises of the Cyclic Self-Regulated Learning Model of SCHUNK; ZIMMERMAN (1998) aiming to enhance the learning and teaching processes. It investigates the effects of the use of self-regulated learning strategies on the students' study behavior through learning interventions applied in classrooms.

The participating students were from undergraduate (Introduction to Economics), graduate-master and doctoral (Modeling of Transport and Logistic

Systems) and Specialization (Supply Chain and Logistic Management) from civil engineering, transport area. The disciplines were chosen following some premises like, unstructured problems and high humanistic interface, involving engineering concepts integrated into economics, administration and social sciences.

Study 2, second step, complemented Study 1 and took place in undergraduate classes, in Transport Economics discipline of civil engineering students, transport area. The focus was on the Mind Map learning strategy, which embodied Guided Notes strategy. A Focus Group was held to evaluate the different ways these students studied and specifically their use of this strategy.

The approach used in this research, the Cyclic Self-Regulated Learning Model based on CLEARY; ZIMMERMAN (2004), to convey self-regulated learning strategies to three groups of students from Civil Engineering, transport area, and the use of Mind Map through Guided Notes learning strategy, in civil engineering, transport area, is unprecedented and shows a great opportunity to enhance the learning in this area.

1.1. Question of the Research and Objectives

1.1.1. Question of the Research

Can self-regulated learning strategies enhance the students' learning independence, in civil engineering, transport area?

The more the learners use self-regulated learning strategies the higher their propensity to apply promising strategies for their learning BORUCHOVITCH; SANTOS (2015).

1.1.2. General Objective

Evaluate the effects of the use of self-regulated learning strategies in three courses of civil engineering, transport area.

1.1.3. Specific Objectives

a) Evaluate to what extent the students use learning strategies.

b) Identify ways to enhance the students' learning through self-regulated learning strategies.

1.2. Scope

This research took place in a Brazilian University of first level – State University of Campinas, Unicamp, in Civil Engineering Institute, Transport Area, located in the state of São Paulo, city of Campinas. Unicamp is ranked as first place in Brazil, according to Education Ministry. Considering some data from 2014, Unicamp had 1,795 teachers (99% with doctorate level). As for undergraduate, there were 66 courses and 18,698 students enrolled. As for Graduate courses, there was a total of 153 courses: 75 for Master, 70 for doctorate and 8 for specialization, with a total of 15,918 students enrolled, divided into 5,175 for Master, 6,223 for Doctorate, 982 for specialization and 3,538 for special students. As for extension courses, there were 1,133 with 7,801 enrolled students.

The School of Civil Engineering, Architecture and Urban Design - FEC is one of the 20 Institutes or Schools of UNICAMP. It has two undergraduate courses (Civil Engineering, with 80 places a year, and Architecture and Urban Design with 30 places a year). The graduate programs (Civil Engineering and Architecture, Technology and Cities) have around 398 students that are enrolled as regular students (216 Master and 182 Ph.D.). There are also 400 students enrolled in extension courses, designed for professionals of industry. The faculty size is 72 professors, most of them working as full time.

FEC is ranked as number 1 in Brazil among the under 50 years old civil engineering courses based on QS world university ranking. Its academics production is placed on number 2 position when considering the annual number of Ph.D. thesis in Brazil, and also, on number 2 position when considering the annual number of published papers in journals in Brazil, among the 99 existing graduate programs in the country.

In the first step of the research (Study 1) in 2010 and 2011, there were three groups of students involved, undergraduate ("Introduction to Economics" class), graduate ("Modeling of Transport and Logistic Systems" class), and specialization

students (“Supply Chain and Logistic Management” class) of Civil Engineering, transport area. There were two teachers involved in those three courses; Introduction to Economics, and Modeling of Transport and Logistic Systems had the same teacher. The graduate classes took place in the morning, the undergraduate, in the afternoon, and the specialization, at night. In the second step of the research in 2015, the research involved undergraduate students from “Transport Economics” discipline.

2. Literature Review

2.1. Learning Theories

SCHUNK (2015) states that people agree on the importance of learning, but they hold different points of view on the causes, processes, and consequences of learning. There are more than one definition of learning but one theorists and researchers accept. The following is a general definition of learning that is consistent with the cognitive focus, which captures the criteria which most educational professionals consider central to learning: “Learning is an enduring change in behavior or in the capacity to behave in a given fashion, which results from practice or other forms of experience”.

SCHUNK (2015) defined three elements for learning. One element is *learning involves change* in the ways individuals behave or in the capability for that. Individuals learn by the time they can attain something in a different manner. Individuals do not see learning in a straightforward way; they observe the results, outcomes. A second element is *learning endures overtime*. This excludes brief changes in behavior produced by drugs or tiredness. By the time these causes are out, the behavior will go back to its original condition. The duration of other changes may classify the changes as learned or not. A third element is *learning occurs through experience*, which is, practicing and witnessing others.

MIZUKAMI (1986) studied some approaches to different pedagogical axes in Brazilian teaching. The approaches that could have affected teachers are *traditional, behavioral, humanist, cognitivist* and *socio-cultural*. Analyses of each approach was developed through basic concepts (categories) that are *general characteristics, the Individual, the world, society–culture, knowledge, education, school, teaching–learning, teacher–student, methodology,* and *evaluation.* See **Table 1** (MIZUKAMI, 1986).

There are some similarities among the approaches and respective concepts detailed in **Table 1** regarding the following aspects:

a) interaction between individual and environment

The individual interacts with the environment (socio-cultural and cognitivist approaches); they intervene in socio-cultural process (cognitivist approach) and they manage the environment (behavioral approach).

b) relationship between teacher and student

The teacher and the student have mutual growth, and their relationship is with affection (socio-cultural approach); the teacher mentors the student making them work more and more independently (cognitivist approach); the teaching is student-oriented making them accountable for their own learning goals (humanistic approach).

c) methodology

The student is active and critical (socio-cultural approach); the action of the individual is the center of the process (cognitivist approach).

Social Cognitive Theory and Self-Regulated Learning, through which this research is based, bring new and more understanding about the relationship between the individual, environment, and culture, through triadic reciprocity (a triadic bidirectional interaction among social environmental determinants, and behavioral determinants and personal determinants). It brings more understanding about the interaction between the teacher and the student, through self-regulated learning (the student is responsible for their learning) and agency (agency is related to attaining things intentionally). It brings more understanding about the methodology, meaning active methods of actions to foster learning, as the cyclic self-regulated learning model. The following pages will show more details of this theory and such elements.

Table 1: A study on the Approaches of the Brazilian Educational Process

Concepts	Approach				
	Traditional	Behavioral	Humanistic	Cognitivist	Socio-Cultural
General Characteristics	no ground on empirically validated theories; it provides a reference framework for other approaches.	empiricism; what has been discovered was already present in exterior reality; knowledge is a direct result from experience.	student-centered teaching; the teacher does not transmit the contents, but assist the students; emphasis on the individual`s psychological and emotional life.	organization of knowledge, information processing, thought or cognitive styles, decision-taking behaviors, etc; it studies the learning process scientifically as a product of environment, people or external factors.	emphasis on socio-political-cultural aspects; concern with popular culture.
The Individual	passive receptor; information provided by environment.	consequences from influences existing in the environment; he is not free; self-control; self-sufficiency.	he is unique; connected to others to continually discover himself; self-realization is the ultimate objective.	the knowledge is the product of the interaction between the individual and the world; individual is an open system searching for a final stage, never reached; the individual changes the environment and changes himself.	the individual intervenes in reality to change it; educative action promotes the individual; the individual has temporal-spatial roots; the individual and the world because it is an interactionist approach.
The World	reality is by formal educational process, family and church.	the world is already created; the individual is a product of the environment.	reality is a subjective phenomenon; the human-being rebuilds in himself the exterior world, from his perception.		
Society - Culture	diploma: hierarchical instrument of the individuals in the social context.	it depends on a socio-cultural infrastructure with coherent meanings assigned to society and culture.	it is concerned about the individual; emphasis on the process, not on the final states of being and it is oriented to an open society.	social development goes democracy way; rules, values, norms, symbols, vary from group to group, according to the average mental level of the group.	the individual creates the culture within his context of life, and reflects about it and bring answers to the challenges.
Knowledge	The individual has to memorize definitions, syntheses,etc trying to keep the acquired product close to the desired one.	direct result from experience; planned experience.	personal and subjective experience; one knows what is perceived; human being is curious about knowledge.	it implies in endogenous aspect, for it presupposes an abstraction-reflexive or empirical; continuous construction;	its elaboration and development are linked to the consciousness process and it is created mutually from thought and practice.
Education	Education is a product; no emphasis on the process	Cultural diffusion; knowledge, ethics, social practices, basic skills, to manage and control the environment.	individual-centered education;	socialization process; logic is built; reciprocity coordinates points of view and actions among the members.	reflection on the individual and his lifestyle.

Cont - A study on the Approaches of the Brazilian Educational Process

Concepts	Approach				
	Traditional	Behavioral	Humanistic	Cognitivist	Socio-Cultural
School	teacher is the mediator among the students and the models; peer cooperation is reduced;	It keeps and changes the standards of behavior accepted as useful and desired for a society.	It makes the autonomy of the student possible.	motivation must be intrinsic; the solution is peculiar to each student; motor, verbal and mental development, and then intervene in social-cultural process.	mutual growth of students and teacher.
Teaching - Learning	the intervention often aims at just one of the players of the relationship; the methods do not vary along the classes.	learning is like a relatively permanent change into a behavioral tendency and into the mental life of an individual, resulting from a reinforced practice. Teaching is an arrangement and planning of reinforcement contingency.	to direct an individual to his own experience.	a true learning is only possible when the learner elaborates his knowledge; it needs to be considered the "learning to learn".	educator and learner are subjects of a process where they grow together, for nobody educates anybody; the individuals educate themselves mediated by the world.
Teacher - Student	the main relationship is teacher-student and interaction among the students rarely exists.	the teacher plans and develops the teaching-learning system to maximize the student`s performance.	the teacher is the unique personality who will develop his own repertoire; the student must be responsible for the objectives referring to learning.	the teacher must guide the student and give him considerable self-control and autonomy, and be his researcher, advisor and coordinator, making the student work more and more independently.	horizontal relationship; the educator becomes learner and vice-versa; relationship with affection.
Methodology	expositive class and teacher`s demonstrations to the students, like an auditorium.	the use of strategies is emphasised to allow a great number of students to achieve high levels of performance.	the instructional strategies assume secondary attention; a technique or method is not emphasized.	the action of the individual is the center of the process and the social or educative factor is a condition of development; the environment must be challenging and always brings imbalances. Motivation is characterized by imbalance, need, and contradiction.	using a debate-like in actual life situations in a group, there are some basic features: being active, critical and talkative. Then it is possible to create a personal programme and use techniques like reduction and codification.
Evaluation	It aims at the exact reproduction of the concepts transmitted in class and the grades have the meaning of the level of culture acquired.	the student evolves at his own pace, without making mistakes, and the evaluation checks if he achieved the objectives.	only the individual can know his experience, hence he must be responsible for his learning control and his evaluation.	one of the ways to check the performance is through free productions, with own expressions, relationships, pragmatic explanations and causal explanations.	self or mutual and permanent evaluation of the educative practice, by teachers and students.

2.1.1. Social Learning Theory

In the perspective of social learning, the individual is neither oriented by internal strength nor bothered by the influences of environment. Instead, emotional operation is best acknowledged regarding a constant reciprocal interaction between behavior and its regulation circumstances. The social learning theory emphasizes the importance of vicarious, symbolic, and self-regulatory processes. Actually, learning coming from direct experiences can happen on a vicarious way by observation of individuals' behavior and consequences for them. The capacity of individuals to learn by observing others enable them to obtain crucial, integrated components of behavior. They do not have to expand the standards progressively to monotonous trial and error. In the same way, psychological responses can be expanded in an observational way when watching the sentimental responses of others when having unpleasant or pleasant experiences. The individuals' cognitive capability is another element that governs, not only how they will be influenced by their experiences, but the future orientations that their acts may take. Individuals can describe external influences symbolically and make use of these illustrations later to steer their acts. They can find solutions for problems symbolically without having to perform a variety of options; and they can foresee the expected results of various performances and steer their behavior appropriately. These superior cognitive processes allow both intuitive and foresighted behavior. A third differentiate characteristic of human-being is their capability of creating self-regulative effects. Individuals can control their behavior to a certain extent, by handling arousal elements of specific activities and generating results for their own acts. The cognitive and self-regulative effects frequently assist remarkable tasks in causal courses (BANDURA, 1971).

Social learning researchers also demonstrated that teachers' expositions together with exhibitions, notably strengthened individual's learning of concepts taught (ZIMMERMAN; SCHUNK, 2003).

2.1.2. Observational Learning

Bandura and colleagues have done research on observational learning, which supplies significant advice for teaching by expositions for teacher and student's evolution. It is relevant to remind the meaning of the word "teach", which is "show" (ZIMMERMAN; SCHUNK, 2003). Educators have recognized the relevance of modeling to successful teaching form the time of Ancient Greeks (ROSENTHAL; ZIMMERMAN, 1978).

Following advices of the philosopher Cicero, the Roman statesman, the students were under mentoring of expressive models. Although instructional methods had an encouraging place in the pantheon for a long time, modeling experienced little scientific studies before Bandura started his research on this learning mode (ZIMMERMAN; SCHUNK, 2003).

Studies on observational learning directed by Albert Bandura and colleagues, was a serious confrontation with behaviorism. The main findings of this study argued that individuals could learn new actions just observing other individuals doing the actions. The people observing did not have to attain the actions at the same time they were learning. There was no need for reinforcement for learning to happen (SCHUNK, 2012).

Bandura devised an extensive theory of observational learning that he has made larger to include acquisition and performance of a variety of abilities, strategies, and behaviors. Social cognitive basics have had relevance in the learning of cognitive, motor, social and self-regulation skills (ZIMMERMAN; SCHUNK, 2003).

BANDURA (1986) and ZIMMERMAN; SCHUNK (2003) argue that to transform understanding modeling into instructing exercise, teachers need an instructive theory. Bandura supplied observational learning theory, which states four subfunctions ruling modeling:

a) Attention

The attention process has to do with important and significant aspects observed in the model's behavior, and respective consequences. The observer has to be able to pay attention to the event and extract key elements from it.

b) Symbol representation (retention)

In the retention (symbol representation) process, the observer has to be able to remember so that it will be possible to come into action. It means that the observer must rehearse and act trying to recall what he has seen. This regards the learner's cognitive construction and rehearsal of modeled information.

c) Production (motor reproduction)

In the motor reproduction (production) process, it means that the observer must practice, reproduce the modeled behavior. This is an indication that the observer can see that the learning has occurred. SCHNEIDER; PRESSLEY (1997), states that the use of keyword and imagery strategies is supposed to improve memory and the use of information during motor reproduction process.

d) Motivation

Finally, in the motivation process, the observer will learn only if the model's behavior consequences are important, with values, and with positive reinforcements. This process means that there is a wide range of incentives to attain on what the learner has learned.

Flaws in observational learning can be tracked down to breakdowns in one of these subfunctions. As an example, a learner may be unsuccessful to acquire a knowledge of a complicated software by modeling because of distraction form significant characteristics of the exposition. This problem may also happen because of observer's lack of ability to examine and convert the model's strategies. The negligence may also happen because of problems in converting the understanding into expert attainment. The learners may also be demotivated to carry out what they have learned (ZIMMERMAN; SCHUNK, 2003).

2.1.3. Social Cognitive Theory

Social Cognitive Theory emphasizes the idea that most individuals' learning happen in a social context. By watching others, individuals acquire understanding, regulation, abilities, strategies, beliefs, and convictions. People also learn from modeling, perform according to beliefs they have about their capacities and about the expected results coming from their performances (SCHUNK, 2012).

Bandura is a productive writer. He wrote Social Learning and Personality Development, in 1963, with Richard Walters; he also wrote Principles of Behavior Modification, in 1969; in 1977 he wrote Social Learning Theory, and Social Foundations of Thought and Action: a Social Cognitive Theory, in 1986; when he wrote Self-Efficacy: The Exercise of Control, in 1997, he meant that he had expanded his theory to show paths that individuals look for to control over remarkable episodes of their lives using self-regulation of their thinking and acting. It requires elementary procedures that involve establishing goals, foreseeing results of actions, assessing results against respective goals, and self-regulating thinking, feelings, and actions (BANDURA, 1986; SCHUNK, 2012).

Social Cognitive Theory has some suppositions about learning and behavior performance, like, reciprocity among people, behaviors, and environment; learning vicariously or by doing; difference between learning and performance; and self-regulation role (ZIMMERMAN; SCHUNK, 2003).

a) Triadic Reciprocity in Social Cognitive Theory

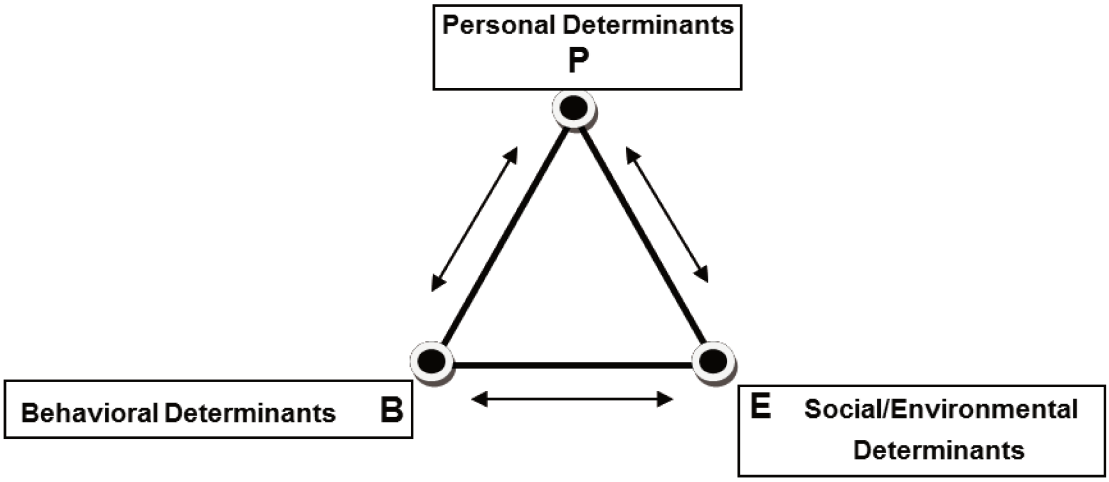
Social Cognitive Theory deals with reciprocal interactions among people, behaviors, and environments (SCHUNK, 2012).

Causation is a term used to explain basic reliance among events. In Social Cognitive Theory, human agency works within a causal body meaning a triadic reciprocal causation (BANDURA, 1986).

A core principle of Bandura's Social Cognitive Theory is that the behavior of the individuals works within a structure of triadic reciprocity. It means reciprocal actions among three groups of impacts: personal (P), as cognitions, self-efficacy, skills and,

affects, behavioral (B) and social/environmental (E) determinants. The way individuals explain their actions outcomes alter their environments and their personal elements. Consequently, these explanations notify and change succeeding behaviors. Triadic reciprocal causation does not mean that the varied sources of impact have the same power, nor do they occur at the same time. A causal determinant does not apply its effect and starts up reciprocal effects immediately; it needs time (BANDURA, 1986;1989;1997;2001; SCHUNK; USHER, 2013). See Triadic Reciprocal Causation in **Figure 1** (BANDURA, 1997;2001).

Figure 1: Triadic Reciprocal Causation



P ←→ B

Expectancies, beliefs, self-awareness, objectives and plans (P), draw the shape and orientation to behavior (B). The way individuals think, believe, and feel (P), influence their behavior (B) (BANDURA, 1986). The results of their actions, in turn, regulate their thinking standards and the way they react emotionally (BANDURA, 1989).

Concerning the interactions between self-efficacy (P) and behavior (B), some researches demonstrate that self-efficacy affects achievement behaviors, as in choosing an assignment, effort, resilience and use of successful learning strategies (SCHUNK; PAJARES, 2009). These behaviors (B) equally influence self-efficacy (P). As the learners get involved on assignments and notice their learning development, their self-efficacy for continuing learning is increased (SCHUNK; USHER, 2013).

E ←→ P

Individuals' expectancies, beliefs, emotions (P), are constructed and updated by social effects (E) that carry information and stimulate sentimental responses by means of modeling, direction and social persuasion (BANDURA, 1986). People stimulate diverse social responses relying on their socially granted roles and image (BANDURA, 1989).

The interactions between personal (P) and social/environmental (E)determinants can be seen with learners with learning disabilities, and many of whom have low self-efficacy (LICHT; KISTNER, 1986). Learners in their environments (E) may react to them according to basic characteristics such as low skills instead of their real capacities. In return, social/environmental (E) feedback can influence learners' self-efficacy (P). When a teacher tells the learner that they can do it, their self-efficacy may rise (SCHUNK; USHER, 2013).

E ←→ B

In the negotiations of the individuals' lives, behavior (B) changes the conditions of environment (E), and, sequentially it is changed by the conditions it has produced. Most aspects of environment do not act as an effect until they are stimulated by suitable behavior. Teachers do not affect their students unless they come to class. The feature of the potential environment which turns into real environment for some individuals, relies on their behavior (BANDURA, 1989).

The interactions between behaviors (B) and social/environmental (E) elements are in many instructional series. Social/environmental elements steer behavior. Learners' behaviors can alter the instructional environments. When teachers receive wrong answers from the students, teachers should re-teach the information instead of continuing with the subject (SCHUNK; USHER, 2013).

Social Cognitive Theory indicates a sight of human agency in which learners are engaged in their own success in a proactive way (SCHUNK; PAJARES, 2005). The individuals detain beliefs that let them exercise a remarkable degree of control over their thoughts, feelings and actions. In return, the outcomes of their actions and

other environmental information affect individuals. Yet, the range of this reciprocal element is wider than individuals are due to the social environments they live. Groups also influence and are affected by their actions and environments. As an example, teachers may come to a decision to apply more hands-on work to grow students' comprehension of concepts. They progress, execute these actions and keep on processing them based on students' experiences and learning (SCHUNK; USHER, 2013).

b) Enactive and Vicarious Learning

Learning is mainly one activity that deals with information, transforming it into symbols acting as a pattern for performance. In the Social Cognitive Theory investigation of observational learning, modeling impacts work mainly through their instructional purpose (BANDURA, 1977b;1986).

Social Cognitive Theory deals with enactive and vicarious learning. Learning happens either when individuals do the actions or vicariously, when they observe models do. Enactive learning means learning from the results of the individual's own actions. Behaviors are retained in the case the results were successful; the behaviors which led to failure will be treated again or abandoned (SCHUNK, 2012).

c) Learning and Performance

Social Cognitive Theory differs learning from performance, meaning that new learning from performance of preceding learned behaviors. They are different processes. Although much learning happens when people do the actions, it also happens when people witness actions. It is not possible to assure that people will do the actions that they observe. This depends on their motivation, interest, and many other factors (SCHUNK, 2012).

d) Self-Regulation

Self-Regulation is a conscious and volunteer internal mechanism of control, which governs the personal behavior, thoughts and feelings having self-established goals and personal standards as reference. It is a motivational process (BORUCHOVITCH, 2004; ZIMMERMAN; KITSANTAS; CAMPILLO, 2005).

ZIMMERMAN (2005) stated that the capability to self-regulate is perhaps the humans´ most important quality. BANDURA (2005) stated that the forethought capacity allows the individual to control and not just react against the effects of the efforts. The people are motivated and oriented by the goal forethought and not just by the retrospective of limitations.

The self-regulation process is present in all lives and operates through a set of three psychological subfunctions which must be developed and mobilized for changes in personal objectives: self-observation, judgment and self-reaction (BANDURA, 1986).

In the **Figure 2** there is a variety of aspects for each of the subfunctions mentioned including some updates of Bandura along his life; adapted by AZZI; POLYDORO (2008).

Self-regulation is described as cyclical because the feedback from prior performance and then the adjustments during current efforts. Those are necessary because personal, behavioral, and environmental factors are constantly changing during the course of learning and performance (ZIMMERMAN, 2005). See **Table 2** for A Comparison of Theoretical Views Regarding Common Issues in Self-Regulation of Learning (ZIMMERMAN, 2001).

Figure 2: Self-Regulation System - Sub-functions of behavior

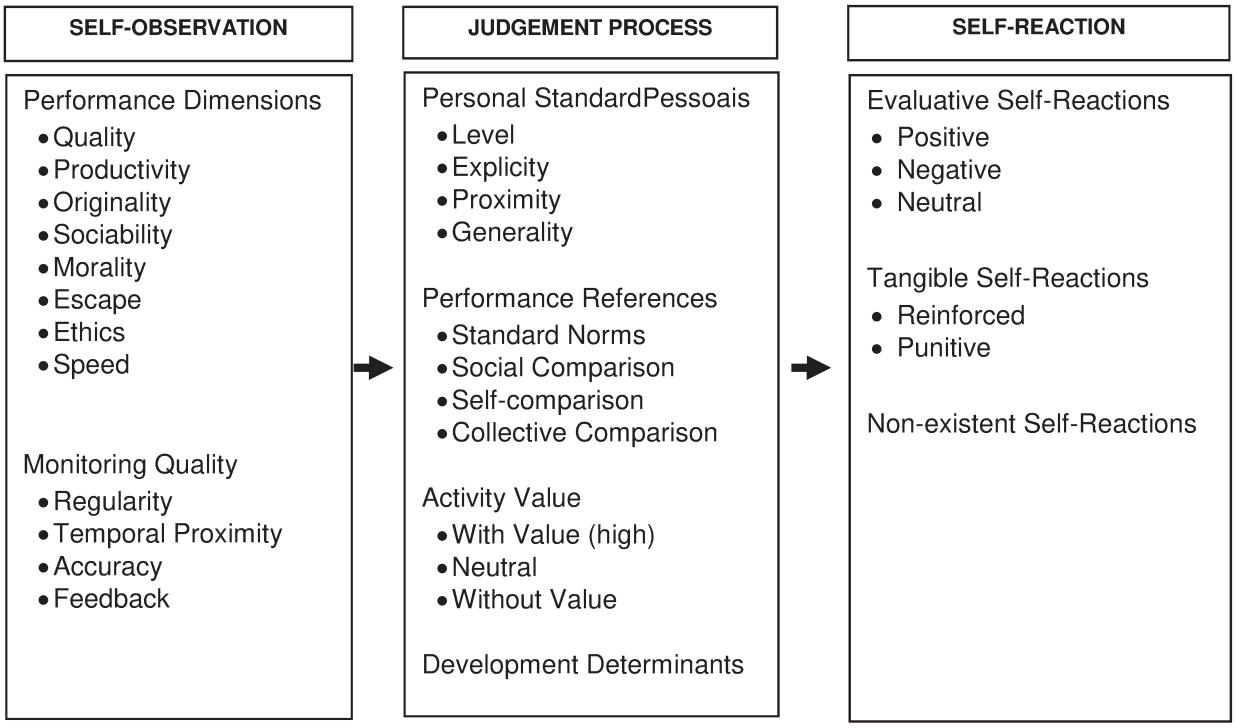


Table 2: A Comparison of Theoretical Views Regarding Common Issues in Self-Regulation of Learning

Theories	Motivation	Self-Awareness	Key Processes	Social & Physical Environment	Acquiring Capacity
Operant	reinforcement stimuli are emphasized.	not recognized except for self-reaction.	self-monitoring, self-instruction, and self-evaluation.	modeling and reinforcement.	shaping behavior and fading adjunctive stimuli.
Phenomeno-logical	self-actualization is emphasized.	Emphasize the role of self-concept.	self-worth and self-identity.	emphasize subjective perception of it.	development of the self-system.
Information Processing	motivation is not emphasized historically.	cognitive self-monitoring.	storage and transformation of information.	not emphasized except when transformed to information.	increases in capacity of system to transform information.
Volitional	it is a precondition to volition based on one`s expectancy / values.	action controlled rather than state controlled.	strategies to control cognition, motivation, and emotions.	volitional strategies to control distracting environments.	an acquired ability to the volitional control strategies.
Vygotskian	not emphasized historically except for social context effects.	consciousness of learning in the zone of proximal development.	Egocentric and inner speech.	adult dialogue mediates internalization of children`s speech.	children acquire inner use of speech in a series of developmental levels.
Constructivist	resolution of cognitive conflict or a curiosity drive is emphasized.	metacognitive monitoring.	constructing schemas, strategies, or personal theories.	historically social conflict or discovery learning are stressed.	development constrains children`s acquisition of self-regulatory processes.
Social Cognitive	self-efficacy, outcome expectations, and goals are emphasized.	self-observation and self-recording.	self-observation, self-judgment and self-reaction.	modeling and enactive mastery experiences.	increases through social learning at four successive levels.

2.1.4. Modeling

Modeling is a crucial element in Social Cognitive Theory, and it refers to behavioral, cognitive and affective adjustments through witnessing one or more models (ROSENTHAL; BANDURA, 1978; SCHUNK, 1987;1998).

There are three key functions of modeling (BANDURA, 1986; SCHUNK, 2012).

a) Response Facilitation

Individuals learn many abilities and behaviors that they do not attain because they are not motivated to do so. Response facilitation means modeled actions that act as social motives for observers to behave accordingly. Imagine a student entering the classroom, going to one corner of the room because there are many students there watching something. He is there because he wanted to know what the others were looking at. Never mind if he did not know why the other students were there.

b) Inhibition/Disinhibition

When models are punished for doing something, this will stop or avoid observers from doing the same thing. This calls Inhibition. On the contrary, when models perform dangerous or forbidden actions without suffering any bad consequence, this may bring observers to act in the same way, repeating the behavior.

c) Observational Learning

As already shown before, the following processes are elements of observational learning: attention, retention, production, and motivation.

2.2. Learning and Performance: Influence factors

When people witness models, it does not mean that learning will happen or even that learned behaviors would happen later. Many factors affect learning and performance.

a) Status of Development of Learners

Learning depends on learners' abilities to learn from models. The skills to self-regulate the learners' performance for lengthier periods rise with development. Encouragement for action varies according to the development. Young children prefer immediate results of their performances. As they grow older, they prefer to perform actions according to some models related with their goals and values (BANDURA, 1986; SCHUNK, 2012).

b) Model Prestige and Capability

Modeled behaviors differ in convenience. Learners pay attention to a teacher because they are sure that they will have to show the same abilities and behaviors in a determined moment. One deduces model capability from results of their actions, as success or failure, and from symbols meaning they are capable. An important element is prestige. Models with high prestige can draw more attention than the others with low prestige can (SCHUNK, 2012).

c) Vicarious Consequences to Models

The results from experiences of models take information to observers about the kind of performances that could likely be successful. When individuals witness modeled behaviors and their consequences, they create beliefs regarding the behavior that will be successful or not (SCHUNK, 2012).

2.3. Motivation

Goals, outcome expectancies, values, and self-efficacy are, among others, remarkable impacts on enactive and vicarious learning, and on performance of behaviors (SCHUNK, 2012).

a) Goals

A lot of human behavior maintain for lengthy periods in the lack of current external stimulus. That perseverance relies on goal setting and self-evaluations of development. Goal setting implicates determining a pattern or objective to act as the target of an individual's action. Individuals can set their own goals or they can be set by somebody else, like parents and teachers. Modeling can also help goal setting (SCHUNK, 2012).

Social Cognitive Theory argues that goals improve learning and performance by the means of their results on perceptions of development, self-efficacy, and self-evaluations (BANDURA, 1988;1997; LOCKE; LATHAM, 1990;2002; SCHUNK, 1990). Firstly, individuals have to be committed to attempting to achieve their goals because goals do not influence performance without commitment. As they work towards a goal, individuals compare their current development with the goals they have to achieve. If they have a positive self-evaluation of their achievement, this raises self-efficacy and keep motivation. In case of a not successful development, the discrepancy between what was desired and what was the result could increase effort. Individuals are more subject to follow some models when they think the modeled behavior will aid them to achieve their goals (SCHUNK, 2012).

Goals alone do not necessarily improve learning and motivation. The properties of specificity, proximity, and difficulty raise self-perceptions, motivation, and learning (LOCKE; LATHAM, 2002).

- *Specific* goals raise task performance because of a better description of the sense of achievement that the success demands. They encourage self-efficacy because it becomes simple to assess development when the goal is explicit (SCHUNK, 2012).

- *Proximity*: Goals differentiate by how far they are into the destination. Proximal or short-term goals are those one can achieve faster. This brings more motivation than the distal, long-term goals (SCHUNK, 2012).
- Goal *difficulty* means the rank of task expertise needed when assessed against a pattern. The energy needed to achieve a goal depends on the expertise rank. This means, the higher the expertise the more amount of effort will it require. Positive results because of goal difficulty rely on learners having enough skills to achieve the goal. Hard goals do not increase performance in the lack of necessary skills. Self-efficacy is also important. Students who think it is impossible for them to achieve a goal hold low self-efficacy, and do not engage in trying the goal, and work without disposition. Teachers should persuade such learners to see to the task and supply feedback on their development (SCHUNK, 2012).

Concerning self-set goals, researchers say that it is relevant for the learners to set up their own goals. This increases their self-efficacy and learning. Maybe this happens because goals set by oneself generate high goal commitment (SCHUNK, 2012). SCHUNK (1985) states that in an experiment, some learners set goals every day, another group did not have goals. The ones with goals set up had the highest evaluation of confidence for achieving the goals and self-efficacy for solving problems.

Concerning goal progress feedback, it supplies information about development towards goals (HATTIE; TIMPERLEY, 2007). This feedback is mainly precious when individuals cannot deduce trustworthy information on their own. This should increase self-efficacy, motivation, and attainment when it tells individuals that they are capable. Higher self-efficacy keep motivation when individuals believe that constant effort will permit them to achieve their goals. When the individuals achieve their goals, they are likely to set up more new goals (SCHUNK, 1990;2012).

b) Outcome Expectancies

Outcome expectancies are individual beliefs about the foreseen outcomes of actions (SCHUNK; ZIMMERMAN, 2006). Social Cognitive Theory argues that individuals create outcome expectancies about the probable results of some actions on the basis of personal experiences and witness of models (BANDURA, 1986;1997). People direct their actions to ways they consider will be favorable and take models who teach them worthy skills. Outcome expectancies keep behaviors over lengthy periods when individuals consider that their actions will be successful (SCHUNK, 2012).

c) Values

Values deal with perceived significance or functioning of learning. An important element of social cognitive theory is that people's performances affect their value preferences (BANDURA, 1986). Students perform things that make happen what they wish and do things to prevent outcomes from inconsistency with their values. When the students consider that learning and performance are important, they get motivated to learn and perform (SCHUNK, 2012).

2.4. Self-Efficacy

Albert Bandura introduced Self-Efficacy in 1977 (BANDURA, 1971;1977a). BANDURA (1986) and CLEARY; ZIMMERMAN (2004) state that self-efficacy refers to people´s judgments of their capabilities to organize and execute courses of action required to achieve designated types of performances. self-efficacy denotes when the students perceive they are able to learn and act at a certain level and deal with difficulties, and feel competent (BANDURA, 1997). Self-efficacy has been shown to be well suited to explaining variations in personal motivation to self-regulate one´s performance and achievements (BANDURA, 1997; BOEKAERTS; CASCALLAR, 2006; ZIMMERMAN, 1995). ZIMMERMAN (2001) stated that self-efficacy is the belief of one´s capabilities to learn or perform behaviors. Self-efficacy beliefs influence not only the procedures chosen for action, but also the effort made, the time of perseverance when facing success or failure, the resilience to difficulties, how much stress experienced, and the level of performance accomplished (BANDURA, 1997).

Self-efficacy in education affects the activities chosen by the students (SCHUNK, 1995).

Actual performances (enactive mastery performances), vicarious experiences, forms of social persuasion (verbal persuasion), and physiological indexes (affective states), are sources of self-efficacy (BANDURA, 1986;1997).

The most powerful source is the mastery experience. People measure the consequences of their performances, and their explanations of these consequences help build their efficacy beliefs. If the performances are successful then self-efficacy will be risen. On the other hand, if the performances are faulty, then self-efficacy will lower (PAJARES, 1997). BANDURA (1986) stresses that mastery experiences are the strongest source of self-efficacy because these bring consequences for the self-enhancement of academic attainment.

Vicarious experience is weaker than mastery experiences, but when individuals are not sure about their skills or own limited previous experience, they come to be more aware of it. People also build and grow self-efficacy beliefs because of verbal persuasions they receive from others. These persuasions demonstrate vulnerability to verbal judgments that others make, and they are weaker source than mastery or vicarious experiences, but persuaders are important people in the growth of an individual's self-efficacy. Persuaders have to work with the people's beliefs and make sure that the intended success is achievable. Negative persuaders can function to reject and wear out self-beliefs (PAJARES, 1997).

BANDURA (1986) says that it is regularly easier to weaken self-efficacy beliefs through negative evaluations than to build up such beliefs through positive motivation. People have the capacity to change their own way of thinking, and self-efficacy beliefs, and hence intensely affect the physiological states. They say that individuals can "read" themselves, and so this reading becomes a performance of their thoughts and emotional states.

Self-efficacy is not created by a few successes and requires learning how to handle adversity and mastering increasingly tougher challenges through perseverant effort. New skills are unlikely to be used for long unless they prove useful when they

are put into practice. The students must experience sufficient success by using what they have learned to believe in themselves. People have to believe they can succeed otherwise they will have little incentive to perform the tasks. If people believe they do not have any power to perform a task, they will not even attempt to bring about it. People live their lives according to beliefs they have in their personal efficacy. According to beliefs of people's competence, they try to find the ways of action to meet their goals, even not knowing how the neurophysiological system works to make it possible (BANDURA, 1997).

2.5. Human Agency

Agency beliefs are defined by Bandura as the capability to exercise the regulation on what affects the individuals, as well as their quality of lives. Being an agent is meant to be able to evaluate their own capacities, and add them to their beliefs, to predict possible courses of actions and outcomes, to evaluate opportunities and sociocultural limits, as well as to imagine the capacity to regulate the behavior in function of outcomes (BANDURA, 1993;1997) .

Badura regards that human agency originated from his earlier work on self-efficacy. His interpretation of agency reinforces the forms in which individuals exercise control over their lives by taking actions on their environments through a goal way. For Bandura, human agency is intentional, development-oriented, and plan-oriented. It requires predicting the results of our actions, evaluating our capabilities, controlling affects, and launching effort. We not only play on a stage, we build the stage we play on, and the motivations and results of our actions (BANDURA, 1997;1999;2002).

Social Cognitive Theory establishes three ways of human agency: individual (personal), proxy, and collective. Personal agency applies cognitive, motivational, affective and choice processes for its results. If people do not want to face hard work to create necessary requirements, and take on duties and stressors required by control process of individual agency, they prefer to hand over to somebody else. This also happens in many areas of performance, when individuals do not have absolute control over the social states and institutional practices, which influence their regular lives. Under these conditions, they look for their welfare through proxy agency. It means that individuals try by one way or another to reach those who can manage the resources

or expertise to work at their request being sure about the outcomes they wish (BANDURA, 2000;2005). They do so considering these could affect negatively their lives. This mode of proxy control is socially conciliated. These people try to choose those with impact and authority to perform on their behalf. It requires a high level of personal efficacy to affect the intermediaries who are supposed to work as agents. A low sense of efficacy fuels the reliance on proxy control, which will lead to fewer opportunities to have the needed skills to avoid proxy control later (BANDURA, 1997). Individuals do not have autonomous lives. They can accomplish many things they look for only if working socially (BANDURA, 2005). Collective agency explains that people believe in their shared efforts to make changes happen in their lives (BANDURA, 2000).

The core characteristics of personal agency convey the matter of the meaning of being human. The most relevant characteristics are in the following text.

a) Intentionality

Agency is related to attaining things intentionally. An intention represents a further course of action to be achieved. It does not mean a simple expectation or forecast of actions in the future. It means a commitment in advance to make things happen. Intentions and actions are not similar elements of a practical connection set apart in time. Given this, it is relevant to say that intentions based on self-motivators influence the probability of action in the future to happen (BANDURA, 1999).

Outcomes are not the features of agency actions. These are the results of them. Sometimes, individuals achieve some outcomes that were not wanted or intended; the actions were attained believing they could reach the wished outcomes. Sometimes it is not possible to foresee whether the practice of that agency will have beneficial or detrimental consequences, or attain unintended results (BANDURA, 1999).

b) Forethought

The future time point of view shows itself in a variety of routes. People establish goals for themselves and foresee the probable results of these performances; choose and produce paths of actions that probably will achieve the wished results and prevent

harmful ones (BANDURA, 1991; LOCKE; LATHAM, 1990). BANDURA (1999) states that by practicing forethought, individuals motivate themselves and lead their activities in advance. As individuals carry on in their lives paths, they keep on planning, updating their priorities, and organizing their lives properly.

Future events naturally cannot be causes of present-day motivation and action because they do not exist. Yet, through cognitive representation in the present, it is possible to convert foreseeable future events into present-day motivators and controller of the behavior (BANDURA, 1999).

c) Self-Reactiveness

An agent does not need to know how to plan or foresee things only, but how to be a motivator and self-regulator as well. When the agent decides about an intention and an action plan, he cannot just be waiting for the proper actions to arrive. Agency does not mean just intentional capacity to make selections and action plans, but the capacity to configure suitable paths of action and to motivate and control their attainment. This multi-aspect self-directedness works by having self-regulatory processes linked to thought and action (BANDURA, 1999). BANDURA (1986); (BANDURA, 1991) argue that self-regulation of motivation, aspects of emotion, and activity is determined by a series of self-referent subfunctions. These include self-monitoring, self-directed attainment through personal patterns, and remedial self-reactions.

d) Self-Reflectiveness

Individuals are not just agents of action but also auditor of their own performance. The metacognitive capacity to think about oneself and be adequate with own thoughts and actions is another relevant core characteristic of agency. By showing one's awareness, individuals assess their motivation, worth, and significance of their life dreams. It happens in their stronger level of one's reflectiveness that people convey confrontation in motivational encouragement and select to work supporting one over another. In this metacognitive action, individuals assess the rightness of their forecasting and operational thoughts against the results of their actions, the

consequences that other individuals' attainments yield, what others think, inference about prevailing thinking and what, therefore, comes after it (BANDURA, 1999).

2.5.1. Human Development: Social Cognitive Theory View

Development is a flexible operation. Human capabilities differ in their psychological and biological sources and in the exploratory circumstances necessary to intensify and support them. Consequently, human development is comprised of varied kinds and standards of change. Differences in social preparation yield considerable individual contrasts in the capabilities that are planted and those that continue underachieved (BANDURA, 1989).

The Human Capabilities are the following (BANDURA, 1989):

a) Symbolizing Capability

The exceptional potential to make use of symbols supplies individuals with a strong tool to understand and manage their environment. Almost all effects from outside influence behavior by means of cognitive processes. Cognitive elements partially regulate which environmental aspects will be watched, what significance will be granted to them, whether there are any enduring results, what touching effect and motivating strength they will possess, and how the information they carry will be arranged for future operation. People treat and change temporary experiences by means of verbal, imaginative and other symbols into cognitive models of real world that serve as pattern for assessment and action. The individuals give reason, structure, and progression to the events they have had, through symbols. Symbols act as an instrument of thought. Cognitive expositions of experiences in understanding organizations supply the element for reasoning. Regulations and strategies supply the cognitive functioning for operating understanding for a variety of reasons. By symbolically operating the information coming from personal and vicarious backgrounds, individuals obtain knowledge of casual associations and widen their understanding (BANDURA, 1989).

b) Vicarious Capability

The highly developed capability of vicarious learning is another peculiar quality that human beings have. It has high consideration in Social Cognitive Theory. Psychological theories have customarily highlighted learning by means of influences of individuals' actions. If understanding and abilities should be learned only by direct experience, the procedure of cognitive and social evolution would be seriously delayed, in addition to extremely boring and dangerous. A culture would never spread its language, customs, and social experiences. The shortening of acquisition procedure is crucial for survival and for human evolution because natural talent supplies a few innate abilities. The individuals cannot rely only on trial and error experiences. Furthermore, the restriction of time, resources, and ability to move, force difficult limits on the facts and acts that can be instantly explored for the acquisition of new knowledge (BANDURA, 1989).

Individuals have grown an early capacity for observational learning that make them grow their understanding and abilities founded upon information carried by modeling effects. Certainly, all learning coming from direct involvement can happened vicariously by watching individuals' behavior and results for them (BANDURA, 1986; ROSENTHAL; ZIMMERMAN, 1978). Great amount of social learning happens either intentionally or accidentally, by observing the real behavior of others and the results for them. Even so, vast amount of information about behavior standards and the consequences they bring to environment is obtained from models described symbolically by means of verbal or illustrated method (BANDURA, 1989).

c) Forethought Capability

The capability for forethought is another very important capability of people. Individuals do not just respond to their current environment, nor are they directed by their former experiences. Most of individuals' behavior is ruled by forethought. The view of future presents itself in a wide range of ways. People foresee the expected future actions, they establish goals for themselves, and they devise some actions to achieve what they want. Bye means of the practice of forethought, individuals motivate themselves and lead their performances in advance (BANDURA, 1989).

d) Self-Regulatory Capability

Advices and punishments from parents affect deeply the process of socialization. Nevertheless, no significant adult will be all time with the child to check the behavior. When the capability of self-steering is attained, the natural needs and punishments set by themselves will work as crucial guides, motivators and obstructions. Individuals have capabilities to self-steer making it possible for them to act over their thoughts, performances and feelings, by means of results they make for themselves. Psychosocial performance is then ruled by an interaction of self-created and external sources of effects (BANDURA, 1989).

e) Self-Reflective Capability

If there is any feature that is typically human, it is the capability for reflective self-awareness. This makes individuals analyze their involvements and consider their own thought procedures. When thinking about their varied involvements and about what they know, they can gain common understanding about themselves and everything around them. By means of reflection, individuals obtain knowledge and they assess and update their own knowledge. They also observe their concepts, operate on them or foresee events with them, assess the results and update them if this is necessary (BANDURA, 1989).

2.6. Self-Regulated Learning

Theory and research about academic self-regulated learning emerged in mid-1980s to address the question of how the students could master their own learning process. Self-regulation refers to the self-directive process transforming the students´ mental abilities into task-related academic skills and learning hence acts as a proactive way for the students rather than reacting because of teaching experience. Self-Regulated Learning theory and research are forms of learning such as modeling, guidance, and feedback from peers, coaches, and teachers. In self-regulated learning, the student is supposed to show personal initiative, perseverance, and adaptive skill in searching for it. The student´s proactivity brings deep instructional implications for the way the teacher interacts with the student in the activities planning and for the way the schools are organized. A self-regulated learning perspective shifts the focus of

education from student learning abilities and environments at school or home as fixed entities to students´ personally initiated strategies designed to improve learning outcomes and environments (ZIMMERMAN, 2001).

ZIMMERMAN (1986) states that the students are self-regulated to the extent that they are metacognitive, motivational, and behaviorally active participants in their own learning process. According to ZIMMERMAN (2001) this means that there are some common underlying issues such as:

a) “what motivates the students to self-regulate during learning?”;
b) “through what process do students become self-reactive or self-aware?”;
c) “what are the key processes or responses that self-regulated students use to achieve their academic goals?”;
d) “how does the social and physical environment affect student’s self-regulated learning?”; and
e) “how does a learner acquire the capacity to self-regulate when learning?“.

2.7. Learning Academy Model of Self-Regulation

Homework is an important element in most educational environments (BEMBENUTTY, 2011). Homework is related to better retention of actual understanding, increased comprehension, better crucial thinking and information processing, learning during pleasure time, and obtaining better study practices and abilities (KITSANTAS; ZIMMERMAN, 2009). Consequently, homework continues to be an instructional activity that is relevant in most educational environments in any level (BEMBENUTTY, 2013). Despite the assignment of homework for multiple educational intentions, Zimmerman and associates, KITSANTAS; ZIMMERMAN (2009) and RAMDASS; ZIMMERMAN (2011) and ZIMMERMAN et al. (1996) and ZIMMERMAN; KITSANTAS (2005), have proposed that from Social Cognitive Theory in addition to revealing academic understanding to students, homework is a process that induce learners to participate actively in self-instructed, self-governing, and self-direct learning; and that homework could encourage self-regulation of learning, as noted before.

If homework is a significant academic task affected by social, cultural, and educational components, then the connection between homework and achievement has to be questioned by means of the perspective of the self-regulatory processes. Those lead students to deal with interferences, to keep motivation and continue to have focus on the tasks, and be self-reflective in order to obtain the most of the time to study and to succeed in completing the task (BEMBENUTTY, 2013).

Zimmerman's self-regulation model of homework completion, different from other models (see (DUMONT et al., 2012; KEITH; COOL, 1992; XU; CORNO, 2003)). According to Zimmerman's approach, an extensive self-regulation proposal should concentrate on particular cyclical and manageable procedures and beliefs before, during, and after homework realization, like how students choose, self-observe, and self-assess their tasks of homework. To evaluate and increase self-regulation of homework completion, ZIMMERMAN et al. (1996) initiated a learning academy model that teaching and learning formulates a self-regulated learning process. While students learn to master their own learning, they use, as a significant element of learning academy, their behavioral concentration on learning procedures on cyclic resources. In the learning academy model, teachers transfer to learners the authority for learning and homework procedures, until they are autonomous, self-directed, self-evaluated, self-observed, controlling their tasks of homework. Teachers are as models and coaches responsible for supplying to students the relevant social and individual support at the same time that they grow as self-regulated students.

Although self-regulation of learning is relevant to homework completion, it is significant to reflect on how the homework procedure could be assessed and upgraded in an interpretation of a learning academy. It is essential to comprehend the homework procedure through the lens of learners' demand to engage in goal setup and intention; bringing into effect schemes and strategies; applying monitoring, and assessing strategies; and deciding and adjusting (BEMBENUTTY, 2013).

Zimmerman supplies an instructional model for teaching important study skill while studying and doing homework. Zimmerman initiated a learning academy model of self-regulation. The learning academy model is comprised of four cyclical phases (BEMBENUTTY, 2013):

- self-evaluation and monitoring;
- goal setup and strategic planning;
- implementation of strategies and monitoring; and
- strategic outcome monitoring.

It is important to observe that the Zimmerman's learning academy model is different from his cyclical phases of self-regulated learning (ZIMMERMAN, 1998;2005;2008). In the forethought phase of the latter model, students set up goals, get involved in task analysis, strategic planning, and self-motivated beliefs. In the performance phase, students have self-control and self-observation during their actions. In the self-reflection phase, students take on in judgment and self-reaction to complete the task. These procedures are cyclical because they highly influence the actions ahead. This model is general and not prescriptive. Differently, the learning academy model is prescriptive and particular to a specific duty that the student has. Zimmerman created the academy model before the cyclic three-phase model, comprised of a wide range of elements that were not completely described in the academy model. These two models are complementary and the academy model emphasizes the particular stages of assignment completion while the former model emphasizes the processes that happen while completing an assignment. For more details on the cyclic three-phase model see (SCHUNK; USHER, 2013).

Considering the academy model Zimmerman imagines the classrooms transformed into learning academies where learners increase their self-efficacy; get involved in peer learning and modeling; are functioning agents, producers of and produced by social contexts; and affect their contexts. In the light of this, Zimmerman visualizes teachers as self-regulatory coaches. His learning academy model of self-regulatory education is a successful model that can help students and teachers achieve their academic and professional goals. The academy model supplies a different standard for homework (BEMBENUTTY, 2013).

The learning academy model is the consequence of the knowledge that frequently students (BEMBENUTTY, 2013):

- do not finish their homework;
- are not aware of how to self-steer their processes of learning;

- are unaware of how to create thoughts, sensations, and efforts to achieve academic triumph;
- are not aware of how to establish goals;
- have an absence of reading, writing and computational abilities;
- have an absence of convincing assessment preparation; and
- have low self-beliefs about their skills to carry out planned assignments.

The learning academy model is founded by four significant roles of teachers (BEMBENUTTY, 2013):

- teachers can supply modeling. Teachers are able to demonstrate the mastery of self-regulatory procedures that they intend the students will also master;
- teachers can supply encouragement to learners making them follow suitable learning paths;
- teachers are able to educate the students about task and strategy analysis; and
- teachers are able to aid learners to get involved in outcome checking and strategy refinement. When the learners finish their assignment, teachers help them move their focus to assess their success considering some pre-established standards.

The learning academy model supplies an instructional structure for aiding students to take advantage of their time for studies and homework. In the following, the roles of teachers and learners in the academy model are described (BEMBENUTTY, 2013):

2.7.1. Phase 1: Self-evaluation & Monitoring

The first phase involves observation of teachers and peers, and self-recording of assignments and earlier production; the learners assess their capacity and success from this. It is the role of teachers to supply directions, present obvious instructions and feedback, supply everyday homework to create skills and motivate periodic evaluation, call attention to learners' academic development, and to clear the way for peer assessment and task monitoring.

The role of learners incorporate assessment of their skills to achieve the assignments. The students check their records and peers, making comparisons with their assignments. Doing this they can self-assess their competences and abilities. They can redo their homework if this does not meet the rules supplied by the teacher.

2.7.2. Phase 2: Goal setup & Strategic Planning

Phase two deals with learners setting their short-term goals and selecting learning strategies in order to aid them to achieve the goals. The role of teachers in this phase two is to coach students on how to assess their assignments;

- to help students identify short-term goals;
- to model and coach the application of learning strategies;
- to supply chances for the learners to identify when, where, with whom, and how they will finish the homework; and
- to coach about how to apply learning strategies.

The students have some directions to finish an assignment. For example, these could be:

- to establish goals;
- to determine where and with whom to complete the assignment; and
- to choose suitable strategies.

2.7.3. Phase 3: Implementation of Strategies & Monitoring

In this phase, the learners execute and apply the learning strategies and monitor the goals and academic development. Teachers and coaches take part of significant social starting points of feedback to make sure of the performance of assignments.

The duties of learners incorporate to come up with a plan of action to achieve their goals, as at the same time, to monitor their development to complete the assignment. The students also execute the strategies chose in advance, observing their development, and seek for help form peers, selected from suitable social relations, and teachers, whenever it is necessary.

2.7.4. Phase 4: Strategic Outcome Monitoring

This last phase deals with participating in self-evaluation, self-examination, and self-reflection of how good the students will complete the assignment. It deals with the assessment of the success of their strategies, according to standards, which previously were brought to the students. Teachers evaluate the progress of learners and supply feedback on their performance. Teachers also recommend to students the use of new strategies, if this is the case. They help the learners understand and use the cyclical self-regulatory process, to learn how to complete the task. Teachers give feedback about their development and levels of self-efficacy they have reached.

The duties of the learners incorporate finding out whether they achieved success with the task. They observe what has not been achieved successfully and even not achieved. Students observe their performance according to patterns established for themselves and, according to teachers' feedback.

2.8. Zimmerman's Self-Regulation

Three axes explain Zimmerman's ideas and models of self-regulation:

- dimensions;
- phases; and
- levels of self-regulated learning.

Zimmerman's ideas have gone beyond the traditional social cognitive approach on self-regulation (SCHUNK; USHER, 2013).

2.8.1. Dimensions of Self-Regulated Learning

Zimmerman's theory shows that self-regulated learning is a complex phenomenon and includes multiple dimensions. These are comprised of distinct self-regulatory processes to show ways to help learners turn into better self-regulated. Students have to regulate most of the dimensions; it will be a problem, otherwise, because the choice is a critical element of self-regulated learning. The teachers should reconsider that proposal to bring more benefits to the students' learning. If teachers want their student to know and learn regulatory skills, they should allow them to apply

the skills. This could not be possible if the students' activities are highly externally regulated (SCHUNK; USHER, 2013).

a) Motive Dimension

The motive dimension brings out the matter of the reason why for students engagement in self-regulated learning. If they believe that, the self-regulatory processes will aid them in the learning and better performance in what is important for them, then they will be ready to use these processes. This belief can aid them to introduce to task engagement and keep motivation (SCHUNK; USHER, 2013).

Key self-regulatory processes deal with goals and self-efficacy (ZIMMERMAN, 2011). Before engaging in a task, self-regulated learners set goals for their learning dividing them into subgoals. They also act with the feeling of self-efficacy to achieve the goals. As they undertake the task, they evaluate their progress of goals by monitoring them and the belief they are making progress keeps them motivated and with higher self-efficacy. In case the self-regulated learner finds their progress insufficient, they may adjust their strategies and goals, and seek for help, to improve the progress. Their self-efficacy should not decrease if they think they have other resources to increase their learning (SCHUNK; USHER, 2013).

b) Method Dimension

The method dimension brings out the way self-regulated learning will happen. Self-regulated learners will choose learning strategies and procedures which they believe will be successful. As they become more expert, their selection and application can become a habitual procedure. They have a collection of strategies to apply. The processes involved in this dimension are selection and learning strategies use and application of habitual procedures. If the strategies take them to unacceptable performance they can change to others they believe will be successful (SCHUNK; USHER, 2013).

c) Time Dimension

The third dimension is time and the key self-regulatory process is time management. Self-regulated learners decide when and for how long they will engage

in a task. They plan and monitor their time bringing them to success. They will schedule different times for certain tasks considering cognitive efforts needed and more or less motivation than other tasks. Self-regulated learners keep motivation and be away from distractions (SCHUNK; USHER, 2013).

d) Behavior Dimension

The behavior dimension deals with outcome degree the learners look for. Behavioral outcomes need that learners set their goals appropriately and monitor and evaluate their performance to see whether they have achieved what they had planned to. Self-regulatory processes are self-observation, self-judgment, and self-reaction. Self-regulated learners observe what they have done, and judge themselves for what they done according to desired goals, and continue doing the same thing or drive to other methods to make it more successful (SCHUNK; USHER, 2013).

e) Physical Dimension

This dimension means the place the learners will learn and the elements in it. Self-regulated learners create rich learning environments that keep distractions away and let them be successful, and feel comfortable learning. Self-regulated learners take all materials and equipment for the task, and they will adapt the environment taking out distractions like noise, electronic devices. They may even use headphones if these help them learn (SCHUNK; USHER, 2013).

f) Social Environment Dimension

The social environment dimension means the people with whom the self-regulated learner will engage. Self-regulated learners select their teachers, coaches, peers and pairs with and from whom they will learn, in a successful way. They are socially sensitive and talented. They select those whom they believe will help them learn the skills need to achieve their goals. Significant self-regulatory processes of this dimension are social networking and selective help seeking. Self-regulated learners create strong social networks with people with similar minds. They only look for help if they believe this will lead them to achieve their goals. They try to find partners

according to their learning goals. If the selection of social environment is bad, the learning and self-efficacy are compromised (SCHUNK; USHER, 2013).

2.8.2. Phases of Self-Regulated Learning

Self-regulatory processes are comprised of three cyclical phases:

- forethought;
- performance or volitional control; and
- self-reflection processes.

The Cyclic Self-Regulated Learning Model of Prof. Zimmerman, in **Figure 3** (SCHUNK; ZIMMERMAN, 1998) and **Table 3** (ZIMMERMAN, 2005) shows these phases. Each phase is a feedback for the following phase, affecting them in the cycle (SCHUNK; ZIMMERMAN, 1998; ZIMMERMAN, 2005;2008).

Figure 3: Cyclic Self-Regulated Learning Model

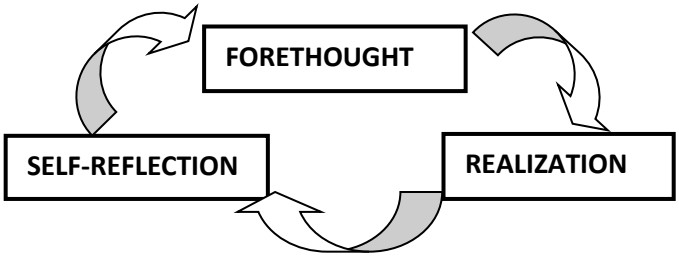


Table 3: Cyclical self-regulatory phases

Forethought	Performance	Self-reflection
Task analysis	**Self-control**	**Self-judgment**
Goal setting	Self-instruction	Self-evaluation
Strategic planning	Imagery	Causal attribution
	Attention focusing	
	Task strategies	
Self-motivation beliefs	**Self-observation**	**Self-reaction**
Self-efficacy	Self-recording	Self-satisfaction/affect
Outcome expectations	Self-experimentation/	Adaptive-defensive
Intrinsic interest/value	Metacogntive Monitoring	
Goal orientation		

According to ZIMMERMAN (2005), the cyclical nature of self-regulation is due to the feedback from previous performance to be used for modifications in the current work.

Self-regulation is the range of integrated processes concerning motivation, behavior and metacognition, which work in a sequential way. This provides the nature of the cyclic model. Before the learning and performance, there are the forethought processes. During the learning and performance there are the performance control processes; and following the learning and performance there are the self-reflection processes. Strong self-regulated learners have strong forethought skills, such as, striving to comprehend the task demands (task analysis), setting up goals they desire to achieve (goal setting), and choosing the right strategies needed to attain the goals (strategic planning) (CLEARY; LABUHN, 2013).

The wish to initiate this self-regulatory process relies on a set of forethought motivational beliefs, such as self-efficacy (BANDURA, 1997), task interest and instrumentality (ECCLES; WIGFIELD, 2002), and goal orientation (PINTRICH, 2005).

If the student feels more efficacious about doing well a task, they will see this task with different eyes. It will be interesting, enjoyable, and the student is more likely to engage in the cyclical feedback loop (CLEARY; LABUHN, 2013).

a) Forethought Phase

This is the phase which establishes the stage for learning and preceding the actions to act, creating conditions for the development of the behavior (SCHUNK; USHER, 2013). Task analysis and Self-motivational beliefs are two different but linked categories of this phase. Task analysis is comprised of goal setting and strategic planning (SCHUNK; ZIMMERMAN, 1998; ZIMMERMAN, 2005;2008).

Before the learners start their tasks, they set goals, which lead them to achieve their learning outcomes. They also engage in strategic planning to prepare strategies and procedures they believe will support them to optimize the performance during learning attempts (SCHUNK; USHER, 2013; SCHUNK; ZIMMERMAN, 1998).

The highly self-regulated learner has an organized goal system. The process subgoals are not just mechanical and they convey a value, proving a certain progress (ZIMMERMAN, 2005).

The self-regulated students engage in tasks analysis by checking their requirements and setting goals to them. These goals are used as a basis to be compared with the students' progress showing them their level of engagement. This process leads them to rely on self-motivational beliefs, such as self-efficacy, expectation for engagement in the task and learning orientation. These self-beliefs affect the students' academic behavior (PAPE; BELL; YETKIN-OZDEMIR, 2013). If the students want to master a skill then they will need some appropriate methods do deal with the tasks (ZIMMERMAN, 1989).

The planning and strategies chosen need cyclical adjustments considering the instabilities in some covert personal, behavioral and environmental components. (Covert behavior is the one that only the person who has that behavior knows about it. This behavior is not publicly observable (POWELL; HONEY; SYMBALUK, 2012). It is not possible for the self-regulatory strategy work in the same way for all persons. Only a few, if any, strategies will work well for a person every time. The self-regulated individuals must continuously make adjustments in their goals and choices of strategies because of diverse, individual, and contextual conditions (ZIMMERMAN, 2005).

According to ZIMMERMAN (2008), the motivational influences of goals that individuals set up for themselves are:

- goals enhance one's choice of relevant tasks;
- goals enhance one's attention for relevant tasks;
- goals enhance one's choice away from irrelevant tasks;
- goals enhance one's attention away from irrelevant tasks;
- goals intensifies one's effort to achieve them, and;
- goals help one's persistence in achieving them.

According to BANDURA (1997) people have influence over what they do according to some alternatives:

- how they anticipate and measure possible outcomes ahead, considering their self-evaluative answers; and
- how they assess their skills to carry out what they take into consideration.

Considering that, students will value self-regulatory skills only if they are motivated. Underneath forethought task analysis, processes are key self-motivational beliefs (ZIMMERMAN, 2005):

- self-efficacy;
- outcome expectations;
- intrinsic interest or valuing; and
- goal orientation.

Motivational beliefs are also core for the learners. The students face tasks with a certain sense of self-efficacy for learning, which will impact their subsequent effort to engage in the task (SCHUNK; PAJARES, 2009).

Self-efficacy belief, as noted before, is the personal belief for learning or doing things to meet designated levels. It is a very strong influence on individuals' motivation, achievement and self-regulation. Attitudes of the students with high self-efficacy is different from those with low self-efficacy. They participate more, interact more, work longer, are more interested in activities, are more resilient, and attain higher levels of performance (BANDURA, 1997).

b) Performance / Volitional Control (Realization)

ZIMMERMAN (2005) and SCHUNK; ZIMMERMAN (1998) state that this phase relates to task engagement. It involves processes occurring during the efforts and affect the attention and action. There are two key processes in this phase, self-control, and self-observation. Self-control is divided into:

- self-instruction;
- imagery;
- attention focus; and
- task strategies.

Self-control processes help students guide their learning. When the students have the self-control, it means that they apply task strategies. These make the students be engaged in the task and want to improve. During the self-observation, students are concerned about their performances and outcomes. It is very important to make careful observation otherwise they will have difficulty in improving their performances (SCHUNK; USHER, 2013).

ZIMMERMAN et al. (1996) and SCHUNK; ZIMMERMAN (1998) say that self-recording is a self-observation technique and it can be informative and precise. The students can be surprised if they record the study time. The students engaging better with the tasks can be seen in the self-recording records. It is about taking notes such as:

- how long it took them to do homework;
- where and how they did it; and also
- whether the expectations had been achieved or not.

In this phase, the students record what they have attained, and make observations which lead them to the progress achieved (SCHUNK; USHER, 2013).

c) Self-Reflection

The self-reflection phase occurs after the realization efforts and influences the response of an individual related to that experience. It uses information from self-observation. It influences the forethought of efforts to act, completing in this way the self-regulated cycle. Students self-evaluate their progress and make adjustments in their behavior if they believe they are falling short. For self-reaction, they also make attributions for the success or failure in their goals (PAPE et al., 2013; SCHUNK; ZIMMERMAN, 1998). This phase happens when tasks are over and when the students take a break (ZIMMERMAN, 2011).

Self-judgment and self-reaction are two important processes of that phase. Self-judgment indicates self-evaluation of one's performance and then discover causal attributions for the success or failure. The students can see that they are improving when they compare their current performance against their goals. The belief that they

are succeeding in achieving their goals strengthens self-efficacy and motivation (SCHUNK; PAJARES, 2009).

The self-judgment processes allow students to have chance to self-evaluate, and to have right causal attributions for successes or failures. Causal attributions related to their progress are very important. When students attribute good values to their strategy use and effort, they will be able to feel self-efficacious about keeping doing well. On the other hand, when students attribute their results to factors that are beyond their control, like luck, there should not feel so self-efficacious. The self-reaction processes allow students to have the chance to observe levels of satisfaction with the success achieved (SCHUNK; USHER, 2013; SCHUNK; ZIMMERMAN, 1998).

The attention is very important in all three phases of the cyclic model. Those students with attention problems may want to go to performance phase, leaving forethought phase prematurely, without adequate procedures such as goal setting and strategy use. The pause, important in performance phase, may also be skipped, just to move quickly to self-reflection phase. Learners should rely more on forethought and self-reflection phase, which are usually deliberately ignored (ZIMMERMAN; BEMBENUTTY; SCHUNK, 2013).

The cycle in the model suggests that teachers should not teach only those self-regulatory skills the students employ in the performance control phase. Instead, the teachers should get involved with students on self-regulatory processes before, during and after task engagement (ZIMMERMAN et al., 2013).

2.8.3. Levels of Self-Regulated Learning

A third important axis of Zimmerman's theory convey the process through which self-regulatory skills are built. It draws the attention to methodical teaching and practice, and implicates levels of observation, emulation, self-control and self-regulation (ZIMMERMAN, 2005). It is said that this model envision the development of self-regulatory skills starts with social sources and moves to self-sources, that is, from external to internal sources, over the flow of all four levels (SCHUNK; ZIMMERMAN, 1997; ZIMMERMAN, 2005).

a) Observational Level

In this level, students learn basic skills and strategies from social sources, observing. This means that they may not be able to perform them. This level clearly indicates the social cognitive importance in observational learning. When the learners see live models, as on TV, and computer, they will generate cognitive representations of the skills and understand the basics. The sources here are social (SCHUNK; USHER, 2013).

b) Emulation Level

The emulation level means practice, feedback, stimulation, and the learner's achievement start to reach their model's shape. This level means performance and the learners try to practice what they have learned in the observation. They perform the behaviors although it will be in primitive ways. The sources here are social (SCHUNK; USHER, 2013).

c) Self-Control Level

In this level, the learners can practice the skills or strategies relying on themselves when carrying out similar tasks. Learners in the level can show their behavior outside the learning environment, as at home or with peers. Learner are still acting following their models, and internalization occurs. Yet it will be necessary for the learners to evolve their competence to change internally their performances according to the needs in given circumstances (SCHUNK; USHER, 2013).

d) Self-Regulation Level

In the self-regulation level, the learners experience a higher level of functioning. Despite changes of personal and circumstances conditions, the learners can change their skills and strategies according to their knowledge of what they will needed to face these conditions (SCHUNK; USHER, 2013). This is due to the learners' internalized skills and strategies that the learners can use, change them to meet what they need, and keep their motivation to achieve their goals, sense of goals development, and self-efficacy (ZIMMERMAN, 2005).

2.9. Cognitive, Metacognitive and Dysfunctional Metacognitive Strategies

WEINSTEIN; MAYER (1986) categorize strategies as five types:

- rehearsal strategies;
- elaboration strategies;
- organizational strategies;
- comprehension monitoring, and;
- affective strategies.

ZIMMERMAN; PONS (1986) address that other studies have also observed the following strategies:

- self-assessment;
- organization and transformation;
- registration of information;
- self-monitoring;
- environmental organization;
- help-seeking, and
- revision.

BORUCHOVITCH; SANTOS (2015) states that the use of learning strategies helps students deal with their difficulties in learning and some researchers categorize learning strategies as two main groups:

- cognitive learning strategies, and
- metacognitive learning strategies.

DEMBO; SELI (2013) say that cognitive strategies deal with the way the individual acts and affects the learning process. Metacognitive strategies deal with the individual's processes to plan, monitor, and control the way they think. LIVINGSTON (1997) argues that metacognition refers to higher order thinking which involves active control over the cognitive processes engaged in learning. FLAVELL (1979) goes further and says that metacognition regards the individual's capability of being self-

reflexive. It goes beyond being able to think about the thoughts. It involves active monitoring, and regulation of cognitive processes.

Researchers call attention that there exists an agreement among them saying that learning strategies require the use of cognition, metacognition, and motivation, emotion, and engagement of learners. They also say that the use of the term “self-regulated learning strategies” is more regular currently. They state that these strategies help students in their self-regulated learning (DUNCAN; MCKEACHIE, 2005; DUNN et al., 2011; ZIMMERMAN; PONS, 1986).

Dysfunctional metacognitive strategies are those, which do not work effectively for the students’ learning, on the contrary, they undermine performance attainment (e.g., to be distracted with something when reading or studying). In this research, dysfunctional, self-handicapped, maladaptive, faulty strategies and others, which do not function effectively for the learning, have the same meanings. In the following lines, there are some examples of these dysfunctional metacognitive strategies.

Maladaptive strategies used by some students mean that students’ endeavors will result in undesirable academic outcomes. Some of the strategies or behavior engaged by students that take them away from successful academic tasks achievement are self-handicapping, the propensity of the students to engage in activities that can take them away from relevant academic goals; procrastination, meaning to postpone academic activities that will result in poor performance; defensive pessimism, setting up low expectations in a non-realistic way; defective academic delay of gratification, putting off immediate reward in favor of distal academic goals; misregulation, trying to manage actions, beliefs, and behavior in such ways that the desired outcomes are failed; underregulation, setting low patterns, and have problems for monitoring behavior and fail in the self-control; iConnected parents, the parents are allowed to be involved deeply in students’ homework activities by using technology (ARMOUR, 2005; CONE, 2006; HOWE; STRAUSS, 1992).

COVINGTON (2000) states that the behavior of a student using self-handicapped strategy leads to the creation of an obstacle bringing a prepared excuse for potential failure. This strategy can be procrastination, and setting up unrealistic goals. The students know that if they study at the last moment, their failures will not be

about their inability. They believe that not reaching an unattainable goal will not blame significantly their ability, provided no other student is expected to succeed either. URDAN; MIDGLEY (2001) state that self-handicapping deals with learners' movement to engage in activities that can keep them from achieving relevant academic goals.

KLASSEN; KRAWCHUK; RAJANI (2008) express that universities have given close attention to procrastination. Findings have revealed that procrastination is related to lower levels of self-efficacy and self-regulation, associated with high levels of stress, anxiety, sickness, negative behavior, late submitting of assignments, assessment anxiety, and fear of failure. (HAJLOO, 2014) says that procrastination behavior is quite common and is a critical problem in our world. However, it seems that researchers cannot come to a common definition for it. Planned delaying in doing something is suggested as the definition of procrastination. As for tendency to procrastination, the motivation for it are lack of time management skills, low self-efficacy beliefs and self-esteem, discomfort concerning tasks, personal features (accountability, perfectionism, disturbed tendency, etc.), illogical thoughts, lack of concentration, worry about failure, lack of skills to lead objectives of success, low self-respect, anxiety, lack of problem-solving skills, unrealistic expectations, and working habits.

3. Methodology

3.1. Introduction

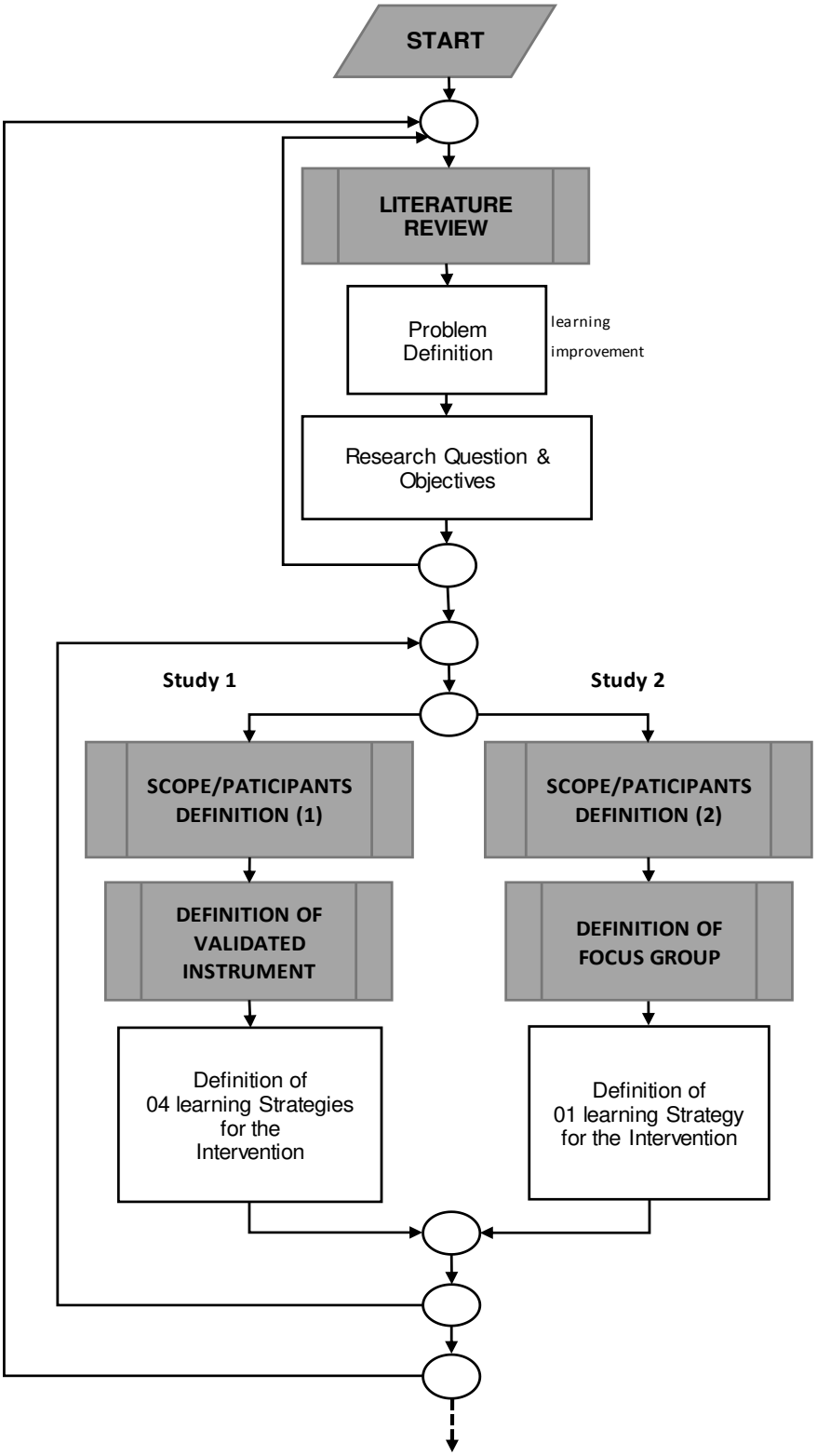
This research was organized into two steps and took place in Unicamp, a university placed in the city of Campinas, in the state of São Paulo, Brazil. The participants were students from Civil Engineering, transport area. In the first step, “Study 1”, there was an experiment involving interventions in classrooms to deliver some learning strategies. The participants were students from three different courses from Unicamp. There was a control group in 2010 and an experimental group in 2011. In the second step, “Study 2”, there was a new and single Learning Strategy, embedded in the “Transport Economics” discipline, in 2015. **Figure 4** shows the sequence of activities in this research as the literature review, definitions of interventions, instruments, learning strategies, focus group meetings, learning strategies, analyses, results, and conclusion.

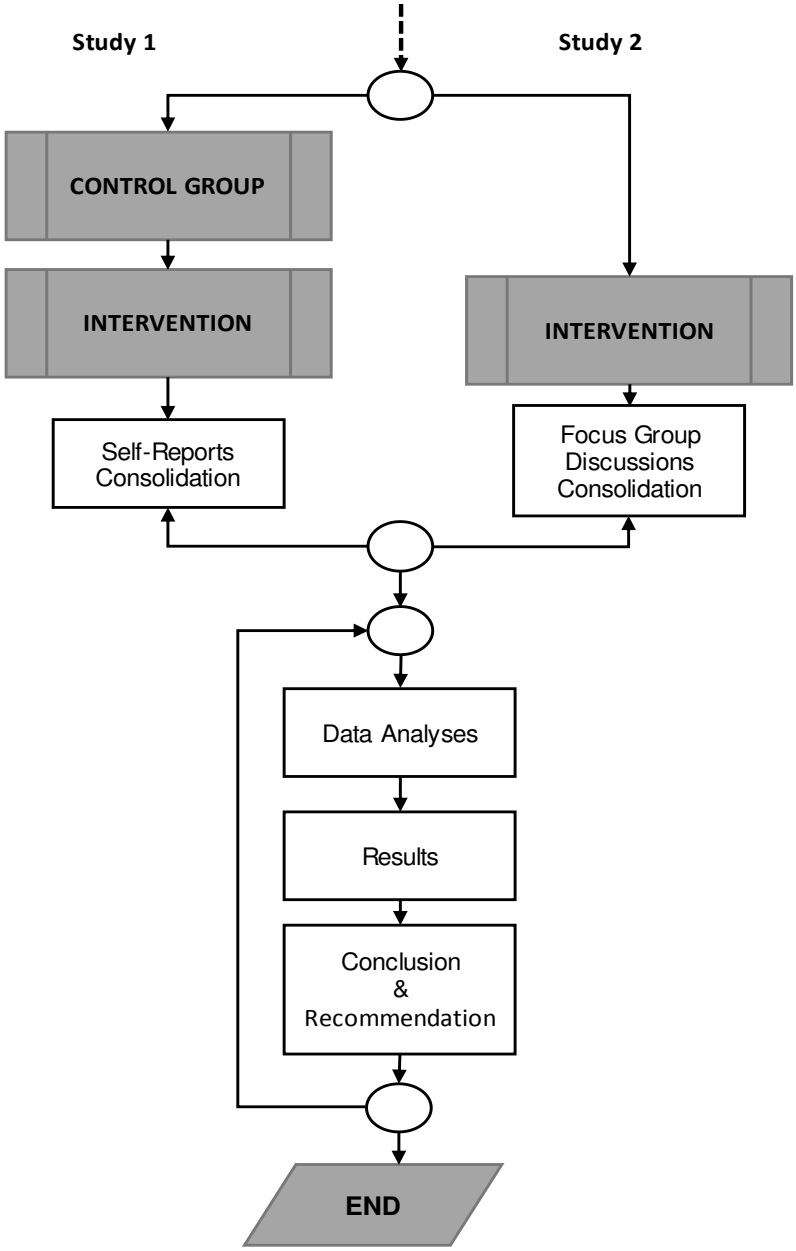
3.2. Participants

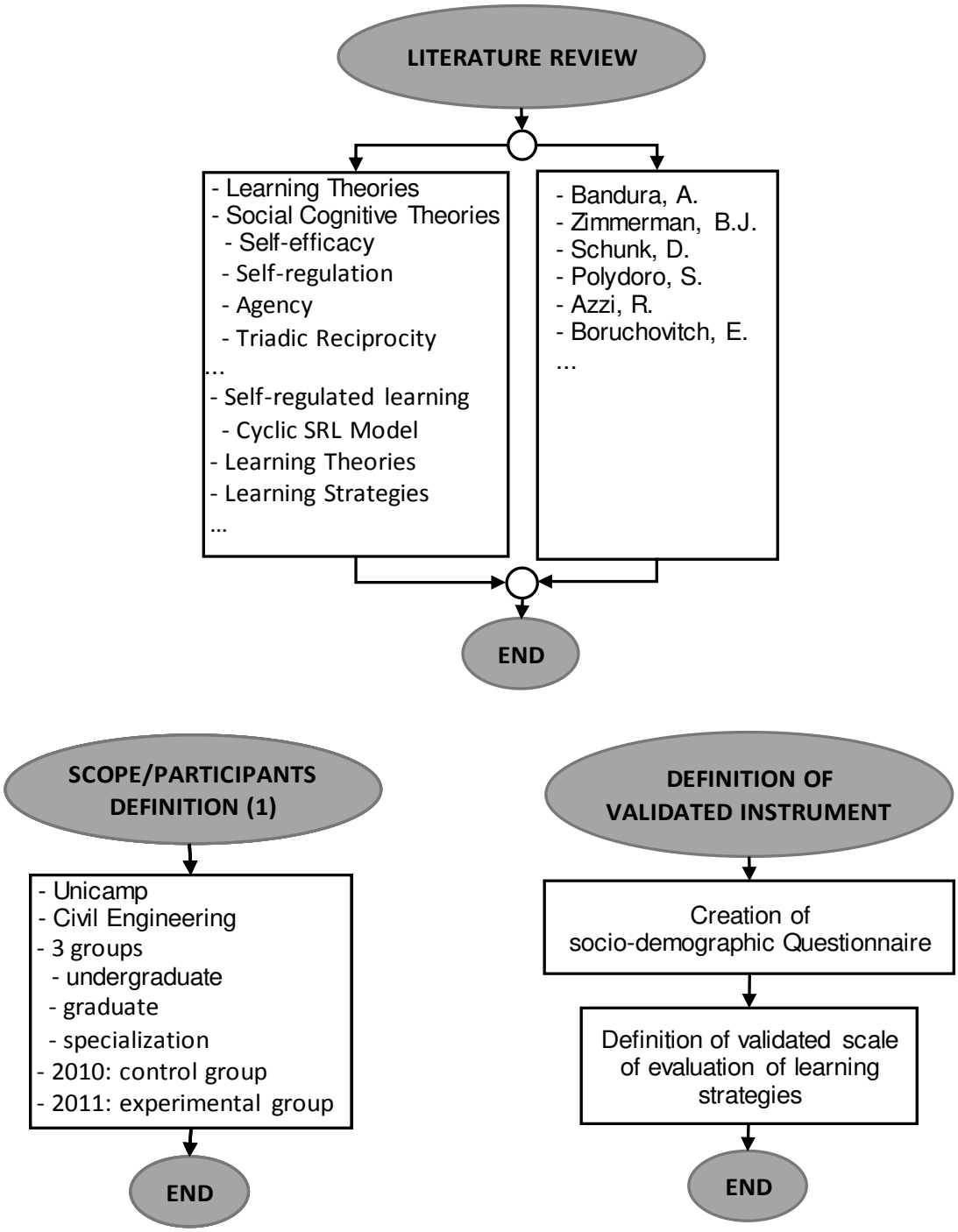
In the first step of the research, (Study 1), there were 125 students from the control groups, in 2010, and 122 students from the experimental groups, in 2011. The participation of the students was voluntary and they signed an Informed Consent Form allowing the researcher to administer the questionnaire and the scale in the classrooms. All students signed the document (See Annex B1). This research involved undergraduate and graduate students of Civil Engineering, transport area. There were also specialization students under LALT (Learning Laboratory on Logistics and Transport) of Civil Engineering of Unicamp. The undergraduate students were from “Introduction to Economics” class, the graduate students from “Modeling of Transport and Logistic Systems” class, and the specialization students from “Supply Chain and Logistic Management” class.

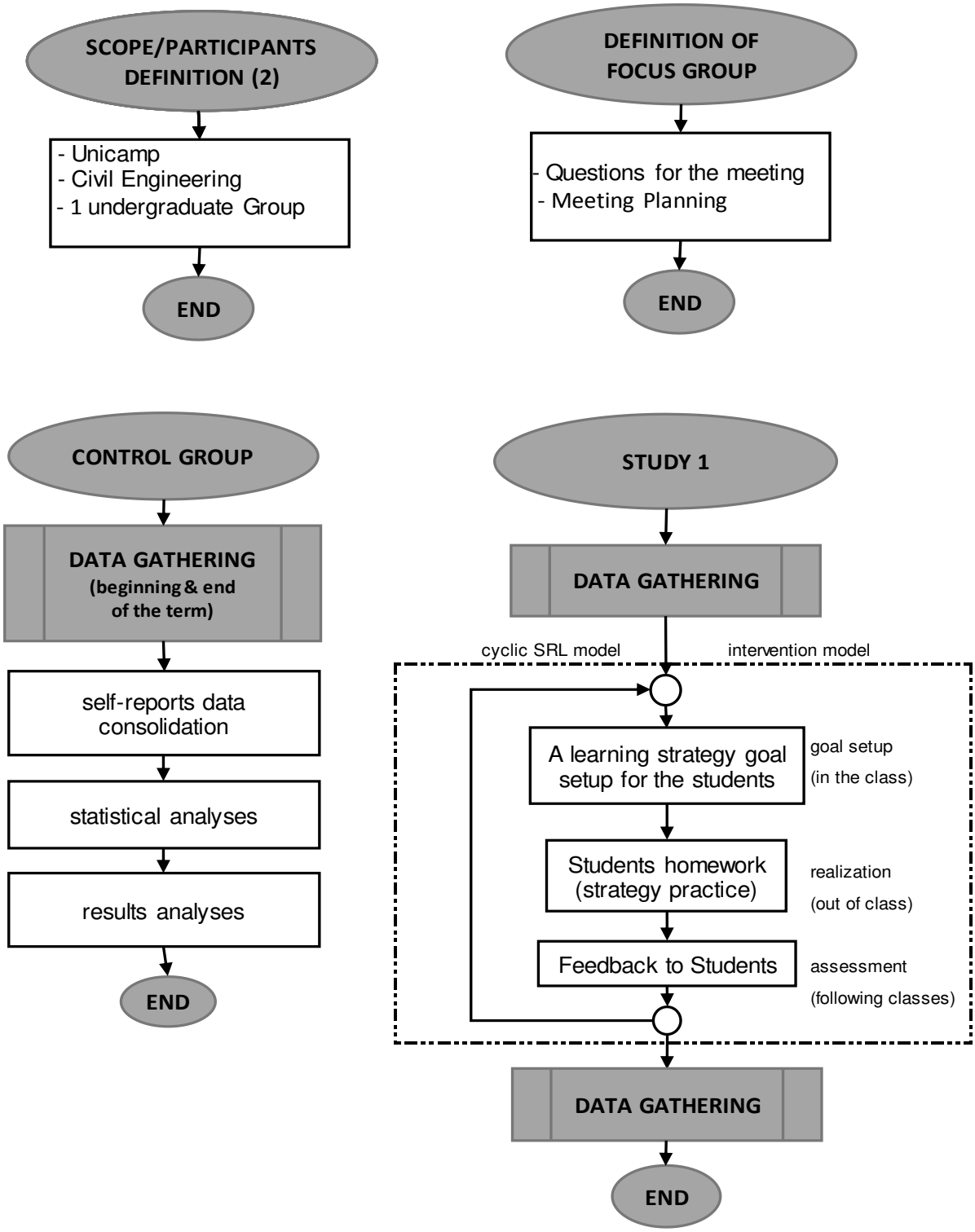
In the second step of the research, (Study 2), in 2015, there were 58 undergraduate students from “Transport Economics” discipline of civil engineering, transport area. The participation of the students was voluntary and they signed an Informed Consent Form allowing the researcher to administer the questionnaire. All students signed the document (See Annex B2).

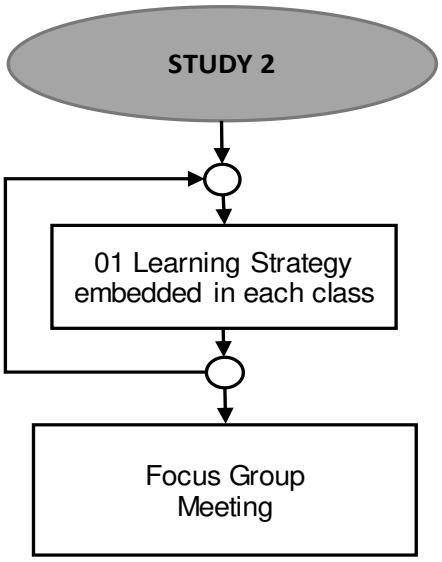
Figure 4: Research Framework

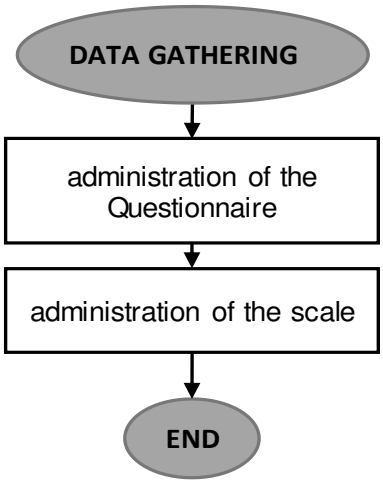



Study 1
Study 2
CONTROL GROUP
INTERVENTION
INTERVENTION
Self-Reports Consolidation
Focus Group Discussions Consolidation
Data Analyses
Results
Conclusion & Recommendation
END

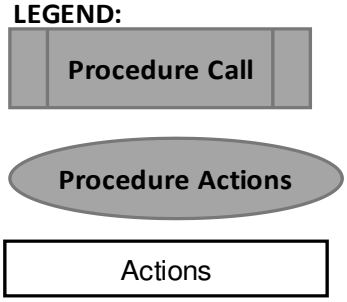

LITERATURE REVIEW
- Learning Theories
- Social Cognitive Theories
- Self-efficacy
- Self-regulation
- Agency
- Triadic Reciprocity
...
- Self-regulated learning
- Cyclic SRL Model
- Learning Theories
- Learning Strategies
...
- Bandura, A.
- Zimmerman, B.J.
- Schunk, D.
- Polydoro, S.
- Azzi, R.
- Boruchovitch, E.
...
END
SCOPE/PARTICIPANTS DEFINITION (1)
- Unicamp
- Civil Engineering
- 3 groups
- undergraduate
- graduate
- specialization
- 2010: control group
- 2011: experimental group
END
DEFINITION OF VALIDATED INSTRUMENT
Creation of socio-demographic Questionnaire
Definition of validated scale of evaluation of learning strategies
END


SCOPE/PARTICIPANTS DEFINITION (2)
- Unicamp
- Civil Engineering
- 1 undergraduate Group
END
DEFINITION OF FOCUS GROUP
- Questions for the meeting
- Meeting Planning
END
CONTROL GROUP
DATA GATHERING (beginning & end of the term)
self-reports data consolidation
statistical analyses
results analyses
END
STUDY 1
DATA GATHERING
cyclic SRL model
intervention model
A learning strategy goal setup for the students
goal setup (in the class)
Students homework (strategy practice)
realization (out of class)
Feedback to Students
assessment (following classes)
DATA GATHERING
END





LEGEND:



SCT: Social Cognitive Theory
SRL: Self-Regulated Learning

3.3. Research Instruments

3.3.1. Study 1

a) Socio-Demographic Questionnaire

There was a socio-demographic questionnaire asking for information as: age, gender, marital status, languages knowledge, perception of English language skill, and whether they had already traveled abroad. Some other specific data from the graduate students were also gathered, such as: master or doctorate degrees, their current occupation, what undergraduate course taken and whether any specialization course taken. For the specialization students, they were asked their occupations and undergraduate courses taken. The details of this questionnaire is in annex A.

b) Learning Scale

A scale - *Learning Strategies Assessment Scale for University Students* - (BORUCHOVITCH; SANTOS, 2008;2015), was also administered to the students, and aimed to identify the student´s cognitive, metacognitive and dysfunctional metacognitive strategies. It is a scale of four-point likert type ranging from “always”, “sometimes”, “rarely” to “never”. Each question was worth four, three, two and one scores respectively. There were 19 questions related to cognitive strategies and 23 related to metacognitive strategies. As for dysfunctional metacognitive strategies, there were seven, and the score setting was in inverse proportion to the others, that is, one score for “always”, two scores for “sometimes”, three scores for “rarely”, and four scores for “never”. As the dysfunctional metacognitive strategies, have an inverse score setting, it means that, the higher the score, the less dysfunctional the strategy is. The scale with cognitive, metacognitive, and dysfunctional metacognitive items can be seen in the **Table 4**.

Table 4: Learning Strategies Assessment Scale

	COGNITIVE
1	Repeat the information orally while reading the text.
2	Write down in full the explanations of the teacher.
4	Summarize the texts indicated for study.
5	Read the texts indicated by the teacher.
6	Make notes in the text or on a separate sheet.
7	Write in your own words what you understood from the text.
8	Read supplementary texts, in addition to those indicated by the teacher.
10	Prepare questions and answers on the subject studied.
11	Select the main ideas of the text.
13	Analyze graphs and tables found in texts.
14	Identify the main ideas and relate them through diagram or conceptual maps.
18	Search the dictionary for the meanings of unfamiliar words.
23	Use other texts and books on the subject.
31	Create questions about the subject you are studying and try to answer them.
41	Research Internet about my homework.
42	Study in a group.
44	Make a scheme on the paper (sketch, graph or drawing) to better understand the relationships between things.
46	Discuss the matter with colleagues to see whether you understood.
47	Know by heart the subject when it is time for a test.
	METACOGNITIVE
3	Identify your difficulties to learn certain topics or subjects.
9	Self-motivate for the reading and study activities.
12	Control your anxiety in evaluation situations.
15	Identify how much or how little you are learning.
16	Request help from the teacher regarding doubts about the content.
17	Review the notes taken in class.
19	Ask for help from colleagues in case of doubts.
20	Manage your study time.
21	Organize your study environment.
22	Stay calm when faced with difficult tasks.
24	Perceive when I do not understand what I read, then I stop and reread.
25	Plan your study activities.
26	Separate all the material needed for the task that you will perform.
27	Manage to complete a task even when it is difficult and tedious.
28	Stop during the reading to self-evaluate.
29	Check your mistakes after receiving the grade for a test.
33	Try to redo questions that you got wrong in a test.
38	Perceive when I do not understand what I read.
40	Read your answers again before handing in a test.
43	Note on the agenda things that you have to do.
45	Paste reminders to remember what you need to do.
48	Ask someone to go over the material.
49	Reread the material to understand it better.
	DYSFUNCTIONAL
30	Listen to music as I study or do homework.
32	Get very nervous when I am doing a difficult test.
34	Get standing all the time as I study.
35	Eat as I study or do my homework.
36	Forget to do tasks the teachers asked me to do.
37	Distract yourself or think of something else when reading, studying or doing work.
39	Study or do homework as I watch TV.

This experiment relied on self-reports responded by the students to the questions of the scale and questionnaire. The maximum and minimum possible scores concerning the scale are presented in **Table 5**.

Table 5: Maximum and Minimum Possible Scores

	Cognitive	Metacognitive	Dysfunctional	Total
Minimum	19	23	7	49
Maximum	76	92	28	196

3.3.2. Study 2

a) Socio-Demographic Questionnaire

There was a socio-demographic questionnaire asking for the following information from the students: gender, age, marital status, and how many years they were studying civil engineering.

b) Focus Group Meeting

There was a Focus Group meeting discussing the students' usage of Guided Notes using mind map. This learning strategy was embedded in the "Transport Economics" discipline. The Focus Group also discussed the general strategies they used to improve their learning. It involved 11 participants of this discipline. The questions brought into discussion in the meeting can be seen in **Table 6**.

Table 6: Questions for Focus Group Meeting

Q1	What is your favorite way to study?
Q2	Do you study all disciplines in the same way?
Q3	How do you choose the way you study? Does it depend on the teacher or the discipline?
Q4	Has anybody ever talked to you about different ways to study?
Q5	Do you ask the teacher for material in advance?
Q6	Do you give feedback to teachers?
Q7	Talk about your favorite ways to follow a class (in the classroom).
Q8	What do you prefer: a 3-hour class or a 1-hour class?
Q9	Which terms do you use as meanings of different ways of studying? (e.g. strategy, method, tactic, technique, etc.)
Q10	How was it for you to use the mind map in the 'Transport Economics' discipline?
Q11	Has anybody asked the teacher for help, and that you did not understand what mind map was for?".
Q12	Has the use of the mind map made the teaching-learning simpler, easier?
Q13	Is there anything else you would like to comment about ways of studying?
Q14	What do you thing about the use of a media, as a blog, or whatsapp, as a strategy for learning?

The students who participated in the Focus Group meeting were encouraged to evaluate it. They did this one week after the meeting was held. The researcher handed out some forms with the following notes:

> "Por favor, escrever suas críticas sobre a nossa Reunião GRUPO FOCAL da última quinta-feira.
>
> Escreva sua opinião, do que gostou e do que não gostou, sobre:
>
> **motivo da reunião, local, ambiente, perguntas feitas na reunião, qualidade do lanche, horário, explicações, motivação, etc.**
>
> **onde poderia melhorar…**
>
> Este é um momento para o seu feedback para nós podermos melhorar nas próximas reuniões.
>
> *Gostei disso, não gostei daquilo, poderia melhorar isso, não precisava daquilo*, …
>
> Não se identifique"

3.4. Procedures

3.4.1. Study 1

A pre-test and post-test socio-demographic questionnaire and learning scale were administered to the selected students (control groups) in 2010, for each course and no intervention took place. In 2011, the same pre-test and post-test questionnaire and scale were administered to the same courses, for different groups of students (experimental groups). For these groups, before starting the interventions, the teachers of the disciplines talked to the students about the importance of this research for their learning, and introduced the researcher. The interventions aimed to convey and reinforce some learning strategies.

The researcher started the intervention with some pre-interventions questions about learning strategies written on the blackboard, shown ahead. The researcher asked the students to answer those questions on the blackboard in groups. The idea was to call the students' attention to some dysfunctional metacognitive strategies. There were discussions in groups and shared among all in the class.

Interventions conveyed learning strategies through the Cyclic Self-Regulated Learning Model. The researcher relied on the same approach for all groups, using 30 minutes in the classes, bearing in mind to be the least intrusive possible.

In the interventions sessions, the researcher presented a learning strategy with an example. Some homework was delivered to the students. It was about the learning strategy just given and applied it to the current class. In the following class the strategy was reinforced, questions and answers were provided, some homework was corrected and feedback was given to students. The researcher was in class only the first time to present the new strategy. In the following classes the researcher was present but not acting, just being there available, just in case they needed any feedback. Then, in succeeding classes, a new strategy was delivered, until the end of the term. During the questions and answers, and the homework correction, the researcher had opportunities to give the students some orientations, and some observations about their understanding of the strategies, giving them a chance to self-regulate.

Four learning strategies were brought into details during the interventions: “self-recording”, “note-taking” during class by CORNELL (2001), which was adapted from PAUK; OWENS (2013), “note-taking” in reading by ROBINSON, F. P. (1961) and mind map (BUZAN; BUZAN, 2010; BUZAN; BUZAN; HARRISON, 2010). These learning strategies were delivered by the researcher along the courses, starting from *note taking during class*.

The researcher carried out the Interventions under The Cyclic Self-Regulated Learning Model, and used three phases of this model during the interventions.

- **Forethought Phase: t**he researcher explained each learning strategy through examples and demonstrations and the students were given some homework. This was equivalent to *goal setting* process, which also served to show to the students the specific *outcome expected* from that homework. The use of the strategy conveyed is part of the *strategic planning* process.

- **Realization Control Phase:** In this phase, the students are involved in their homework and they might have used *self-control* processes to maximize their learning in the assigned homework.

- **Self-Reflection Phase: t**his phase allows the students to *reflect* on their performance and to make *adjustments*. The researcher discussed homework individually and at times collectively. This provided the students with *feedback* on what they did, and then they could start using *self-judgment* and *self-reaction* as they adjusted their faulty strategies.

Details of the Experiment Protocol

The interventions take place in Undergraduate, Graduate and Specialization classes and the strategies involved are the following:

1. Note-Taking (Cornell) Strategy for Lectures/Classes (Annex C1)
2. Note-Taking (SQ3R) Strategy for Text Reading (Annex C2)
3. Mind Map (Tony Buzan) Strategy (Annex C3)
4. Self-Recording Strategy (Annex C4)

The teacher of the discipline is involved only in the first class for the introduction of the researcher to the students. The researcher is responsible for the implementation of the interventions, explanations of learning strategies, and feedback to the students in all classes and in all courses. The sequence of the procedures might be the following.

CLASS 01 – Introduction and administration of Instruments (20 min.)

- The teacher of the subject introduces the researcher to the students
- The teacher tells the students that the researcher is there because of a research, which aims to improve the learning processes.
- The researcher tells them that this research is very relevant not only for them but for Unicamp.
- The researcher tells them that they are not obliged to take part in it but he and the teacher expect so.
- The researcher tells the students that those who accept to take part in the research should sign the consent form.
- The researcher starts handing out the consent form to the students and then a socio-demographic questionnaire and a learning scale.

CLASS 02 – Pre-Interventions Questions (25 min.)

- Hand out the following pre-interventions questions about learning strategies to the students.
  1. Have you ever received any orientation on how to use any learning strategy?
  2. How do you take note in your classes?
  3. How to you take note during the reading of a text?

4. Which are the special difficulties in paying attention to classes and to studying the subject?
5. How do you overcome your difficulties and distractions?

- Give fifteen minutes to students for discussion in groups not bigger than 8 students.
- Send one student of each group to the blackboard to write the group's conclusion.
- Give the students 10 minutes to discuss whether they considered those learning strategies written on the blackboard useful.

CLASS 03 – Learning Strategy: Note-Taking (Cornell) Strategy for Lectures/Classes (30 min.)

- Explain the learning strategy with example (see annex C).
- Hand out homework about this strategy involving the current class.
- Ask the students to bring homework to class two weeks later.
- Tell the students that the researcher will be available every class from the beginning to the end to answer doubts if needed.

CLASS 04 – Learning Strategy - Doubts Discussion (10 min.)

- Answer some questions about last class strategy.
- Reinforce the learning strategy with another example.
- Give more feedback.
- Remind the students to bring homework the following class.
- Reinforce the students that the researcher will be in the following class to answer more doubts, if this is the case.

CLASS 05 – Learning Strategy: Homework feedback

- Receive homework before the class starts.
- Be available for possible questions before the class starts.
- Return homework to students with feedback at the end of the class.

Repeat classes 03, 04 and 05 for the other 3 strategies.

CLOSING CLASS – Closing - Administration of Instruments (20 min.)

- Hand out the socio-demographic questionnaire and the learning scale.
- Thank the students for their participation in the research

3.4.2. Study 2

In the beginning of the term, in 2015, the teacher of Transport Economics discipline talked to the students about the use of a learning strategy that would be embedded in their classes. They would be receiving an A4-sheet with some macro notes of the current class, but incomplete. Those notes were in mind map format and had the main topics of the current class. The students were supposed to break down these notes and complete the map as they attended the class. This strategy is called “Guided Notes using mind map”. See Annex C5.

It was late in the middle of the term and the teacher of the discipline talked to the students about holding a Focus Group meeting, in the following week, after their class. It would start at lunchtime and there would be snacks and beverages for all participants. He asked for volunteers and a list with 11 names was created. At the end of the following class, these students were then called and led to another classroom that was already prepared by the researcher to hold that meeting. All materials needed for that meeting were at place, like pencils, pens, sheets of paper, markers, audio recorder and a video camera. The layout of the chairs was in such way to facilitate the recognition of everybody in the video recorded.

The researcher started the meeting asking them to sit down anywhere, and explained that the aim of that meeting was to discuss about their use of the learning strategy used in the intervention in their “Transport Economics” discipline; it was about the Guided Notes using mind map. They had also to discuss their general learning strategies that they used for themselves or knew if any. The researcher explained that it was very important to keep the focus on the questions, on the discussion. It should not be interrupted. The researcher told them if anybody wanted to use the toilet, they

should go immediately. There would be no problem if they wanted to go to toilet later on.

The researcher asked them to write their names in a piece of paper that was already in front of them and explained that everybody would have a chance to speak; they should speak what they thought without fear; that meeting was totally confidential and everything they said would be used only for the research with identifying anybody.

The researcher asked them to sign an Informed Consent Form explaining that it was a guarantee for the researcher that they were there allowing us to use the results of that meeting. It was also a guarantee for them once it is to be used for a research and confidentiality is assured.

The researcher started asking the questions, one by one and sometimes one student was elicited to answer and other times other students volunteered to start answering. The researcher tried to give opportunities for those who had not talked much. Everybody had equal chance to talk. Sometimes the researcher asked if anybody agreed or disagreed on what had just been said, and asked if anybody had anything else to complement what had just been said. When the researcher thought the question had already been exhausted then a new question was asked. They talked freely and felt comfortable in this environment. Some students left the room only when there was a short interruption for the snacks and beverages.

The Focus Group meeting organization will follow the premises found in MACK et al. (2005). There will be an evaluation of the Focus Group meeting by the participants.

The questions used for the discussions can be found in Annex E.

3.5. Data Analyses

3.5.1. Study 1

There was be a socio-demographic characterization of the participants.

Cronbach´s alpha evaluated the internal consistency analysis for the likert-type learning strategies scale. For internal consistency analyses, see HATCHER (1994); (JOHNSON; WICHERN, 1988; PEREIRA, 1999).

There were some tests involving strategies scores of cognitive, metacognitive, and dysfunctional metacognitive strategies, and the total scores of strategies.

The statistical tests in this research were non-parametric tests, as there was no knowledge of the population or parameters, and the data did not have a normal distribution. The following non-parametric tests in this research were Mann-Whitney, Kruskal-Wallis, and Wilcoxon tests. Mann-Whitney tests compared two groups; for more than two groups, Kruskal-Wallis was used. Wilcoxon tests were for repeated measures, or longitudinal study (CONOVER, 1999; SIEGEL; CASTELLAN, 2006).

Mann-Whitney tests did a cross-sectional analysis among the three courses in control and experimental groups – pre-test of control against pre-test of experimental groups; and post-test of control against post-test of experimental groups (see **Figure 5** and **Figure 6**). Wilcoxon tests did a longitudinal analysis between the pre-test and post-test of control groups; and between the pre-test and post-test of experimental groups (see **Figure 7 Figure 8**). Kruskal-Wallis tests did a cross-sectional analysis among the three courses in control and experimental groups. There was a comparison of strategies scores among undergraduate, graduate and specialization courses, of control groups in the pre-test (see **Figure 9**) and post-test (see **Figure 10**); and of experimental groups in the pre-test (see **Figure 11**) and post-test (see **Figure 12**).

Figure 5: Cross-Sectional Analysis: Pre-Test–Control/Experimental Groups

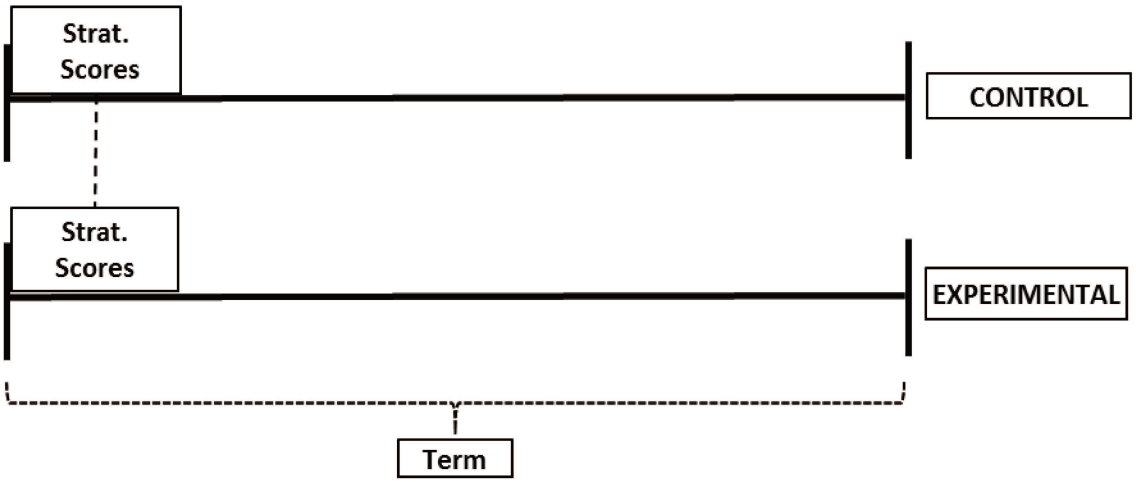


Figure 6: Cross-Sectional Analysis: Post-Test–Control/Experimental Groups

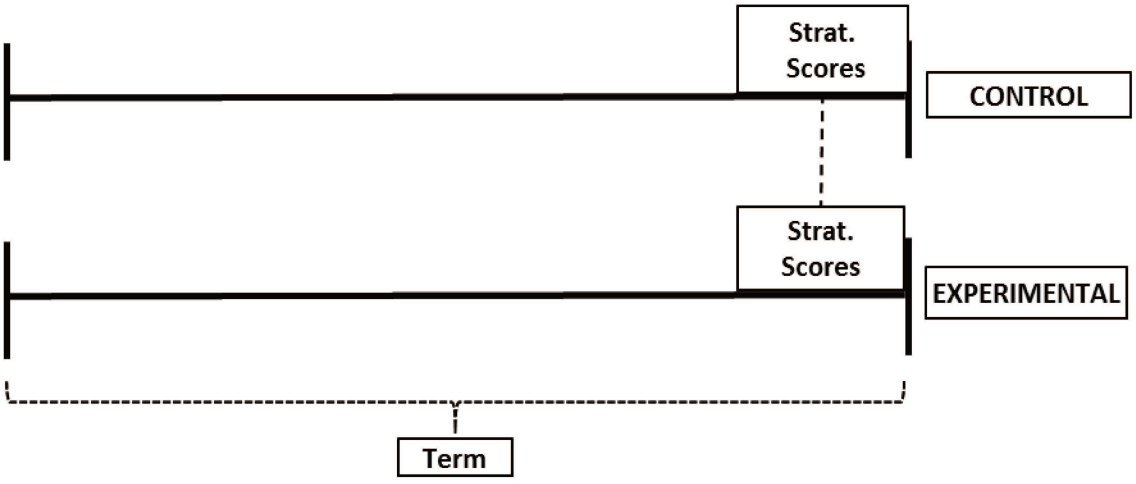


Figure 7: Longitudinal Analysis: Pre-Test/Post-Test - Control Groups

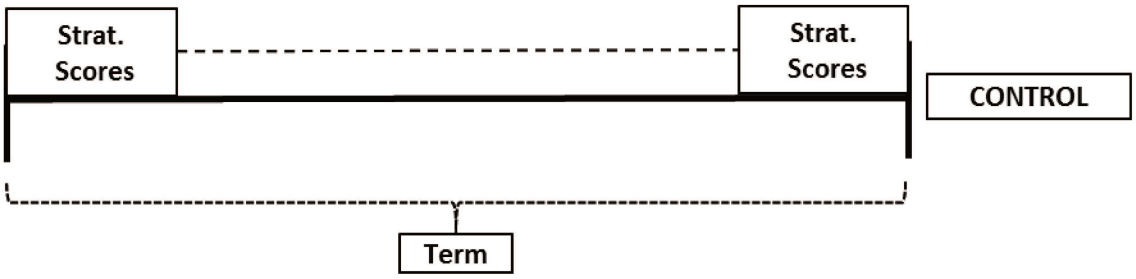


Figure 8: Longitudinal Analysis: Pre-Test/Post-Test - Experimental Groups

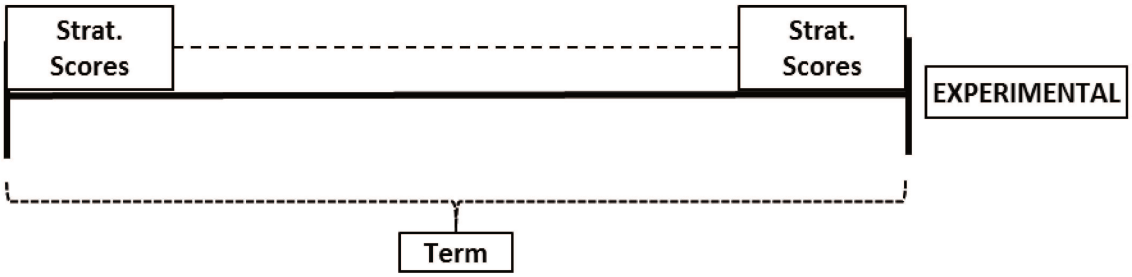


Figure 9: Cross-Sectional Analysis: Pre-Test - Control Groups

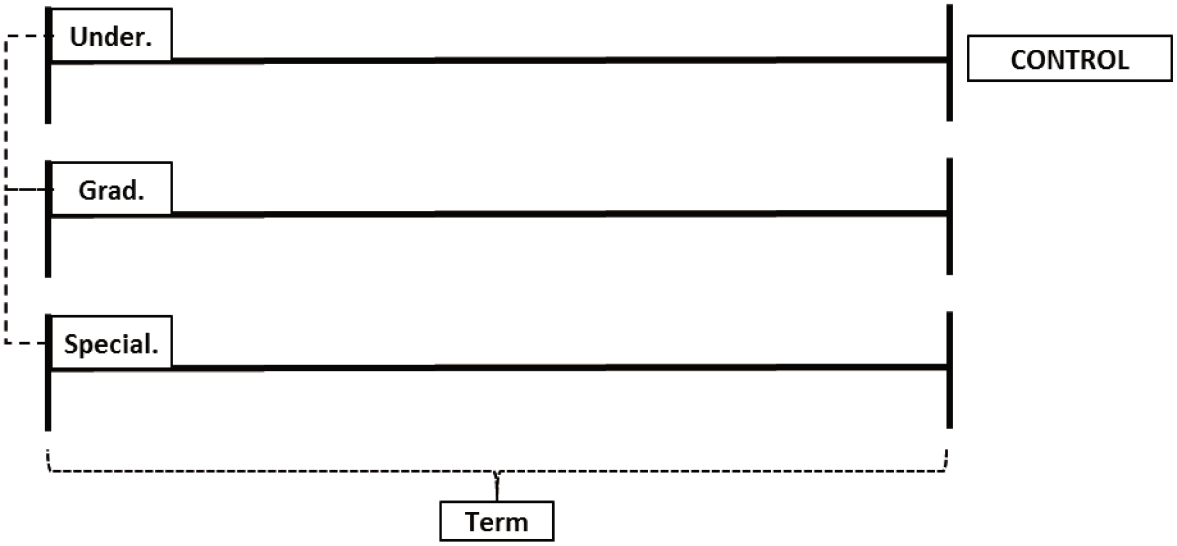


Figure 10: Cross-Sectional Analysis: Post-Test - Control Groups

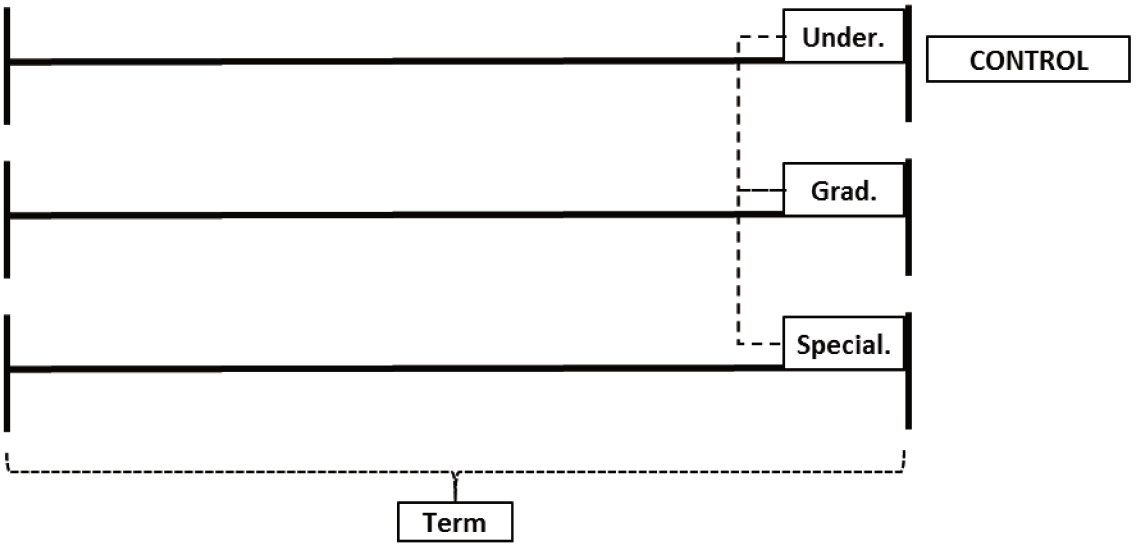


Figure 11: Cross-Sectional Analysis: Pre-Test - Experimental Groups

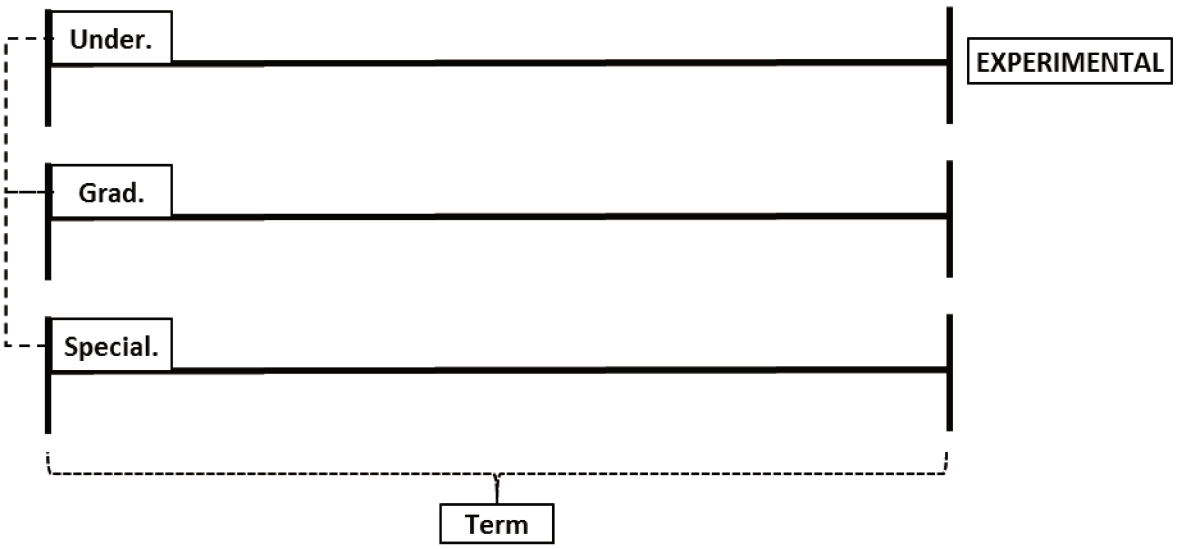
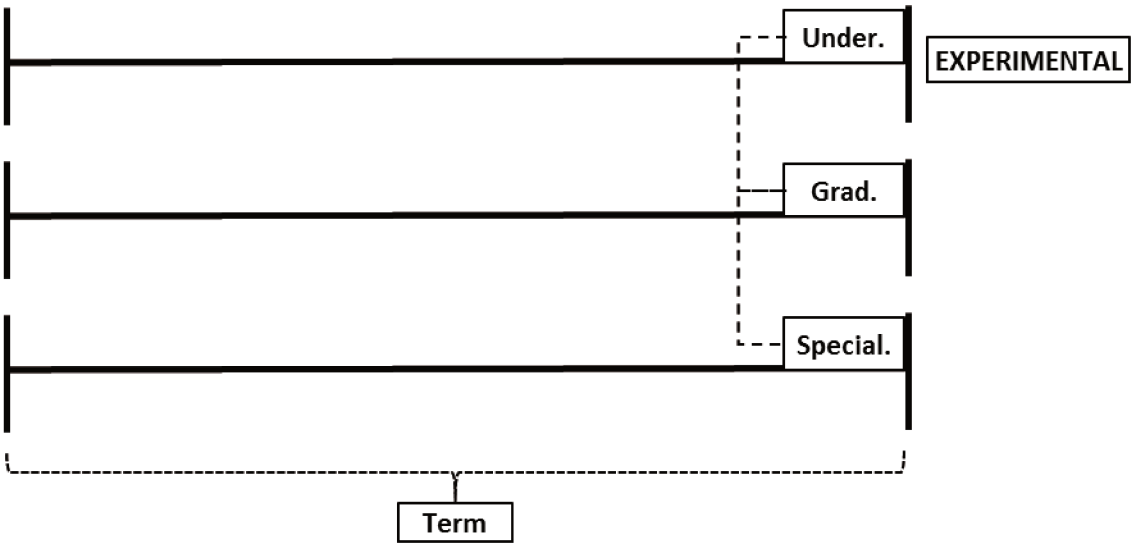
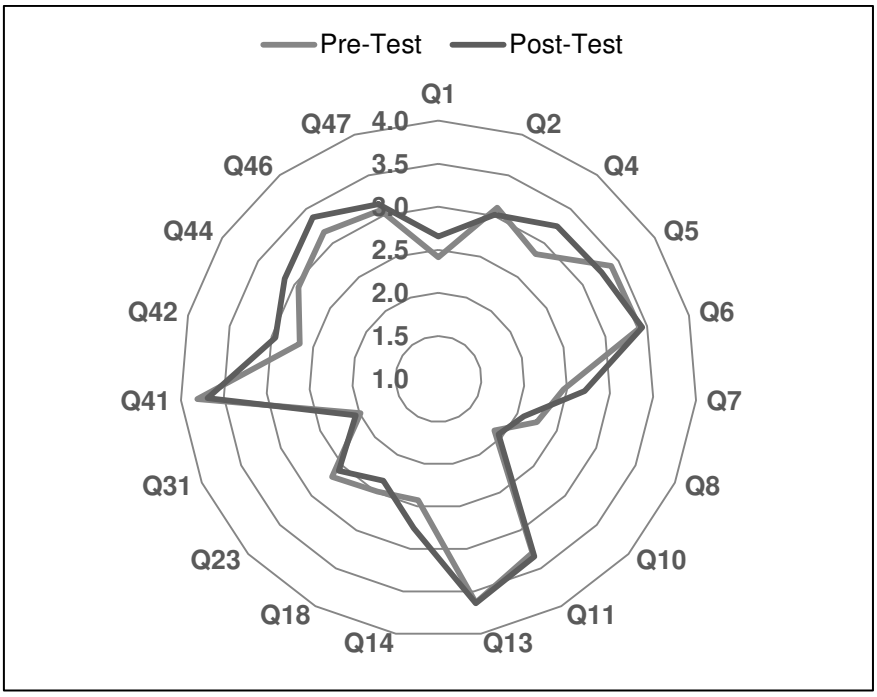


Figure 12: Cross-Sectional Analysis: Post-Test: Experimental Groups



The individual score averages, for all types of strategies, and for all courses, were calculated in the pre-test and post-test, for both control and experimental groups. Some radar graphics represent this information. **Figure 13** shows an example for metacognitive strategies with corresponding items in the scale (Q1, Q2, Q4, etc.) and score average in the range of 1 to 4 according the Likert scale.

Figure 13: Control Groups – Pre-Test/Post-Test: Cognitive Strategies (Example)



3.5.2. Study 2

There was a socio-demographic characterization of the participants.

The verbal reports about the themes discussed by the students in the Focus Group Meeting were organized in the following analysis categories.

- Category a: “Strategies and ways used by the students to study”
- Category b: “Knowledge of strategies to study”
- Category c: “Duration of classes”
- Category d: “Mind Map Usage”
- Category e: “Give Feedback to Teachers”

4. Results and Analyses

4.1. Study 1

a) Socio-Demographic Characterization

There were 69, 28 and 28 students respectively from the control groups, with 65%, 75% and 57% being male; 75, 16 and 31 students from the experimental groups, with 68%, 62% and 29% being male. The average ages were 19 and 19 for the undergraduate, 36 and 33 for graduate, and 28 and 29 years for specialization courses, respectively from control and experimental groups. The duration of each course was four months.

Table 7 shows socio-demographic data**.** Specific extra data gathered from the graduate and specialization students are in **Table 8** and **Table 9**.

Table 7: Socio-demographic data about the students

	UNDERGRADUATE		GRADUATE		SPECIALIZATION	
	CONTROL	EXPERIM.	CONTROL	EXPERIM.	CONTROL	EXPERIM.
N	69	75	28	16	28	31
Male	45 (65%)	51 (68%)	20 (71%)	10 (63%)	16 (57%)	9 (29%)
Age Avg	19.5	19.5	36.8	33	28	29
Single	67 (97%)	75 (100%)	8 (29%)	9 (56%)	18 (64%)	17 (55%)
Languages:						
- English	69 (100%)	74 (99%)	28 (100%)	16 (100%)	28 (100%)	29 (94%)
- French	11 (16%)	9 (12%)	5 (18%)	0	5 (18%)	1 (3%)
- Spanish	33 (48%)	31 (41%)	15 (54%)	11 (69%)	16 (57%)	13 (42%)
- Other	13 (19%)	10 (13%)	0	4 (25%)	6 (21%)	3 (10%)
English Skill Perception	intermediate to good	intermediate	intermediate	intermediate to good	intermediate to good	intermediate
Travel Abroad	34 (49%)	30 (40%)	18 (64%)	14 (88%)	19 (68%)	14 (45%)

Control: Control Groups; Experim.: Experimental Groups

Table 8: Extra Data gathered from Graduate Students

GRADUATE	CONTROL	EXPERIM.
N	28	16
Master Student Quantity	18 (64%)	12 (75%)
Doctorate Student Quantity	10 (36%)	3 (19%)
Occupation as:		
- Civil Engineer	6 (21%)	6 (38%)
- Teacher	8 (29%)	3 (19%)
- Student	3 (11%)	2 (13%)
- Others	11 (39%)	5 (31%)
Civil Engineer Undergraduate	11 (39%)	7 (44%)
Specialization Title	16 (57%)	9 (56%)

Control: Control Groups; Experim.: Experimental Groups

Table 9: Extra Data gathered from Specialization Students

SPECIALIZATION	CONTROL	EXPERIM.
N	**28**	**31**
Occupation as:		
- Buyer	6 (21%)	2 (6%)
- Analyst	6 (21%)	7 (23%)
- Manager	4 (14%)	1 (3%)
- Supervisor	2 (7%)	5 (16%)
- Engineer	2 (7%)	3 (10%)
- Coordinator	1 (4%)	4 (13%)
- Teacher	1 (4%)	0
- Student	1 (4%)	2 (6%)
- Others	5 (18%)	7 (23%)
Undergraduation as:		
- Administration	14 (50%)	15 (48%)
- Supply Chain Man.	3 (11%)	0
- Engineering	4 (14%)	10 (32%)
- Others	7 (25%)	6 (19%

Control: Control Groups; Experim.: Experimental Groups

b) Internal Consistency of the Scale: Cronbach´s alpha

As for the internal consistency analysis for the likert-type learning strategies scale, there were high values for the Cronbach´s alpha for the strategies. Having Cronbach´s alpha > 0.70, the scale was internally consistent. One can see a higher internal consistency in total scores and metacognitive scores. There were no Cronbach´s alpha calculated for control specialization students at the end of the term, due to a low number of students. This could produce an inaccurate value. See annex D for more details.

c) Cross-Sectional Analysis: Control and Experimental Groups

This was a comparison between pre-test of control and experimental groups (**Figure 5**), and post-test (**Figure 6**). This comparison took place through the Mann-Whitney test.

For the specialization courses, the pre-test cognitive scores average and the total scores average from the experimental groups were significantly higher than the control groups; that is, 54.64 and 57.81; 145.89 and 152.68; and p-value=0.023 and p-value=0.019, respectively. See annex D.

d) Longitudinal Analysis: Pre-test/Post-test Control and Experimental Groups

This was a comparison between the pre-test and post-test of control groups (see **Figure 7**); and of experimental groups (see **Figure 8**). This comparison took place through the Wilcoxon test.

Table 10 shows that from the control undergraduate groups, there was a significant increase (p-value =0.041) of the cognitive strategies scores average, and a significant decline (p-value =0.004) of the dysfunctional metacognitive strategies scores average. From the control graduate groups, there was a significant decline (p-value =0.022) of the metacognitive strategies scores average, and a significant decline (p-value =0.022) of the total scores average of all strategies. From the experimental undergraduate groups, there was a significant decline (p-value =0.002) of the metacognitive strategies scores average, and a significant decline (p-value =0.040) of the dysfunctional metacognitive strategies scores average, and a significant decline (p-value =0.002) of the total scores average of all strategies. From the experimental

specialization groups, there was a significant decline (p-value =0.002) of the cognitive strategies scores average, and a significant decline (p-value =0.011) of the metacognitive strategies scores average, and a significant decline (p-value <0.001) of the total scores average of all strategies. From the experimental graduate groups, there was a significant decline (p-value =0.043) of the dysfunctional metacognitive strategies scores average. See annex D for more details.

Table 10: Longitudinal Analysis: Pre-Test/Post-Test of Control/Experimental Groups

Groups	Students	Pre-Test Avg (SD)	Post-Test Avg (SD)	Strategy Used	Increase/Decrease P-value
CONTROL	Undergraduate	53.73 (5.45)	55.45 (5.60)	Cognitive	Incr. 0.041
		17.24 (3.00)	16.29 (3.11)	Dysfunctional	Decr. 0.004
	Graduate	74.81 (6.12)	71.75 (9.10)	Metacognitive	Decr. 0.022
		152.88 (12.38)	147.56 (17.50)	All	Decr. 0.022
EXPERIMENTAL	Undergraduate	72.63 (7.09)	70.24 (6.73)	Metacognitive	Decr. 0.002
		17.32 (3.58)	16.53 (3.11)	Dysfunctional	Decr. 0.040
		143.97 (12.35)	140.07 (11.97)	All	Decr. 0.002
	Specialization	58.06 (5.67)	54.94 (7.64)	Cognitive	Decr. 0.002
		74.53 (7.84)	70.94 (6.13)	Metacognitive	Decr. 0.011
		152.18 (12.41)	144.76 (11.87)	All	Decr.<0.001
	Graduate	150.45 (12.51)	143.73 (11.30)	Dysfunctional	Decr. 0.043

Note. Avg = Average; SD = Standard Deviation; Incr. = Increase; Decr. = Decrease;

e) Cross-Sectional Analysis Among the Courses

This was a comparison among the three courses in control and experimental groups. There was a comparison of pre-test strategies scores among undergraduate, graduate and specialization courses, of control groups (see **Figure 9**) and post-test (see **Figure 10**); and of pre-test experimental groups (see **Figure 11**) and post-test (see **Figure 12**). This comparison took place through the Kruskal-Wallis test**.**

Table 11 shows that in the pre-test of the control groups, comparing the dysfunctional metacognitive strategies scores average and the total strategies scores average, the undergraduate students showed significantly lower numbers (p-value=0.012 e p-value=0.042 respectively) than those of the graduate course. In the post-test of the control groups, comparing the dysfunctional metacognitive strategies scores average, the undergraduate students showed a significantly lower number (p-

value =0.003) than the specialization course. As for the pre-test of the experimental groups, comparing the cognitive, the dysfunctional metacognitive and the total strategies scores averages, the undergraduate students showed significantly lower numbers (p-value=0.002 and p-value=0.003 and p-value=0.001 respectively) than those of the specialization course. As for the post-test of experimental groups, comparing the dysfunctional metacognitive strategies scores average, the undergraduate students showed a significantly lower number than the graduate and the specialization courses (p-value=0.009 for both courses). See more details in annex D.

Table 11: Cross-Sectional Analysis of the Three Courses

	Pre-Post Test	Strategy	Undergrad. Avg (SD)	Graduate Avg (SD)	Specialization Avg (SD)	P-Value
CONTROL	Pre-Test	Dysfunctional	17.63 (3.13)	19.54 (3.27)	-	0.012
		All	144.06 (11.91)	151.71 (13.18)	-	0.042
	Post-Test	Dysfunctional	16.48 (3.04)	-	19.13 (1.55)	0.003
EXPERIM.	Pre-Test	Cognitive	53.53 (6.07)	-	57.81 (4.62)	0.002
		Dysfunctional	17.55 (3.58)	-	19.97 (2.39)	0.003
		All	143.80 (12.13)	-	152.68 (10.31)	<0.001
	Post-Test	Dysfunctional	16.55 (3.15)	18.40 (1.76)	18.52 (3.65)	0.009

Note. Avg=Average; Control=Control Groups; Experim.=Experimental Groups; SD=Standard Deviation

f) Individual Score Averages for Control and Experimental Groups

The following figures show the score averages in the pre-test and post-test of control and experimental groups, for undergraduate, graduate and specialization students in that sequence.

For control groups, **Figure 14** shows the cognitive strategies individual score averages. The highest and the lowest score averages in the pre-test and post-test of the terms are the following.

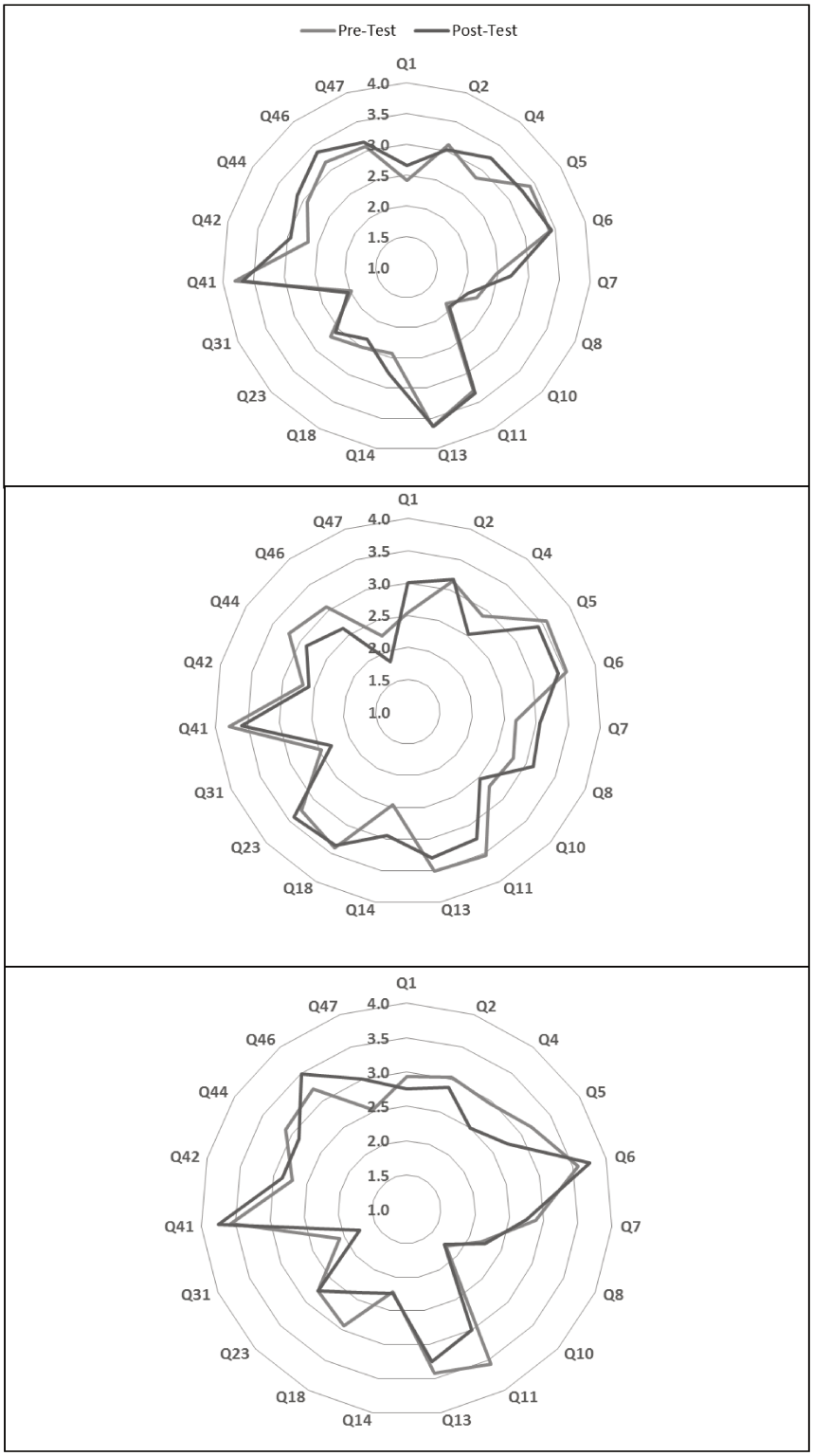
For undergraduate students, the figure shows that the strategy 41 (Research Internet about my homework) has the highest score average in the pre-test and post-test (3.8 and 3.7 respectively). The strategy 10 (Prepare questions and answers on the subject studied) has the lowest score average in the pre-test and post-test (1.9 and 2.0 respectively). The strategy 31 (Create questions about the subject you are studying

and try to answer them) has also the lowest score average in the post-test with score 2.0.

For graduate students, the figure shows that the strategy 41 (Research Internet about my homework) has the highest score average in the pre-test and post-test (3.8 and 3.6 respectively). The strategy 47 (Know by heart the subject when it is time for a test) has the lowest score average in the pre-test and post-test (2.3 and 1.8 respectively).

For specialization students, the figure shows that the strategies 6 (Make notes in the text or on a separate sheet) and 41 (Research Internet about my homework) have the highest score average in the pre-test and post-test (3.6 and 3.8 respectively). The strategy 11 (Select the main ideas of the text) has also the highest score average in the pre-test with score 3.6. The strategy 10 (Prepare questions and answers on the subject studied) has the lowest score average in the pre-test and post-test (1.8). The strategy 31 (Create questions about the subject you are studying and try to answer them) has also the lowest score average in the post-test (1.8).

Figure 14: Control Groups Cognitive Strategies: Pre-Test/Post-Test



Undergraduate

Graduate

Specialization

For control groups **Figure 15** shows the metacognitive strategies individual score averages. The highest and the lowest score averages in the pre-test and post-test are the following.

For undergraduate students, the figure shows that the strategy 24 (Perceive when I do not understand what I read, then I stop and reread) has the highest score average in the pre-test and post-test (3.8 and 3.7 respectively). The strategy 48 (Ask someone to go over the material) has the lowest score average in the pre-test and post-test (1.9).

For graduate students, the figure shows that the strategy 26 (Separate all the material needed for the task that you will perform) has the highest score average in the pre-test (3.8), and the strategies 22 (Stay calm when faced with difficult tasks) and 29 (Check your mistakes after receiving the grade for a test) have the highest score average in the post-test (3.5). The strategy 48 (Ask someone to go over the material) has the lowest score average in the pre-test and post-test (1.6 and 1.5 respectively).

For specialization students, the figure shows that the strategy 17 (Review the notes taken in class) has the highest score average in the pre-test, and the strategy 22 (Stay calm when faced with difficult tasks) has the highest score average in the post-test (3.8 and 3.9 respectively). The strategy 48 (Ask someone to go over the material) has the lowest score average in the pre-test and post-test (1.8 and 1.6 respectively).

For control groups **Figure 16** shows the dysfunctional strategies individual score averages. The highest and the lowest score averages in the pre-test and post-test are the following.

For undergraduate students, the figure shows that the strategy 39 (Study or do homework as I watch TV) has the highest score average in the pre-test and post-test (3.2 and 2.9 respectively). The strategy 37 (Distract yourself or think of

Figure 15: Control Groups Metacognitive Strategies: Pre-Test/Post-Test

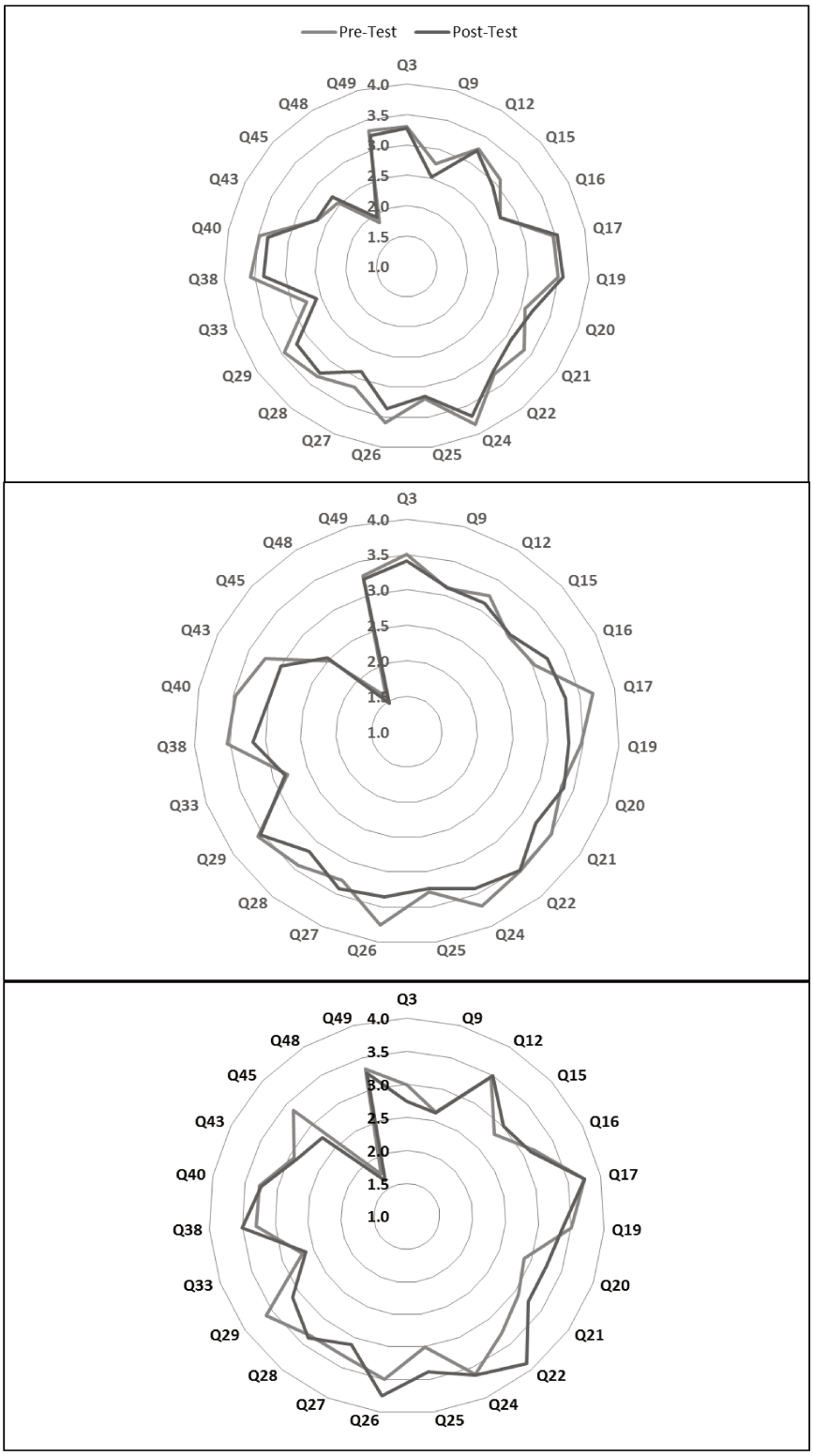
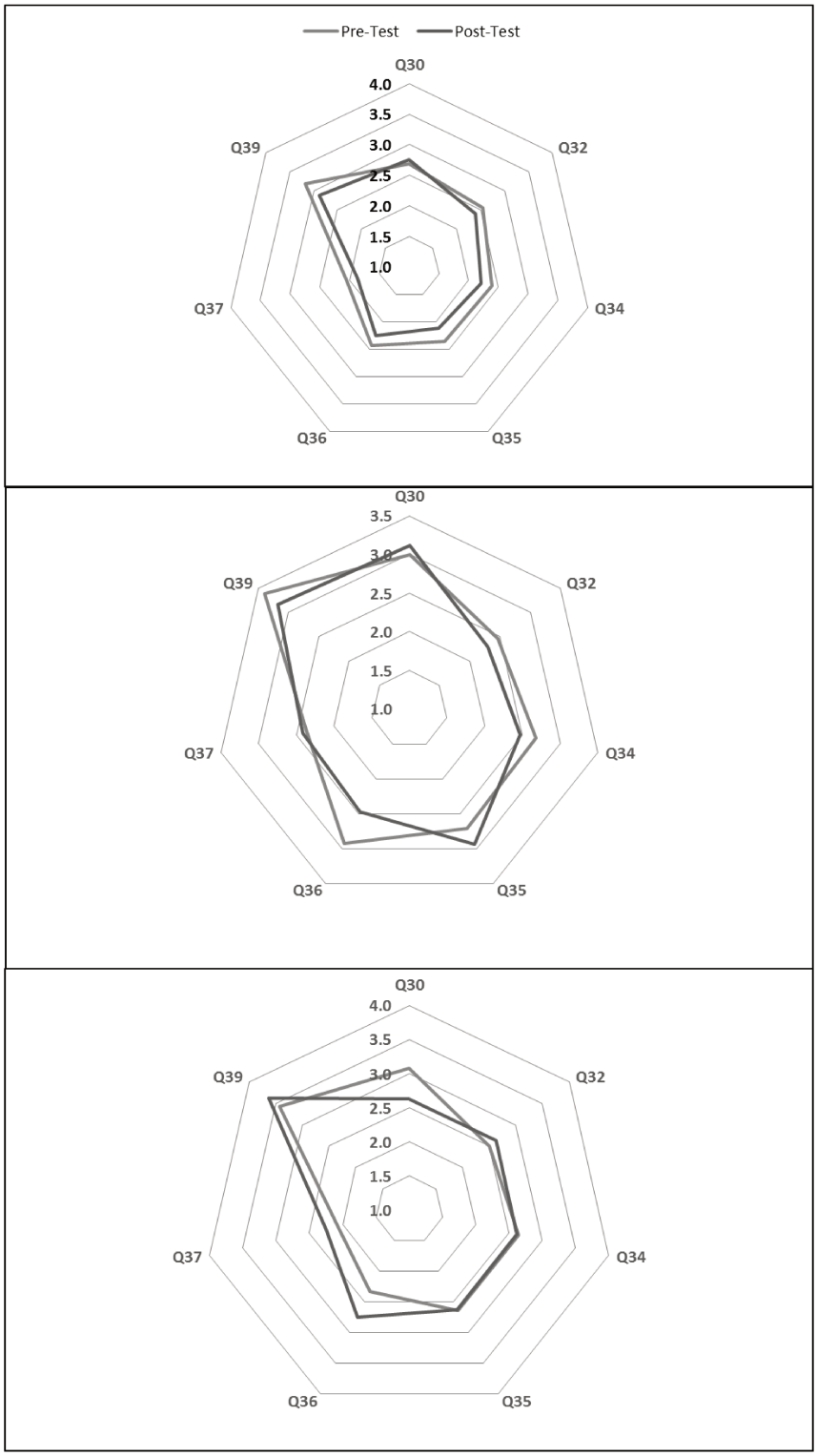


Figure 16: Control Groups Dysfunctional Strategies: Pre-Test/Post-Test



Undergraduate

Graduate

Specialization

something else when reading, studying or doing work) has the lowest score average in the pre-test and post-test (2.0 and 1.9 respectively).

For graduate students, the figure shows that the strategy 39 (Study or do homework as I watch TV) has the highest score average in the pre-test and post-test (3.4 and 3.2 respectively). The strategy 37 (Distract yourself or think of something else when reading, studying or doing work) has the lowest score average in the pre-test and 32 (Get very nervous when I am doing a difficult test) has the lowest score average in the post-test (2.4 and 2.3 respectively).

For specialization students, the figure shows that the strategy 39 (Study or do homework as I watch TV) has the highest score average in the pre-test and post-test (3.4 and 3.6 respectively). The strategy 37 (Distract yourself or think of something else when reading, studying or doing work) has the lowest score average in the pre-test and post-test (2.1 and 2.3 respectively).

For experimental groups, **Figure 17** shows the cognitive strategies individual score averages. The highest and the lowest score averages in the pre-test and post-test are the following.

For undergraduate students, the figure shows that the strategy 41 (Research Internet about my homework) has the highest score average in the pre-test and post-test (3.8 and 3.7 respectively). The strategy 10 (Prepare questions and answers on the subject studied) has the lowest score average in the pre-test and post-test (1.9 and 2.1 respectively).

For graduate students, the figure shows that the strategies 13 (Analyze graphs and tables found in texts) and 41 (Research Internet about my homework) have the highest score average in the pre-test and post-test (3.8 and 3.7 respectively). The strategy 31 (Create questions about the subject you are studying and try to answer them) has the lowest score average in the pre-test and post-test (2.1 and 2.2 respectively). The strategy 47 (Know by heart the subject when it is time for a test) has also the lowest score average in the pre-test and the strategy 10 (Prepare questions and answers on the subject studied) has also the lowest score average in the post-test (2.1 and 2.2 respectively).

For specialization students, the figure shows that the strategy 6 (Make notes in the text or on a separate sheet) has the highest score average in the pre-test and post-test (3.7 and 3.5 respectively). The strategy 41 (Research Internet about my homework) has also the highest score average in the post-test (3.5). The strategy 10 (Prepare questions and answers on the subject studied) has the lowest score average in the pre-test, and the strategy 8 (Read supplementary texts, in addition to those indicated by the teacher) has also the lowest score average in the post-test (2.2 and 2.0 respectively).

For experimental groups **Figure 18** shows the metacognitive strategies individual score averages. The highest and the lowest score averages in the pre-test and post-test are the following.

For undergraduate students, the figure shows that the strategy 24 (Perceive when I do not understand what I read, then I stop and reread) has the highest score average in the pre-test and post-test (3.7 and 3.6 respectively). The strategy 19 (Ask for help from colleagues in case of doubts) has also the highest score average in the post-test (3.6). The strategy 48 (Ask someone to go over the material) has the lowest score average in the pre-test and post-test (2.3 and 2.1 respectively).

For graduate students, the figure shows that the strategy 24 (Perceive when I do not understand what I read, then I stop and reread) has the highest score average in the pre-test and post-test (4.0 and 3.8 respectively). The strategy 48 (Ask someone to go over the material) has the lowest score average in the pre-test and post-test (1.9 and 1.7 respectively).

For specialization students, the figure shows that the strategy 24 (Perceive when I do not understand what I read, then I stop and reread) has the highest score average in the pre-test and post-test (3.8 and 3.6 respectively). The strategies 29 (Check your mistakes after receiving the grade for a test) and 40 (Read your answers again before handing in a test), have also the highest score average in the post-test (3.6). The strategy 48 (Ask someone to go over the material) has the lowest score average in the pre-test and post-test (2.2 and 1.9 respectively).

For experimental groups, **Figure 19** shows the dysfunctional strategies individual score averages. The highest and the lowest score averages in the pre-test and post-test are the following.

For undergraduate students, the figure shows that the strategy 39 (Study or do homework as I watch TV) has the highest score average in the pre-test and post-test (3.1). The strategy 37 (Distract yourself or think of something else when reading, studying or doing work) has the lowest score average in the pre-test and post-test (2.1 and 1.9 respectively).

For graduate students, the figure shows that the strategy 39 (Study or do homework as I watch TV) has the highest score average in the pre-test. The strategy 30 (Listen to music as I study or do homework) has the highest score average in the post-test (3.6 and 3.3 respectively). The strategy 37 (Distract yourself or think of something else when reading, studying or doing work) has the lowest score average in the pre-test and post-test (2.1 and 1.9 respectively).

For specialization students, the figure shows that the strategy 39 (Study or do homework as I watch TV) has the highest score average in the pre-test and post-test (3.6 and 3.3 respectively). The strategy 37 (Distract yourself or think of something else when reading, studying or doing work) has the lowest score average in the pre-test and post-test (2.3 and 2.2 respectively).

Figure 17: Experimental Groups Cognitive Strategies: Pre-Test/Post-Test

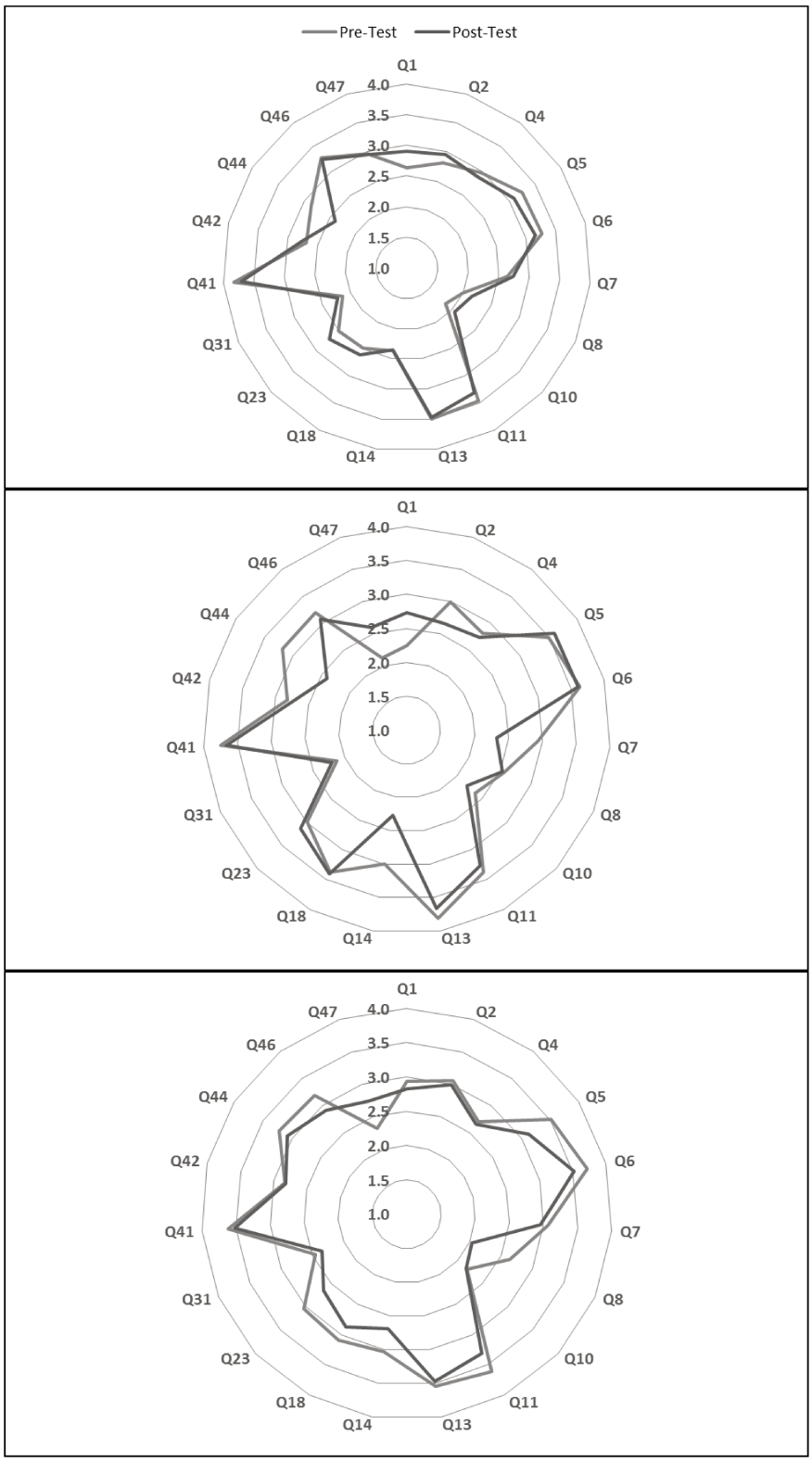


Figure 18: Experimental Groups Metacognitive Strategies: Pre-Test/Post-Test

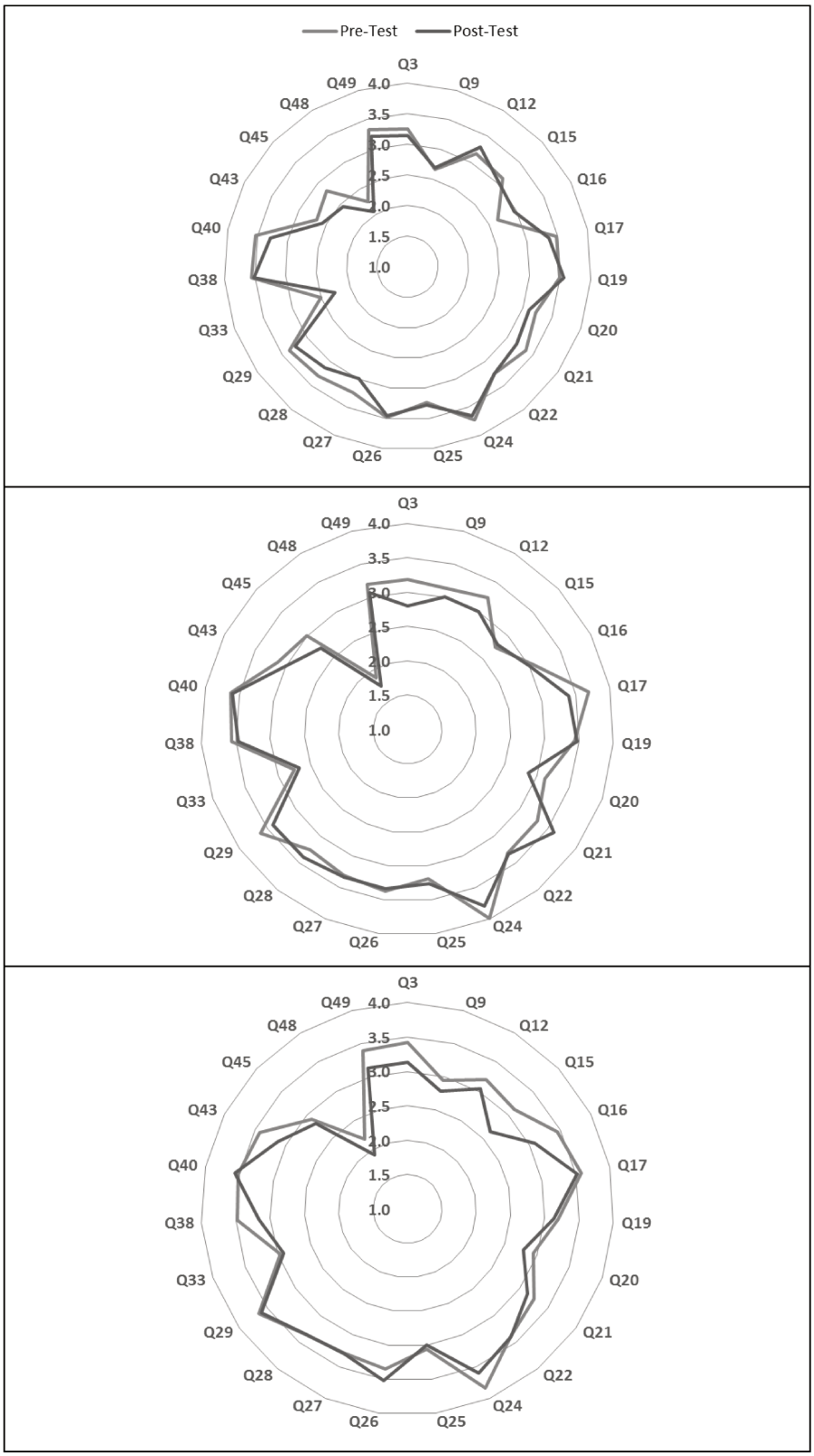
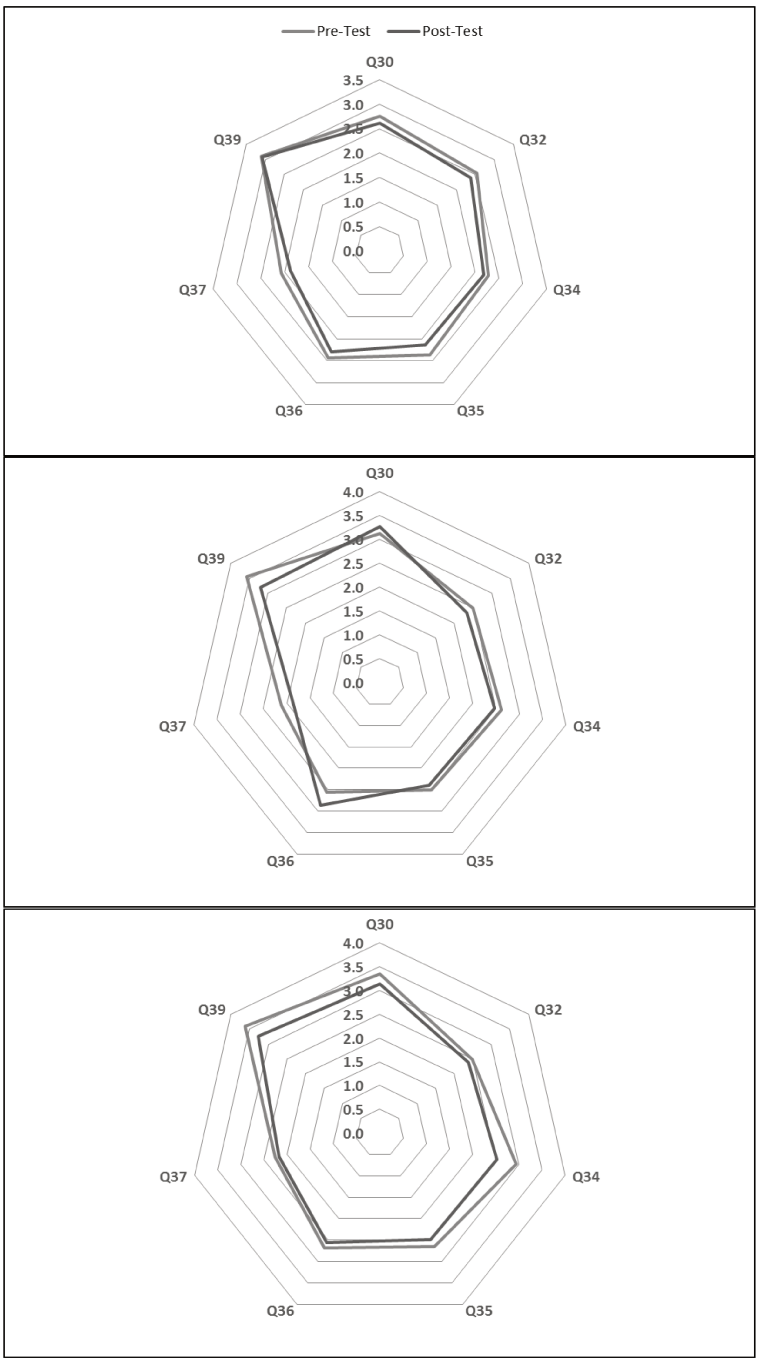


Figure 19: Experimental Groups Dysfunctional Strategies: Pre-Test/Post-Test



g) Score Averages Achieved by the Students

The score averages achieved by the students of both control and Experimental Groups, in the pre-test and post-test, considering all types of strategies, and the maximum possible score for each strategy ant the total, are in **Table 12**.

Table 12: Scores Averages Achieved by the Students

Group	Strategy	Course	Pre-Test	Post-Test	Max. Possible Score Average
CONTROL	Cognitive	Under.	53.90	55.36	76
		Grad.	57.46	56.29	
		Spec.	54.64	52.75	
	Metacog.	Under.	72.53	70.67	92
		Grad.	74.71	71.94	
		Spec.	72.57	72.75	
	Dysfunct.	Under.	17.63	16.48	28
		Grad.	19.54	18.88	
		Spec.	18.68	19.13	
	TOTAL	Under.	144.1	142.5	196
		Grad.	151.7	147.1	
		Spec.	145.9	144.6	
EXPERIM.	Cognitive	Under.	53.53	53.68	76
		Grad.	56.81	54.80	
		Spec.	57.81	54.74	
	Metacog.	Under.	72.72	70.63	92
		Grad.	74.13	72.07	
		Spec.	74.90	71.70	
	Dysfunct.	Under.	17.55	16.55	28
		Grad.	19.00	18.40	
		Spec.	19.97	18.52	
	TOTAL	Under.	143.8	140.9	196
		Grad.	149.9	145.3	
		Spec.	152.7	145.0	

Note. Max.=Maximum; Under.=Undergraduate; Grad.=Graduate; Spec.=Specialization; Metacog.=Metacognitive; Dysfunct.=Dysfunctional

The score averages achieved by the students are much lower than the maximum possible. One can observe that the undergraduate students have the lowest score averages in all strategies, in the pre-test and post-test, from both control and experimental groups. The only exception is with the cognitive strategies score, in the

post-test, for the control groups, where the undergraduate students have a score average (55.36) higher than the specialization students (52.75).

h) Cross-Reference among Groups x Strategies

The following tables show the cross-reference among groups (control and experimental) and the chosen strategies in each course (cognitive and metacognitive); **Table 13** for undergraduate, **Table 14** for graduate, and **Table 15** for specialization students. The score average shown in the tables are the averages of the achieved scores in the pre-test and post-test, considering the scores greater or equal to three. The figures lie between sometimes (score 3) and always (score 4), according to the Likert scale measurement. These strategies are called in this text as the students' preferred strategies. The achieved scores are shown in crescent order.

Table 13 shows that the undergraduate students preferred the most the cognitive 41 (Research Internet about my homework), score 3.7/3.8 (control and experimental), and the metacognitive 24 (Perceive when I do not understand what I read, then I stop and reread), score 3.8/3.7 (control and experimental).

Table 14 shows that the graduate students preferred the most the cognitive 41 (Research Internet about my homework), score 3.7 (control and experimental), and the metacognitive 24 (Perceive when I do not understand what I read, then I stop and reread), score 3.5/3.9 (control and experimental).

Table 15 shows that the specialization students preferred the most the cognitive 41 (Research Internet about my homework), score 3.7/3.6 (control and experimental), the cognitive 6 (Make notes in the text or on a separate sheet), score 3.7/3.6 (control experimental), and the metacognitive 17 (Review the notes taken in class), score 3.8/3.6 (control and experimental), and the metacognitive 24 (Perceive when I do not understand what I read, then I stop and reread), score 3.6/3.7 (control and experimental).

Table 13: Undergraduate Cross-Reference: Groups x Strategy Types

UNDERGRADUATE						
Strat.	Q	Control	Score	Q	Experimental	Score
Cog	2	Write down in full the explanations of the teacher.	3.1	5	Read the texts indicated by the teacher.	3.2
	47	Know by heart the subject when it is time for a test.	3.1	6	Make notes in the text or on a separate sheet.	3.2
	46	Discuss the matter with colleagues to see whether you unders	3.3	46	Discuss the matter with colleagues to see whether you unders	3.3
	11	Select the main ideas of the text.	3.3	11	Select the main ideas of the text.	3.4
	5	Read the texts indicated by the teacher.	3.3	13	Analyze graphs and tables found in texts.	3.5
	6	Make notes in the text or on a separate sheet.	3.4	41	Research Internet about my homework.	3.8
	13	Analyze graphs and tables found in texts.	3.6			
	41	Research Internet about my homework.	3.7			
Metac	20	Manage your study time.	3.1	15	Identify how much or how little you are learning.	3.1
	25	Plan your study activities.	3.2	20	Manage your study time.	3.2
	21	Organize your study environment.	3.2	3	Identify your difficulties to learn certain topics or subjects.	3.2
	12	Control your anxiety in evaluation situations.	3.2	28	Stop during the reading to self-evaluate.	3.2
	22	Stay calm when faced with difficult tasks.	3.3	12	Control your anxiety in evaluation situations.	3.2
	49	Reread the material to understand it better.	3.3	22	Stay calm when faced with difficult tasks.	3.2
	3	Identify your difficulties to learn certain topics or subjects.	3.3	25	Plan your study activities.	3.3
	28	Stop during the reading to self-evaluate.	3.3	21	Organize your study environment.	3.3
	29	Check your mistakes after receiving the grade for a test.	3.3	49	Reread the material to understand it better.	3.3
	40	Read your answers again before handing in a test.	3.4	29	Check your mistakes after receiving the grade for a test.	3.3
	38	Perceive when I do not understand what I read.	3.5	40	Read your answers again before handing in a test.	3.4
	26	Separate all the material needed for the task that you will perfo	3.5	17	Review the notes taken in class.	3.4
	17	Review the notes taken in class.	3.5	26	Separate all the material needed for the task that you will perfo	3.5
	19	Ask for help from colleagues in case of doubts.	3.5	19	Ask for help from colleagues in case of doubts.	3.5
	24	Perceive when I do not understand what I read, then I stop and	3.8	38	Perceive when I do not understand what I read.	3.5
				24	Perceive when I do not understand what I read, then I stop and	3.7

Table 14: Graduate Cross-Reference: Groups x Strategy Types

GRADUATE						
Strat.	Q	Control	Scor	Q	Experimental	Scor
Cog	2	Write down in full the explanations of the teacher.	3.2	23	Use other texts and books on the subject.	3.1
	23	Use other texts and books on the subject.	3.3	46	Discuss the matter with colleagues to see whether you unders	3.1
	18	Search the dictionary for the meanings of unfamiliar words.	3.4	11	Select the main ideas of the text.	3.3
	11	Select the main ideas of the text.	3.4	18	Search the dictionary for the meanings of unfamiliar words.	3.4
	13	Analyze graphs and tables found in texts.	3.4	5	Read the texts indicated by the teacher.	3.6
	6	Make notes in the text or on a separate sheet.	3.5	6	Make notes in the text or on a separate sheet.	3.6
	5	Read the texts indicated by the teacher.	3.5	41	Research Internet about my homework.	3.7
	41	Research Internet about my homework.	3.7	13	Analyze graphs and tables found in texts.	3.7
Metac	9	Self-motivate for the reading and study activities.	3.1	16	Request help from the teacher regarding doubts about the con	3.0
	43	Note on the agenda things that you have to do.	3.1	9	Self-motivate for the reading and study activities.	3.1
	16	Request help from the teacher regarding doubts about the con	3.1	43	Note on the agenda things that you have to do.	3.1
	12	Control your anxiety in evaluation situations.	3.2	12	Control your anxiety in evaluation situations.	3.1
	40	Read your answers again before handing in a test.	3.2	49	Reread the material to understand it better.	3.1
	25	Plan your study activities.	3.3	25	Plan your study activities.	3.2
	49	Reread the material to understand it better.	3.3	22	Stay calm when faced with difficult tasks.	3.3
	28	Stop during the reading to self-evaluate.	3.3	27	Manage to complete a task even when it is difficult and tedious	3.3
	20	Manage your study time.	3.3	28	Stop during the reading to self-evaluate.	3.3
	27	Manage to complete a task even when it is difficult and tedious	3.3	26	Separate all the material needed for the task that you will perfo	3.4
	38	Perceive when I do not understand what I read.	3.4	19	Ask for help from colleagues in case of doubts.	3.5
	21	Organize your study environment.	3.4	21	Organize your study environment.	3.5
	19	Ask for help from colleagues in case of doubts.	3.4	29	Check your mistakes after receiving the grade for a test.	3.5
	3	Identify your difficulties to learn certain topics or subjects.	3.5	38	Perceive when I do not understand what I read.	3.5
	17	Review the notes taken in class.	3.5	17	Review the notes taken in class.	3.5
	22	Stay calm when faced with difficult tasks.	3.5	40	Read your answers again before handing in a test.	3.6
	24	Perceive when I do not understand what I read, then I stop and	3.5	24	Perceive when I do not understand what I read, then I stop and	3.9
	29	Check your mistakes after receiving the grade for a test.	3.6			
	26	Separate all the material needed for the task that you will perfo	3.6			

Table 15: Specialization Cross-Reference: Groups x Strategy Types

SPECIALIZATION						
Strat.	Q	**Control**	Scor	Q	**Experimental**	Scor
Cog	11	Select the main ideas of the text.	3.3	2	Write down in full the explanations of the teacher.	3.0
	13	Analyze graphs and tables found in texts.	3.3	44	Make a scheme on the paper (sketch, graph or drawing) to bet	3.2
	46	Discuss the matter with colleagues to see whether you unders	3.4	5	Read the texts indicated by the teacher.	3.3
	6	Make notes in the text or on a separate sheet.	3.7	11	Select the main ideas of the text.	3.5
	41	Research Internet about my homework.	3.7	13	Analyze graphs and tables found in texts.	3.5
				41	Research Internet about my homework.	3.6
				6	Make notes in the text or on a separate sheet.	3.6
Metac	16	Request help from the teacher regarding doubts about the con	3.2	25	Plan your study activities.	3.0
	21	Organize your study environment.	3.2	12	Control your anxiety in evaluation situations.	3.1
	25	Plan your study activities.	3.2	19	Ask for help from colleagues in case of doubts.	3.2
	27	Manage to complete a task even when it is difficult and tedious	3.2	21	Organize your study environment.	3.2
	40	Read your answers again before handing in a test.	3.3	49	Reread the material to understand it better.	3.3
	49	Reread the material to understand it better.	3.3	16	Request help from the teacher regarding doubts about the con	3.3
	28	Stop during the reading to self-evaluate.	3.3	3	Identify your difficulties to learn certain topics or subjects.	3.3
	29	Check your mistakes after receiving the grade for a test.	3.4	43	Note on the agenda things that you have to do.	3.3
	38	Perceive when I do not understand what I read.	3.4	27	Manage to complete a task even when it is difficult and tedious	3.3
	19	Ask for help from colleagues in case of doubts.	3.4	38	Perceive when I do not understand what I read.	3.3
	12	Control your anxiety in evaluation situations.	3.5	28	Stop during the reading to self-evaluate.	3.4
	22	Stay calm when faced with difficult tasks.	3.6	22	Stay calm when faced with difficult tasks.	3.4
	24	Perceive when I do not understand what I read, then I stop and	3.6	26	Separate all the material needed for the task that you will perfo	3.4
	26	Separate all the material needed for the task that you will perfo	3.6	40	Read your answers again before handing in a test.	3.5
	17	Review the notes taken in class.	3.8	17	Review the notes taken in class.	3.6
				29	Check your mistakes after receiving the grade for a test.	3.6
				24	Perceive when I do not understand what I read, then I stop and	3.7

Table 16 and **Table 17** show the cross-reference among the courses (undergraduate, graduate and specialization) versus the chosen strategies in each group (control and experimental).

Table 16 shows that all courses, undergraduate, graduate and specialization students preferred the most the cognitive 41 (Research Internet about my homework), score 3.7. As for metacognitive strategies, the undergraduate students preferred the most the strategy 24 (Perceive when I do not understand what I read, then I stop and reread), with score 3.8 (undergraduate), score 3.5 (graduate) and score 3.6 (specialization). The specialization students preferred the most the strategy 17 (Review the notes taken in class), score 3.8.

Table 17 shows that all courses, undergraduate, graduate and specialization students preferred the most the cognitive 41 (Research Internet about my homework), with respective scores 3.8, 3.7 and 3.6. As for metacognitive strategies, all courses, undergraduate, graduate and specialization students preferred the most the cognitive 24 (Perceive when I do not understand what I read, then I stop and reread), with respective scores of 3.7, 3.9 and 3.7.

Table 16: Control Groups Cross Reference: Courses x Strategy Types

CONTROL									
	Undergraduate			Graduate			Specialization		
Strat.	#	Question	Scor	#	Question	Sc	#	Question	Sc
Cog	2	Write down in full the explanations of the teacher.	3.1	2	Write down in full the explanations of the teacher.	3.2	11	Select the main ideas of the text.	3.3
	47	Know by heart the subject when it is time for a test.	3.1	23	Use other texts and books on the subject.	3.3	13	Analyze graphs and tables found in texts.	3.3
	46	Discuss the matter with colleagues to see whether you unders	3.3	18	Search the dictionary for the meanings of unfamiliar words.	3.4	46	Discuss the matter with colleagues to see whether you unders	3.4
	11	Select the main ideas of the text.	3.3	11	Select the main ideas of the text.	3.4	6	Make notes in the text or on a separate sheet.	3.7
	5	Read the texts indicated by the teacher.	3.3	13	Analyze graphs and tables found in texts.	3.4	41	Research Internet about my homework.	3.7
	6	Make notes in the text or on a separate sheet.	3.4	6	Make notes in the text or on a separate sheet.	3.5			
	13	Analyze graphs and tables found in texts.	3.6	5	Read the texts indicated by the teacher.	3.5			
	41	Research Internet about my homework.	3.7	41	Research Internet about my homework.	3.7			
Metac.	20	Manage your study time.	3.1	9	Self-motivate for the reading and study activities.	3.1	16	Request help from the teacher regarding doubts about the con	3.2
	25	Plan your study activities.	3.2	43	Note on the agenda things that you have to do.	3.1	21	Organize your study environment.	3.2
	21	Organize your study environment.	3.2	16	Request help from the teacher regarding doubts about the con	3.1	25	Plan your study activities.	3.2
	12	Control your anxiety in evaluation situations.	3.2	12	Control your anxiety in evaluation situations.	3.2	27	Manage to complete a task even when it is difficult and tedious	3.2
	22	Stay calm when faced with difficult tasks.	3.3	40	Read your answers again before handing in a test.	3.2	40	Read your answers again before handing in a test.	3.3
	49	Reread the material to understand it better.	3.3	25	Plan your study activities.	3.3	49	Reread the material to understand it better.	3.3
	3	Identify your difficulties to learn certain topics or subjects.	3.3	49	Reread the material to understand it better.	3.3	28	Stop during the reading to self-evaluate.	3.3
	28	Stop during the reading to self-evaluate.	3.3	28	Stop during the reading to self-evaluate.	3.3	29	Check your mistakes after receiving the grade for a test.	3.4
	29	Check your mistakes after receiving the grade for a test.	3.3	20	Manage your study time.	3.3	38	Perceive when I do not understand what I read.	3.4
	40	Read your answers again before handing in a test.	3.4	27	Manage to complete a task even when it is difficult and tedious	3.3	19	Ask for help from colleagues in case of doubts.	3.4
	38	Perceive when I do not understand what I read.	3.5	38	Perceive when I do not understand what I read.	3.4	12	Control your anxiety in evaluation situations.	3.5
	26	Separate all the material needed for the task that you will perfo	3.5	21	Organize your study environment.	3.4	22	Stay calm when faced with difficult tasks.	3.6
	17	Review the notes taken in class.	3.5	19	Ask for help from colleagues in case of doubts.	3.4	24	Perceive when I do not understand what I read, then I stop and	3.6
	19	Ask for help from colleagues in case of doubts.	3.5	3	Identify your difficulties to learn certain topics or subjects.	3.5	26	Separate all the material needed for the task that you will perfo	3.6
	24	Perceive when I do not understand what I read, then I stop and	3.8	17	Review the notes taken in class.	3.5	17	Review the notes taken in class.	3.8
				22	Stay calm when faced with difficult tasks.	3.5			
				24	Perceive when I do not understand what I read, then I stop and	3.5			
				29	Check your mistakes after receiving the grade for a test.	3.6			
				26	Separate all the material needed for the task that you will perfo	3.6			

Table 17: Experimental Groups Cross Reference: Courses x Strategy Types

EXPERIMENTAL									
	Undergraduate			Graduate			Specialization		
Strat.	#	Question	Sco	#	Question	Sc	#	Question	Sc
Cog	5	Read the texts indicated by the teacher.	3.2	23	Use other texts and books on the subject.	3.1	2	Write down in full the explanations of the teacher.	3.0
	6	Make notes in the text or on a separate sheet.	3.2	46	Discuss the matter with colleagues to see whether you unders	3.1	44	Make a scheme on the paper (sketch, graph or drawing) to bet	3.2
	46	Discuss the matter with colleagues to see whether you unders	3.3	11	Select the main ideas of the text.	3.3	5	Read the texts indicated by the teacher.	3.3
	11	Select the main ideas of the text.	3.4	18	Search the dictionary for the meanings of unfamiliar words.	3.4	11	Select the main ideas of the text.	3.5
	13	Analyze graphs and tables found in texts.	3.5	5	Read the texts indicated by the teacher.	3.6	13	Analyze graphs and tables found in texts.	3.5
	41	Research Internet about my homework.	3.8	6	Make notes in the text or on a separate sheet.	3.6	41	Research Internet about my homework.	3.6
				41	Research Internet about my homework.	3.7	6	Make notes in the text or on a separate sheet.	3.6
				13	Analyze graphs and tables found in texts.	3.7			
Metac.	15	Identify how much or how little you are learning.	3.1	16	Request help from the teacher regarding doubts about the con	3.0	25	Plan your study activities.	3.0
	20	Manage your study time.	3.2	9	Self-motivate for the reading and study activities.	3.1	12	Control your anxiety in evaluation situations.	3.1
	3	Identify your difficulties to learn certain topics or subjects.	3.2	43	Note on the agenda things that you have to do.	3.1	19	Ask for help from colleagues in case of doubts.	3.2
	28	Stop during the reading to self-evaluate.	3.2	12	Control your anxiety in evaluation situations.	3.1	21	Organize your study environment.	3.2
	12	Control your anxiety in evaluation situations.	3.2	49	Reread the material to understand it better.	3.1	49	Reread the material to understand it better.	3.3
	22	Stay calm when faced with difficult tasks.	3.2	25	Plan your study activities.	3.2	16	Request help from the teacher regarding doubts about the con	3.3
	25	Plan your study activities.	3.3	22	Stay calm when faced with difficult tasks.	3.3	3	Identify your difficulties to learn certain topics or subjects.	3.3
	21	Organize your study environment.	3.3	27	Manage to complete a task even when it is difficult and tedious	3.3	43	Note on the agenda things that you have to do.	3.3
	49	Reread the material to understand it better.	3.3	28	Stop during the reading to self-evaluate.	3.3	27	Manage to complete a task even when it is difficult and tedious	3.3
	29	Check your mistakes after receiving the grade for a test.	3.3	26	Separate all the material needed for the task that you will perfo	3.4	38	Perceive when I do not understand what I read.	3.3
	40	Read your answers again before handing in a test.	3.4	19	Ask for help from colleagues in case of doubts.	3.5	28	Stop during the reading to self-evaluate.	3.4
	17	Review the notes taken in class.	3.4	21	Organize your study environment.	3.5	22	Stay calm when faced with difficult tasks.	3.4
	26	Separate all the material needed for the task that you will perfo	3.5	29	Check your mistakes after receiving the grade for a test.	3.5	26	Separate all the material needed for the task that you will perfo	3.4
	19	Ask for help from colleagues in case of doubts.	3.5	38	Perceive when I do not understand what I read.	3.5	40	Read your answers again before handing in a test.	3.5
	38	Perceive when I do not understand what I read.	3.5	17	Review the notes taken in class.	3.5	17	Review the notes taken in class.	3.6
	24	Perceive when I do not understand what I read, then I stop and	3.7	40	Read your answers again before handing in a test.	3.6	29	Check your mistakes after receiving the grade for a test.	3.6
				24	Perceive when I do not understand what I read, then I stop and	3.9	24	Perceive when I do not understand what I read, then I stop and	3.7

The following paragraphs show the student's preference among the seven dysfunctional metacognitive strategies of the scale.

It is important to remember that the scores measured in dysfunctional strategies are in an inverted order, so the higher the score the least used the strategy is.

The following **Table 18** shows the cross-reference among groups (control and experimental) and the dysfunctional strategies for all courses, undergraduate, graduate, and specialization students.) The score average shown in the tables are the averages of the achieved scores in the pre-test and post-test.

The undergraduate students in both groups, control and experimental, preferred all dysfunctional strategies, with similar scores varying from 2.0 to 3.1 in the same order of the most preferred to the least preferred. The most used is 37 (Distract yourself or think of something else when reading, studying or doing work), score 2.0 for both groups. The least used are the strategies 30 (Listen to music as I study or do homework) and 39 (Study or do homework as I watch TV) with scores of 2.7 and 3.0 for control groups and 2.7 and 3.1 for experimental groups. The graduate students preferred the most the strategies 37 (Distract yourself or think of something else when reading, studying or doing work) and 32 (Get very nervous when I am doing a difficult test) with scores 2.4, 2.4 for control groups and 2.0, 2.4 for experimental groups. The same table shows that they preferred the least the strategies 30 (Listen to music as I study or do homework) and 39 (Study or do homework as I watch TV) with scores of 3.1 and 3.3 for control groups and 3.2 and 3.4 for experimental groups. The specialization students preferred the most the strategies 37 (Distract yourself or think of something else when reading, studying or doing work), scores 2.2 for both groups, control and experimental. The same table shows that they preferred the least the strategies 30 (Listen to music as I study or do homework) and 39 (Study or do homework as I watch TV) with scores 2.8 and 3.5 for control groups and 3.2 and 3.4 for experimental groups.

Table 18: Cross-Reference: Groups x Dysfunctional Strategies

UNDERGRADUATE					
Q	Control	Score	Q	Experimental	Score
37	Distract yourself or think of something else when reading, studyin	2.0	37	Distract yourself or think of something else when reading, studyin	2.0
35	Eat as I study or do my homework	2.2	34	Get standing all the time as I study	2.2
34	Get standing all the time as I study	2.3	35	Eat as I study or do my homework	2.3
36	Forget to do tasks the teachers asked me to do.	2.3	36	Forget to do tasks the teachers asked me to do.	2.4
32	Get very nervous when I am doing a difficult test	2.5	32	Get very nervous when I am doing a difficult test	2.5
30	Listen to music as I study or do homework	2.7	30	Listen to music as I study or do homework	2.7
39	Study or do homework as I watch TV	3.0	39	Study or do homework as I watch TV	3.1

GRADUATE					
Q	Control	Score	Q	Experimental	Score
32	Get very nervous when I am doing a difficult test	2.4	37	Distract yourself or think of something else when reading, studyin	2.0
37	Distract yourself or think of something else when reading, studyin	2.4	32	Get very nervous when I am doing a difficult test	2.4
34	Get standing all the time as I study	2.6	35	Eat as I study or do my homework	2.5
36	Forget to do tasks the teachers asked me to do.	2.7	34	Get standing all the time as I study	2.5
35	Eat as I study or do my homework	2.8	36	Forget to do tasks the teachers asked me to do.	2.7
30	Listen to music as I study or do homework	3.1	30	Listen to music as I study or do homework	3.2
39	Study or do homework as I watch TV	3.3	39	Study or do homework as I watch TV	3.4

SPECIALIZATION					
Q	Control	Score	Q	Experimental	Score
37	Distract yourself or think of something else when reading, studyin	2.2	37	Distract yourself or think of something else when reading, studyin	2.2
36	Forget to do tasks the teachers asked me to do.	2.5	32	Get very nervous when I am doing a difficult test	2.4
32	Get very nervous when I am doing a difficult test	2.6	35	Eat as I study or do my homework	2.6
34	Get standing all the time as I study	2.6	36	Forget to do tasks the teachers asked me to do.	2.6
35	Eat as I study or do my homework	2.6	34	Get standing all the time as I study	2.7
30	Listen to music as I study or do homework	2.8	30	Listen to music as I study or do homework	3.2
39	Study or do homework as I watch TV	3.5	39	Study or do homework as I watch TV	3.4

Table 19 shows the cross-reference among the courses (undergraduate, graduate and specialization) with the dysfunctional strategies in both groups, control and experimental. The score average shown in the tables are the averages of the achieved scores in the pre-test and post-test.

One can see in both groups, control and experimental, that strategy 37 (Distract yourself or think of something else when reading, studying or doing work) is the most used among all courses, undergraduate, graduate and specialization, with respective scores of 2.0, 2.4 and 2.2 for control and 2.0, 2.0 and 2.2 for experimental groups. In the opposite way, the strategy 39 (Study or do homework as I watch TV) is the least used by the all courses students in both control and experimental groups. The respective scores are 3.0, 3.3 and 3.5 for control groups and 3.1, 3.4 and 3.4 for experimental groups.

Table 19: Cross-Reference: Courses x Dysfunctional Strategies

CONTROL								
Undergraduate			Graduate			Specialization		
#	Question	Scor	#	Question	Score	#	Question	Sco
37	Distract yourself or think of something else when reading, studyi	2.0	32	Get very nervous when I am doing a difficult test	2.4	37	Distract yourself or think of something else when reading, studyi	2.2
35	Eat as I study or do my homework	2.2	37	Distract yourself or think of something else when reading, studyi	2.4	36	Forget to do tasks the teachers asked me to do.	2.5
34	Get standing all the time as I study	2.3	34	Get standing all the time as I study	2.6	32	Get very nervous when I am doing a difficult test	2.6
36	Forget to do tasks the teachers asked me to do.	2.3	36	Forget to do tasks the teachers asked me to do.	2.7	34	Get standing all the time as I study	2.6
32	Get very nervous when I am doing a difficult test	2.5	35	Eat as I study or do my homework	2.83	35	Eat as I study or do my homework	2.6
30	Listen to music as I study or do homework	2.7	30	Listen to music as I study or do homework	3.1	30	Listen to music as I study or do homework	2.8
39	Study or do homework as I watch TV	3.0	39	Study or do homework as I watch TV	3.3	39	Study or do homework as I watch TV	3.5

EXPERIMENTAL								
Undergraduate			Graduate			Specialization		
#	Question	Scor	#	Question	Score	#	Question	Sco
37	Distract yourself or think of something else when reading, studyi	2.0	37	Distract yourself or think of something else when reading, studyi	2.0	37	Distract yourself or think of something else when reading, studyi	2.2
34	Get standing all the time as I study	2.2	32	Get very nervous when I am doing a difficult test	2.4	32	Get very nervous when I am doing a difficult test	2.4
35	Eat as I study or do my homework	2.3	35	Eat as I study or do my homework	2.5	35	Eat as I study or do my homework	2.6
36	Forget to do tasks the teachers asked me to do.	2.4	34	Get standing all the time as I study	2.5	36	Forget to do tasks the teachers asked me to do.	2.6
32	Get very nervous when I am doing a difficult test	2.5	36	Forget to do tasks the teachers asked me to do.	2.7	34	Get standing all the time as I study	2.7
30	Listen to music as I study or do homework	2.7	30	Listen to music as I study or do homework	3.2	30	Listen to music as I study or do homework	3.2
39	Study or do homework as I watch TV	3.1	39	Study or do homework as I watch TV	3.4	39	Study or do homework as I watch TV	3.4

4.2. Study 2

a) Socio-Demographic Characterization

There were 58 students from the “Transport Economics” discipline involved in the “Guided Notes using mind map” learning strategy, 60 % being male; 98% single; 40% have been studying civil engineering for 3 years, 50% for 4 years and the others for more than 4 years; and the average age is 22.

b) Focus Group Meeting

A total of 11 students from the same discipline attended the Focus Group meeting.

The analyses of the discussions in the Focus Group meeting were categorized in the following:

- Category a: “Strategies and ways used by the students to study”
  Questions related: 1, 2, 3, 7, 13 and 14

Summary of these discussions:

Most of the students preferred to study doing exercises. They studied the disciplines in different ways and this depended partly on the subject and partly on the behavior of the teacher. If the teacher was not demanding, they did not endeavor to study. As the time available was little, they have to prioritize and study those disciplines they feel more difficulties.

It is common for most of the students not to take notes in class. They borrowed their classmates’ notes to photocopy them or took pictures of the notes with their mobiles. They paid attention to the classes if they were interesting. Some of the students preferred classes that were more practical. Some students said that the teacher makes the difference in the classrooms and can transform a boring class into a motivating one.

They stated that they have too many evaluations. They said that they had a media group in Facebook sharing ideas and doubts of school, and a whatsApp group for general talking. They said that blog is not common anymore.

- Category b: “Knowledge of strategies to study”
  Questions related: 4, 9 and 10

  Summary of these discussions:

Nobody has ever heard anybody talk about different ways to study. The exceptions were a few students who had already had an exchange experience abroad. They did not use mind map in the class, because many of them did not know how to use it. Some of the students created their own map.

- Category c: “Duration of classes”
  Questions related: 8

  Summary of these discussions:

Some of the students preferred a 3-hour class and some a 1-hour class. Some stated that they could have more contact with the class if it lasted 3 hours. Some said this would be too long. Some said that a 1.5-hour class could be the ideal.

- Category d: “Mind Map Usage”
  Questions related: 11, 12

  Summary of these discussions:

No students sought for help from the teacher explaining they did not understand the use of the mind map in classes. All students said that they should create their own maps. They did not like to have received the “Guided Notes using mind map” for this came already with some notes trying to guide them for the others. Almost everyone said that the mind map did not make any difference in their learning. They said that it would be necessary more explanation about this strategy and then maybe they could be motivated to use it.

- Category e: “Give Feedback to Teachers”
  Questions related: 5, 6

  Summary of these discussions:

No students gave feedback to teachers. Most of the students said that it was very difficult to give feedback because they were not sure that they would accept it. They preferred to complain in the general assessment at the end of the term, about the classes and teachers. Some students said this was not possible when the class has 80 students. If the classroom had 15 or 20 students, this could be possible. They said that a few teachers asked the students’ opinions at the end of the term.

c) Focus Group Meeting Evaluation

A short time after the Focus Group meeting was held (1 week), the participants were asked to evaluate it. The researcher handed out some forms with the following notes:

> “Por favor, escrever suas críticas sobre a nossa Reunião GRUPO FOCAL da última quinta-feira.
>
> Escreva sua opinião, do que gostou e do que não gostou, sobre:
>
> motivo da reunião, local, ambiente, perguntas feitas na reunião, qualidade do lanche, horário, explicações, motivação, etc. onde poderia melhorar…
>
> Este é um momento para o seu feedback para nós podermos melhorar nas próximas reuniões.
>
> ***Gostei disso, não gostei daquilo, poderia melhorar isso, não precisava daquilo, …***
>
> Não se identifique”

These were the answers:

- “The environment was soft allowing the discussion; the local was appropriate; the snack had a very good quality; I liked the objective of the meeting with very interesting questions; I liked very much the points brought into the meeting. I think that there should be similar meetings within our faculty covering teaching methodologies, and lectures showing different teaching-learning techniques”.

- “The objective of the meeting was very relevant. The time for the meeting was good for me, as well as the place and the snack. As for the questions, I found them very interesting and instigating and made me reflect about my actions. As for the day and time, it could be held on Thursdays afternoon at a time when the students had no class. I enjoyed the meeting a lot and I suggest it to be held more frequently with the representative of each class/year”.

- “I found the research and the way the meeting was held very interesting; questions and answers; but it was not clear for me the final objective”.

- “The place was warm, the windows closed and besides these facts, the rest was ideal for the meeting”.

- “Some questions were ambiguous and similar, but many of them were very interesting and the discussion made me reflect a lot”.

- “As it was close to lunchtime, I decided not to eat the snack; so I cannot give my opinion about the quality of the snack”.

- “I got very much motivated with the study methods, which I did not know”.

- “An issue that could be improved for the next meetings is the time; it should be earlier; midday is late for me”.

- “I found this focus group meeting very interesting. After this meeting, I started using mind map to study and checking other ways to study”.

- “The objective was very interesting for little is discussed about study methods. The local and time were appropriate as well as the environment. We could talk openly about our opinions. I believe that the questions were appropriate for the objective. As for the quality of the snack, it was not very good, but this was not the objective. I believe that the group could be bigger. I believe that the group diverted the discussion from the objective. I believe that it is up to the researcher to lead the meeting in a better way”.

- “I liked the theme in the meeting due to the huge relevance of the subject that is rarely brought into the faculty. The motivation was high to participate and collaborate with the research. As for the other aspects of the meeting, they were normal and well done for that purpose”.

- “I think it was good to know what the students thought about their education and wanted to improve it”.

- “I liked the meeting; I think everyone felt at home and gave their opinions. I learned about the teaching methods of other countries. I do not see anything that could be improved for the next meetings”.

- “I found the characteristics of the meeting very satisfactory. The discussion was profitable and the environment was good”.

- “I liked the discussion as a whole; the dynamics, everybody interacting on a natural way as a chat; the theme was very interesting and relevant for everybody”.

5. Discussion

5.1. Summary

There were interventions in the classrooms in the first step of the research (Study 1), involving 247 undergraduate, graduate and specialization students, in control and experimental groups. There was another intervention (Study 2) involving 58 undergraduate students. All students were from Civil Engineering department, transport area. **Table 20** shows the summary of results of Study 1 and Study 2. **Table 21** shows the summary of the used strategies by the students, for both groups, control and experimental whose score averages are greater or equal to 3.0.

5.2. The Effects of the use of self-regulated learning strategies

Considering the General Objective *(Evaluate the effects of the use of self-regulated learning in three courses of civil engineering, transport area)* the *Learning Strategies Assessment Scale for University Students* was administered in experimental groups to observe the results in the post-test, after interventions. The students also participated in a Focus Group Meeting to discuss about their general use of learning strategies and more specifically about the Guided Notes using mind map strategy that was delivered to them. Although all interventions and the Focus Group meeting discussions took place according to what was planned, the results were different from the expected.

The teacher of the discipline in Study 2 and the researcher observed that the students were not doing well with the “Guided Notes using mind map” strategy, although every class had its corresponding “Guided Notes using mind map” delivered to the students. The teacher and the researcher planned a Focus Group meeting to discuss the usage of this and other learning strategies. The discussions of the Focus Group meeting was conclusive. The usage of the “Guided Notes using mind map” learning strategy was very low. The students preferred to study doing exercises. As for the mind map, some students created their own maps. They ignored that the map delivered was just a guide.

Table 20: Summary of Results - Study 1 & Study 2

Study 1		
Socio-Demographic Characterization		
Control & Experimental Groups : 247 students, 60% male, 98% single, ages between 17 and 54		
Internal Consistency of the Scale: Cronbach´s alpha		
Internally consistent		
Longitudinal Analysis: Beginning/End - Control and Experimental Groups		
Experimental groups decreased the score average: undergraduate & graduate: dysfunctional; undergraduate&specialization: metacognitive and total; specialization: cognitive		
Cross-Sectional Analysis Among the Courses		
Experimental undergraduate: Start (cognit.,dysfunc,total) < specialization; End (dysfunc) < specialization, graduate		
Common Strategies in All Courses (high scores >= 3.5 for cognit. and metacognt. strategies)		
Control & Experimental Groups: Cogntivie 41(Research Internet about my homework), Metacognitive 24 (Perceive when I do not understand what I read, then I stop/reread); *Control:* Metacognitive 17 (Review the notes taken in class) and 26 (Separate all material needed for the task you will perform. *Control & Experimental Groups:* Dysfunctional 39 (Study or do homework as I watch TV) the least preferred and 37(Distract yourself or think of something else when reading, studying or doing work) is the most preferred.		
Specific Strategies in each Course (high scores >= 3.0)		
Control & experimental groups: Cognitive 18 & 23 (Search the dictionary for the meanings of unfamiliar words), (Use other texts and books on the subject), for graduate students. *Experimental groups:* Metacognitive 15 (Identify how much or how little you are learning) for undergraduate, and metacognitive 9 (Self-motivate for the reading and study activities) for graduate. Control groups:Cognitive 47 (Know by heart the subject when it is time for a test) for undergraduate		
Study 2		
Socio-Demographic Characterization		
58 students from the “Transport Economics” discipline, 60 % male; 98% single; the age average is 22.		
Focus Group Meeting - Questions and Answers		
Q1	What is your favorite way to study?	Doing exercises
Q2	Do you study all disciplines in the same way?	No
Q3	How do you choose the way you study? Does it depend on the teacher or the discipline?	Both
Q4	Has anybody ever talked to you about different ways to study?	No
Q5	Do you ask the teacher for material in advance?	No
Q6	Do you give feedback to teachers?	No
Q7	Talk about your favorite ways to follow a class (in the classroom).	Difficulties in paying attention to classes
Q8	What do you prefer: a 3-hour class or a 1-hour class?	No difference
Q9	Which terms do you use as meanings of different ways of studying? (e.g. strategy, method..)	No terms because they do not know any
Q10	How was it for you to use the mind map in the ‘Transport Economics’ discipline?	They did not use
Q11	Has anybody asked for help, and that you did not understand what mind map was for?	No
Q12	Has the use of the mind map made the teaching-learning simpler, easier?	No difference
Q13	Is there anything else you would like to comment about ways of studying?	Too many disciplines and too many evaluations
Q14	What do you thing about the use of a media, as a blog, whatsapp, as a strategy for learning?	They prefer groups in facebook, whatsapp

Focus Group Meeting - Answers by Category		
Category	**What**	**Answer**
a	Strategies and ways used by the students to study	Doing Exercises
b	Knowledge of strategies to study	They do not know any strategy
c	Duration of classes	1-hour or 3-hour classes are OK for them
d	Mind Map Usage	No use and no help seek
e	Give Feedback to Teachers	No feedback

Table 21: Summary of used Strategies – Control & Experimental Groups

Control Groups		
Cog	Under	2-Write down in full the explanations of the teacher;47-Know by heart the subject when it is time for a test;46-Discuss the matter with colleagues to see whether you understood;5-Read the texts indicated by the teacher;
	Grad	2-Write down in full the explanations of the teacher;23-Use other texts and books on the subject;18-Search the dictionary for the meanings of unfamiliar words;5-Read the texts indicated by the teacher.
	Spec	46-Discuss the matter with colleagues to see whether you understood.
	All	41-Research Internet about my homework;6-Make notes in the text or on a separate sheet;11-Select the main ideas of the text;13-Analyze graphs and tables found in texts.
Meta	Under	20-Manage your study time;3-Identify your difficulties to learn certain topics or subjects.
	Grad	9-Self-motivate for the reading and study activities;43-Note on the agenda things that you have to do;16-Request help from the teacher regarding doubts about the content;20-Manage your study time;27-Manage to complete a task even when it is difficult and tedious;3-Identify your difficulties to learn certain topics or subjects.
	Spec	16-Request help from the teacher regarding doubts about the content;27-Manage to complete a task even when it is difficult and tedious.
	All	25-Plan your study activities;21-Organize your study environment;12-Control your anxiety in evaluation situations 22-Stay calm when faced with difficult tasks;49-Reread the material to understand it better;28-Stop during the reading to self-evaluate;29-Check your mistakes after receiving the grade for a test;40-Read your answers again before handing in a test;38-Perceive when I do not understand what I read;26-Separate all the material needed for the task that you will perform;17-Review the notes taken in class;19-Ask for help from colleagues in case of doubts;24-Perceive when I do not understand what I read, then I stop and reread.
Experimental Groups		
Cog	Under	46-Discuss the matter with colleagues to see whether you understood.
	Grad	23-Use other texts and books on the subject;46-Discuss the matter with colleagues to see whether you understood;18-Search the dictionary for the meanings of unfamiliar words.
	Spec	2-Write down in full the explanations of the teacher;44-Make a scheme on the paper (sketch, graph or drawing) to better understand the relationships between things.
	All	5-Read the texts indicated by the teacher;6-Make notes in the text or on a separate sheet;11-Select the main ideas of the text;13-Analyze graphs and tables found in texts;41-Research Internet about my homework.
Meta	Under	15-Identify how much/little you are learning;20-Manage study time;3-Identify difficulties to learn certain topics/sub
	Grad	16-Request help from the teacher regarding doubts about contents;9-Self-motivate for reading/study activities;43-Note on the agenda things that you have to do;27-Manage to complete a task even when it is difficult/tedious.
	Spec	16-Request help from the teacher regarding doubts about the content;3-Identify your difficulties to learn certain topics;43-Note on the agenda things you have to do;27-Manage to complete a task even when it is difficult and te
	All	28-Stop during the reading to self-evaluate;12-Control your anxiety in evaluation situations;22-Stay calm when faced with difficult tasks;25-Plan your study activities;21-Organize your study environment;49-Reread the material to understand it better;29-Check your mistakes after receiving the grade for a test;40-Read your answers again before handing in a test;17-Review the notes taken in class;26-Separate all the material needed for the task that you will perform;19-Ask for help from colleagues in case of doubts;38-Perceive when I do not understand what I read;24-Perceive when I do not understand what I read, then I stop and reread.

They mostly did not take notes of any class. They were worried about the overload of disciplines, assessments and homework. They also did not seek for help from the teachers. The “Guided Notes using mind map” learning strategy used in the discipline did not promote any motivation in the class. Only when they discussed all the questions during the Focus Group meeting with the researcher including the “Guided Notes using mind map”, their concern about the importance of this and other strategies seemed to change.

The Focus Group Meeting discussions showed that the students are reactive to what the teachers demand them to do, they did not work with feedback either to teachers or among themselves, they had no help seeking and very low repertoire of learning strategies. These might show that they are non-self-regulated learners.

As for some common strategies among all courses, there was the cognitive 41 (Research Internet about my homework). This might be explained by Gen Y students who prefer to use webpages, classes in multimedia (HOCKLY, 2010), do not enjoy traditional classes as reading and listening to teachers, and they tend to be visual learners (ECKLEBERRY-HUNT; TUCCIARONE, 2011; SCHULMEISTER, 2009). The preferred metacognitive strategy was the 24 (Perceive when I do not understand what I read, and then I stop and reread). As for dysfunctional strategies, 37 (Distract yourself or think of something else when reading, studying or doing work) was the most preferred. According to (ECKLEBERRY-HUNT; TUCCIARONE, 2011) the distraction is considered a normal feature of Gen Y students. The dysfunctional strategy 39 (Study or do homework as I watch TV) was the least preferred by the students, and this might suggest that the students have replied the scale in a way to meet the school expectation. See **Table 20** and **Table 21** for more details.

As for some specific strategies, the graduate preferred the cognitive 18 (Search the dictionary for the meanings of unfamiliar words) and 23 (Use other texts and books on the subject) and the undergraduate preferred the metacognitive 15 (Identify how much or how little you are learning). This might suggest that the graduate students have more academic experience than others do. On the contrary, undergraduate students arrive with no study habits, being non-self-regulated. The higher education success relies on the first year (ROSÁRIO et al., 2010). See **Table 20** and **Table 21** for more details.

Comparing some strategies score averages, before and after the interventions for the experimental groups, some scores decreased after the interventions: the undergraduate and graduate students (dysfunctional strategies scores), undergraduate and specialization students (metacognitive and total scores) and specialization (cognitive scores).

Comparing some strategies score averages among the courses in the pre-test of experimental groups, before the interventions took place, the undergraduate students had lower scores in cognitive, dysfunctional and total score average than the specialization students. Comparing the scores in the post-test for the same experimental groups, after the interventions took place, the undergraduate students had lower scores in dysfunctional strategies than graduate and specialization students.

There are some reasons that might explain this. The time and the strategies planned for the intervention might not have been enough to persuade the students about the learning strategies. They might have had more time for practice of the strategies delivered. Holding more Focus Group Meetings might provide more exchange of feedback and make the students understand the relevance of knowing learning strategies, and watch each other and acquire abilities. The planning might have been better prepared if it considered the involvement of the teacher in the interventions. The agent of changes during interventions was the researcher, not the teacher, a natural model for self-regulated learning in classrooms. The students might not be motivated. The teacher as a model might be the ideal agent of change to persuade the students about learning. Persuasion is very important element that might come from the teachers. There was not enough feedback from the researcher about success and failure of the students' use of the strategies delivered. The students did not exchange feedback among themselves as well.

The following academic literature explore the reasons above. The necessary conditions for learning are related with setup planning, creation of favorable environment for the students' engagement, motivation to study, models support, opportunities to try new skills, feedback about success and failure (BANDURA, 1986;1989;1997;2001; HATTIE; TIMPERLEY, 2007; SCHUNK, 1990;2012; SCHUNK; USHER, 2013). SCHUNK (2012) states that the social context involving the students is very important, for they can watch each other and acquire abilities, beliefs, regulation on the strategies brought into class; the individuals can keep their behaviors even for long periods relying on their goals setting and self-evaluations of progress. Modeling can help goal setting.

Persuasion is an important source of self-efficacy, the motivational aspect of forethought phase in the cyclic self-regulated learning model (BANDURA, 1997;2001). The researcher, for the same reason, could not be the change agent, making things happen, supported by self-regulatory capabilities, tasks that should be teachers' duties (BANDURA, 1999).

The goal feedback on what they set up for themselves should increase the students' self-efficacy, motivation and attainment, provided the feedback indicates they are capable. Self-efficacy keeps the students motivated when they have the belief that constantly applied efforts can allow them to achieve their goals (HATTIE; TIMPERLEY, 2007; SCHUNK, 1990;2012).

5.3. The use of self-regulated learning strategies by students

Considering the Specific Objective-a *(*Evaluate to what extent the students use learning strategies*),* the *Learning Strategies Assessment Scale for University Students* was administered in control groups in the pre-test and post-test to find out the use of students' cognitive, metacognitive and dysfunctional learning strategies. The researcher observed through the self-reports that the students had a very small learning strategy repertoire.

As for common strategies used by the students, the self-reports from Study 1 showed that one of the preferred strategies among all courses was the cognitive 41 (Research Internet about my homework), a fact also observed in experimental groups, calling attention for Gen Y students behavior. The preferred metacognitive strategy was 24 (Perceive when I do not understand what I read, then I stop and reread). As for dysfunctional strategies, 37 (Distract yourself or think of something else when reading, studying or doing work) was the most preferred, and 39 (Study or do homework as I watch TV) was the least preferred by the students. The students of the experimental groups similarly chose these strategies, and this might suggest some reasons as Gen Y behavior and a bias towards the school expectations. See **Table 20** and **Table 21** for more details.

As for specific strategies, the undergraduate students were the only ones who preferred the cognitive strategy 47 (Know by heart the subject when it is time for a test). This suggests the students have bad academic experience and prefer simple strategy. The cognitive strategies 18 (Search the dictionary for the meanings of unfamiliar words), and 23 (Use other texts and books on the subject) are specific for the graduate students. This might suggest that the graduate students have more academic experience than others do. See **Table 20** and **Table 21** for more details.

The students of all courses of both control and experimental groups showed not to prefer the cognitive strategies 1 (Repeat the information orally while reading the text), 4 (Summarize the texts indicated for study), 7 (Write in your own words what you understood from the text), 8 (Read supplementary texts, in addition to those indicated by the teacher), 10 (Prepare questions and answers on the subject studied), 14 (Identify the main ideas and relate them through diagram or conceptual maps), 31 (Create questions about the subject you are studying and try to answer them), 42 (Study in a group). See **Table 20** and **Table 21** for more details.

The students of all courses of both control and experimental groups showed not to prefer the metacognitive strategies 33 (Try to redo questions that you got wrong in a test), 45 (Paste reminders to remember what you need to do), 48 (Ask someone to go over the material). This might suggest that the students have bad academic experience. See **Table 20** and **Table 21** for more details.

The possible reasons for this small learning strategy repertoire might be explained as follows. The students might not have had a model to practice with, coach and mentor about learning strategies, and exchanging feedbacks. The students can learn just watching teachers do the actions and they can retain the behaviors if successful, otherwise try again, or quit (SCHUNK, 2012). They might also have had a weak observational learning dealing with attention, retention, production, and motivation (BANDURA, 1986; ZIMMERMAN; SCHUNK, 2003).

BANDURA (1997) explains that just a few successes do not create the resilient sense of efficacy and this requires learning how to handle adversity and mastering increasingly tougher challenges through perseverant effort. New skills are unlikely to be used for long unless they prove useful when they are put into practice and students must experience sufficient success by using what they have learned to believe in themselves.

This might also mean that the determinants of the triadic reciprocity (personal, behavioral and social/environmental) were not appropriately consistent for the reciprocal actions to happen (BANDURA, 1986;1989;1997;2001; SCHUNK; USHER, 2013).

Regarding the students' scores, the higher they are, the higher the students' readiness for their learning (BORUCHOVITCH; SANTOS, 2015).

It is stated that the appropriate use of learning strategies accelerates the acquisition of knowledge and supplies the development in academic performance of students (COSTA; BORUCHOVITCH, 2009; KAVASOĞLU, 2009; KRAMARSKI; MICHALSKY, 2009; PEKRUN, 2006; PEKRUN et al., 2011; SINGLETON; NEWMAN, 2009).

5.4. The Possibilities for Enhancing the Usage of self-regulated learning strategies

Considering the Specific Objective-b *(Identify ways to enhance the students' learning through self-regulated learning strategies),* the *Learning Strategies Assessment Scale for University Students* was administered in control and experimental groups in the pre-test and post-test to check the amount of strategies used by the students. The students also participated in a Focus Group Meeting to discuss about their general use of learning strategies and more specifically about the Guided Notes using mind map strategy that was delivered to them.

The individual's behavior change within the structure of triadic reciprocity. It involves Personal determinants, as skills, self-efficacy, affects, and Behavioral determinants, and Social/Environmental determinants. In a bidirectional way those determinants affect each other (BANDURA, 1986;1989;1997;2001; SCHUNK; USHER, 2013). The triadic reciprocity might have not evolved properly during the research. To

raise the opportunities of learning strategies use it is necessary a wider look bringing the teacher, the students and the socioenvironmental components aiming the academic success.

Individuals will consider learning and performance important if this is consistent with their values. Furthermore, individuals' performances will affect their value preferences (BANDURA, 1986; SCHUNK, 2012). Keeping the Gen Y students motivated the teacher might call their attention using resources supported by the web, social multimedia, sharing feedback and opinions (ECKLEBERRY-HUNT; TUCCIARONE, 2011).

The Focus Group Meeting intended to understand better what the students knew about learning strategies and more specifically what they thought about the strategy delivered in class (Guided Notes using mind map). Based on the results of the discussion, the teacher might explore other strategies besides the preferred ones by the group (e.g. Doing exercises). Other similar meetings might bring more feedback about this. Holding a Focus Group Meeting showed to be a great opportunity to work together with the students, to exchange ideas and feedback, and to practice. It is a special moment to know the students values and work on this.

For all courses, of both control and experimental groups, the students showed not to prefer the cognitive strategies 1 (Repeat the information orally while reading the text), 4 (Summarize the texts indicated for study), 7 (Write in your own words what you understood from the text), 8 (Read supplementary texts, in addition to those indicated by the teacher), 10 (Prepare questions and answers on the subject studied), 14 (Identify the main ideas and relate them through diagram or conceptual maps), 31 (Create questions about the subject you are studying and try to answer them), and 42 (Study in a group). They also showed not to prefer the metacognitive strategies 33 (Try to redo questions that you got wrong in a test), 45 (Paste reminders to remember what you need to do), 48 (Ask someone to go over the material). This might suggest that these strategies could be the target for closer attention by teachers and educators in general. See **Table 20** and **Table 21** for more details.

It is very important to state that persuasion used by a teacher is relevant concerning the use of learning strategies. The students practicing the strategies in class and the teacher as a model, bringing them more exercises, feedback, might leverage the level of motivation, attention, retention and reproduction. The teacher is the one to make the changes in classrooms.

5.5. Teaching-Learning Behavior of Generation Y Students

One should weigh the information in this discussion, observing the students' profile. The participating students of this research are mostly part of Generation Y. One should know the specific behavior of these individuals to understand better the results of this research.

Generation Y individuals were born around 1980 – 1994; the age in 2016 will be between 23-37 (ASCE, 2007; HOCKLY, 2010). Gen Y has different names: Gen Y, Generation Y, The Millennium Generation, Millennials, Gen Why, Gen NeXt, NeXters, Echo-boomers, Net Generation, Net Gener, the generation @. It is called Y because it follows X. The individuals of Gen Y are called currently tech-comfy, i.e. comfortable with technology (ASCE, 2007; ECKLEBERRY-HUNT; TUCCIARONE, 2011; HOCKLY, 2010; NG; SCHWEITZER; LYONS, 2010; SCHULMEISTER, 2009; THALER, 2013).

They prefer work in groups with hands-on experiences, free expression, online social connection, and they enjoy trial and error. Because they had a close relationship with their parents, they prefer a close relationship with authority figures and want to feel special and winners. They learned how to share their feedback and opinions, even in an inappropriately manner. They love to think outside the box (ECKLEBERRY-HUNT; TUCCIARONE, 2011).

For Gen Y students, the teaching requires new concepts. Unfortunately, there is not much in academic literature to suggest teaching strategies to work with Generation Y. Educators have to know and understand that they cannot see Generation Y in the same way as past generations. They should focus on using technology in teaching, mentoring, and feedback. Educators need to stay aware of new technologies and incorporate them

into their teaching. They could use Gen Y's expertise by involving them in a technology advisory committee. They are used to using technology in moments they should be studying or in class. They do not see that multitasking can be a distraction. Clear rules about this are essential. Teachers should supply the students with concrete, prompt and reliable written feedback and involve them in committees and remediation plans. Gen Y students prefer environments with explicit rules and clear lines of communication. They dislike ambiguity (ECKLEBERRY-HUNT; TUCCIARONE, 2011).

Gen Y students have comments like: “I will read seven books this year, and 2000 webpages and 1200 Facebook profiles; I will write 40 pages this semester, and more than 500 pages of e-mail; I facebook during most classes” (HOCKLY, 2010).

Gen Y students do not enjoy lectures as a teaching method. They prefer multimedia format classes. Reading and listening lectures are not worth much. They have tendency to be visual learners. They enjoy classes that are creative, with group work, interactive, and fun, performance-oriented, explorative, hands-on with simulation and group discussion (ECKLEBERRY-HUNT; TUCCIARONE, 2011; SCHULMEISTER, 2009)

They are very emotional and support diversity, and have short attention periods, and have multiple personalities (SCHULMEISTER, 2009).

6. Conclusion and Recommendation

6.1. Conclusion

As demonstrated in the Discussion session, the administration of the scale of evaluation of learning strategies, to measure the use of strategies during normal classes and interventions, together with the Focus Group Meeting discussions to evaluate the students' use the Guided Notes using mind map, strategy delivered in class, and other preferences, showed to be adequate. This made it possible for the research to bring some conclusions about the teaching-learning processes. The question of the research (Can self-regulated learning strategies enhance the students' learning independence, in civil engineering, transport area?) was answered. The processes involving self-regulated learning strategies have a large potential provided the environment is suitable for their learning and use. The courses in civil engineering, transport area, currently does not have the needed structure and environment, which might leverage these processes. The learning resources to be used might meet the values of Gen Y students.

The general objective (Evaluate the effects of the use of self-regulated learning strategies in three courses of civil engineering, transport area) was achieved although there were a few effects found. The specific objective-a (Evaluate to what extent the students use learning strategies) and specific objective-b (Identify ways to enhance the students' learning through self-regulated learning strategies) were achieved.

During this research, a new version of scale of evaluation of learning strategies was created. It was developed in 2015 after factorial analyses: Factor 1 (Cognitive and Metacognitive Self-regulation Strategies) comprised of 23 items; Factor 2 (Internal Resource and Context regulation Strategies) 8 items; and Factor 3 (Social regulation Strategies) 4 items. The new version has 14 items less than the old scale used in this research. This new version scale might bring improvements for future researches.

The students from all courses strongly preferred strategies related to the use of internet to help in homework, reviewing notes taken in classes and rereading material

when not understood. The specialization students preferred complex strategies as making a scheme on paper, or graphs, which suggest academic experience.

There are some strategies that were not preferred (very low scores) by any student and this might be related to a low level of knowledge and practice about learning strategies, as summarizing texts, writing with own words, reading supplementary texts, preparing questions and answers, using diagrams as a learning aid, and identifying the main ideal of the text. These strategies call attention to the ideal targets for the educators.

The distraction was a common element to all students. It works against the self-regulated learning and it is the opposite of attention, a relevant element of observational learning. The students pay attention if there is a value for them and this might bring the need to understand Gen Y students' profiles and find relevant resources accordingly. The Gen Y students are reactive to disciplines, to teachers and environment and they like trial and error processes which is the opposite of self-regulated learning. They have to be understood and brought closer to teachers to exchange information, feedback and affect. This might decrease the gap between the students' interests and the teaching methods of today. They had a very small repertoire of self-regulated learning strategies. The undergraduate students might be the most vulnerable mainly those in the beginning of their academic life when the success is determined as well as the retention in school. This places them as an important target for future interventions.

Under the light of the triadic reciprocity, the teacher, the student and the school are essential components, whose reciprocal interactions might lead them to a favorable teaching-learning environment. The personal determinants of a student (cognitions, self-efficacy, expectancies, objectives, plans, skills, feelings, affects) together with the socio-environmental, cultural and pedagogical determinants of the school can affect the use of self-regulated learning strategies, and the student's behavior, when interacting with each other. The behavior and personal determinants of the students, especially Gen Y, might be relevant to the interaction with the environment, which might lead to a promising teaching-learning environment. The teacher acting as an agent, offering models, feedback, persuasion, skills, and structure for pedagogic elements could convey self-

regulated learning skills. It might be considered that the teacher in civil engineering, transport area today, does not have the culture to use self-regulated learning strategies aiming to improve the teaching-learning processes.

When the socio-environmental aspects of the school meet pedagogical, structural efforts aiming to suit the educational structure and processes, these can lead to productive relationship among the learning and the new generations.

6.2. Recommendation

The following recommendations come up to meet the discussions and conclusions of this research.

6.2.1. Recommendations for Further study

It is important to develop researches involving teaching-learning processes with teachers and students of civil engineering, transport area. These might cover self-regulated learning strategies in different disciplines with students from the first year. It might be interesting to investigate the retention of these students. It is important to remember that the first year in a university is the most important to reach success in the academic life. The research might cover more than one term, or years developing continuously a longitudinal study to observe the results of the self-regulated learning strategies implementation on the students' behavior. It might involve only one class and only one self-regulated learning strategy at a time. It might use different scales to measure the strategies usage, dysfunctional strategies usage, students' self-efficacy and emotion, among others. Some researches might be done involving the teachers with similar measurements. This might provide a broader view of the students' and teachers' behavior.

It might be important to have more than one Focus Group meeting involving first year students to discuss the relevance of teaching-learning aspects, self-regulated learning strategies, and highlight dysfunctional metacognitive strategies. Researches aiming at longitudinal studies, for more than one term, might reinforce the teachers' and students' idea of the importance of learning strategies and being self-regulated learner.

These might bring some information about the weaknesses of the students and the effectiveness of the interventions. The use of the Mind Map strategy might be relevant in futures researches considering that Gen Y students tend to be visual learners. These might be the recommendations.

- Research involving the cyclic self-regulated learning model
- Researches involving first-year undergraduate students
- Researches involving students of only one class at a time
- Researches involving only one strategy at a time
- Explore different self-regulated learning strategies
- Explore scale to measure learning strategies, students' emotion, self-efficacy, self-regulation, and dysfunctional strategies
- Explore the new version of the *Learning Strategies Assessment Scale for University Students*
- Researches in longitudinal studies lasting more than two terms
- Researches involving Mind Map strategy
- Researches involving more than one Focus Group Meeting per term

6.2.2. Recommendations for Practice

It is important to observe the features of the students involved in the researches. Gen Y individuals have and the future generations to come will have specific behavior that if understood, the researcher might observe the results appropriately and might evaluate the next steps accordingly. Gen Y students do not enjoy the traditional lecture teaching method and they prefer multimedia format, creative and interactive classes instead. They have the tendency to be visual learners. Teachers have to be aware of and incorporate new technology in teaching, mentoring, and feedback.

Gen Y students dislike ambiguity and prefer environments with explicit rules and clear lines of communication and teachers should supply them with concrete, prompt and reliable written feedback. They are very emotional and support diversity, and have multiple personalities. Multitasking activities is not a dysfunctional strategy for them. They enjoy

trial and error reactive process, which is against the self-regulated learning and calls for special attention from the teachers and researchers. The characteristic behavior of Generation Y students leads their participation in the creation of self-regulated learning strategies. The acquisition of new skills and new behavior require engagement and opportunities of experiences what should be the aim of other interventions for this generation. An attempt to bring these students closer to a favorable and self-regulated learning environment might be a great step for the teaching-learning processes for the students of civil engineering, transport area of Unicamp.

It might be important to develop and then reinforce teachers with learning strategies and other concepts and constructs from Social Cognitive Theory. A Teaching-Learning Center can support this by concentrating and sharing teaching-learning resources with teachers and students of the school and being the repository of the learned lessons from researches. It might make the teaching culture a more suitable element to bridge the gaps among teachers, students and the school. These might be the practice recommendations.

- Creation of a Teaching-Learning Center
- Coaching and reinforcement of teacher about observational learning, self-regulated learning, self-efficacy and its sources, triadic reciprocity, the cyclic self-regulated learning model, and self-regulated learning strategies

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ANNEXES

ANNEX A – Socio-Demographic Questionnaire

DADOS SOCIODEMOGRÁFICOS PARA A PESQUISA

DATA: ____ / _____ /_____

1. Nome: _____
2. Sexo: ( )Masculino ( )Feminino
3. Idade: ____ anos
4. Ocupação Atual: _____
5. Estado Civil: ( ) Solteiro ( ) Casado ( ) Separado ( ) Divorciado ( ) Outro
6. ========== Somente para quem está fazendo **GRADUAÇÃO** ==========
   6.1. Qual Curso de Graduação está fazendo atualmente: _____
   6.2. Universidade onde faz a Graduação: _____
   6.3. Qual o semestre da Graduação está cursando: _____
7. ========== Somente para quem está fazendo **PÓS-GRADUAÇÃO** ==========
   7.1. Qual Curso de Graduação **concluído**: _____
   7.2. Universidade onde concluiu a Graduação: _____ Ano de conclusão: _____
   7.3. Já fez algum curso de Especialização? ( ) SIM ( ) NÃO
   7.4. Em caso de resposta positiva, qual curso de Especialização e em qual Instituição ele foi realizado:
   Curso: _____ Instituição: _____
   7.5. Quais os cursos e respectivas instituições, que você está estudando **atualmente**? (pode ser mais que 1 curso)
   Mestrado: _____
   Doutorado: _____
   Especialização: _____
   Extensão: _____

==========

8. Possui algum conhecimento nas seguintes línguas:
   ( ) Inglês ( ) Francês ( ) Espanhol ( ) Outras ( ) Nenhum
9. Conhecimento de Inglês:

	FALAR	LER	ESCREVER	OUVIR
Bom				
Intermediário				
Básico				
Sofrível				

10. Viajou para fora do Brasil? ( ) SIM ( ) NÃO
    Em caso de resposta positiva, responda as 2 questões a seguir:
11. Tipo de Viagem: ( ) Estudo/Intercâmbio ( ) Trabalho ( ) Lazer ( ) Profissional/Cultural ( ) Outros
12. Utilizou a língua inglesa em sua viagem? ( ) SIM ( ) NÃO

ANNEX B – Informed Consent Form Signed by the Students

B01. Informed Consent Form Signed by the Students

TERMO DE CONSENTIMENTO

Projeto de Pesquisa de Mestrado – "Análise da Aplicação de Estratégias de Aprendizagem Autorregulada em Alunos de Disciplinas da Graduação, Pós-Graduação e Especialização, no Curso de Engenharia Civil da Universidade Estadual de Campinas – Unicamp"

Data: ____/____/_____

Com o objetivo de investigar a Aplicação de Estratégias de Aprendizagem Autorregulada em Alunos de Disciplinas da Graduação, Pós-Graduação e Especialização, no Curso de Engenharia Civil da Universidade Estadual de Campinas – Unicamp, vimos solicitar sua colaboração no preenchimento de questionários auto-aplicáveis.

As informações obtidas nos ajudarão a identificar a eficácia da aplicação de estratégias autorregulada em sala de aula. Os dados coletados poderão ser divulgados em eventos científicos e a liberdade de desistência em qualquer fase da pesquisa será respeitada.

Será garantido total sigilo de identificação pessoal.

Eu, ...estou respondendo de forma voluntária e espontânea aos questionários e autorizo a utilização dos dados para pesquisa científica.

Assinaturas:

1)_____
Participante da Pesquisa

2)_____
Pesquisador responsável: José Carlos Redaelli fones: 8119.7726/3252.5422 - jc@redaelli.com.br

3) _____
Orientador: Prof. Dr. Orlando Fontes Lima Jr. – Engenharia Civil - oflimaj@fec.unicamp.br

B02. Informed Consent Form Signed by the Students

TERMO DE CONSENTIMENTO

Projeto de Pesquisa de Mestrado – "Diferentes Estratégias de Aprendizagem entre alunos da Graduação, Pós-Graduação e Especialização da Engenharia Civil da Universidade Estadual de Campinas – Unicamp"

Data: ____/____/_____

Com o objetivo de investigar a Aplicação de Estratégias de Aprendizagem Autorregulada em Alunos do Curso de Engenharia Civil da Universidade Estadual de Campinas – Unicamp, vimos solicitar sua colaboração no preenchimento de questionários auto-aplicáveis.

As informações obtidas nos ajudarão a identificar a eficácia da aplicação de estratégias autorregulada em sala de aula. Os dados coletados poderão ser divulgados em eventos científicos e a liberdade de desistência em qualquer fase da pesquisa será respeitada.

Será garantido total sigilo de identificação pessoal.

Eu, ...estou respondendo de forma voluntária e espontânea aos questionários e autorizo a utilização dos dados para pesquisa científica.

Assinaturas:

1)_____
Participante da Pesquisa

2)_____
Pesquisador responsável: José Carlos Redaelli fones: 98119.7726/3252.5422 - jc@redaelli.com.br

3) _____
Orientador: Prof. Dr. Orlando Fontes Lima Jr. – Engenharia Civil - oflimaj@fec.unicamp.br

B03. Informed Consent Form Signed by the Students

TERMO DE CONSENTIMENTO

Projeto de Pesquisa de Mestrado – "Diferentes Estratégias de Aprendizagem entre alunos da Graduação, Pós-Graduação e Especialização da Engenharia Civil da Universidade Estadual de Campinas – Unicamp"

Data: ____/____/_____

Com o objetivo de investigar a Aplicação de Estratégias de Aprendizagem Autorregulada em Alunos do Curso de Engenharia Civil da Universidade Estadual de Campinas – Unicamp, vimos solicitar sua colaboração na participação da reunião "Grupo Focal" que abordará as diferentes formas de estudar.

As informações obtidas nos ajudarão a identificar a eficácia da aplicação de estratégias autorregulada em sala de aula. Os dados coletados poderão ser divulgados em eventos científicos e a liberdade de desistência em qualquer fase da pesquisa será respeitada.

Será garantido total sigilo de identificação pessoal.

Eu, ...estou participando de forma voluntária e espontânea na reunião "Grupo Focal" e autorizo a utilização dos dados para pesquisa científica.

Assinaturas:

1)_____
Participante da Pesquisa

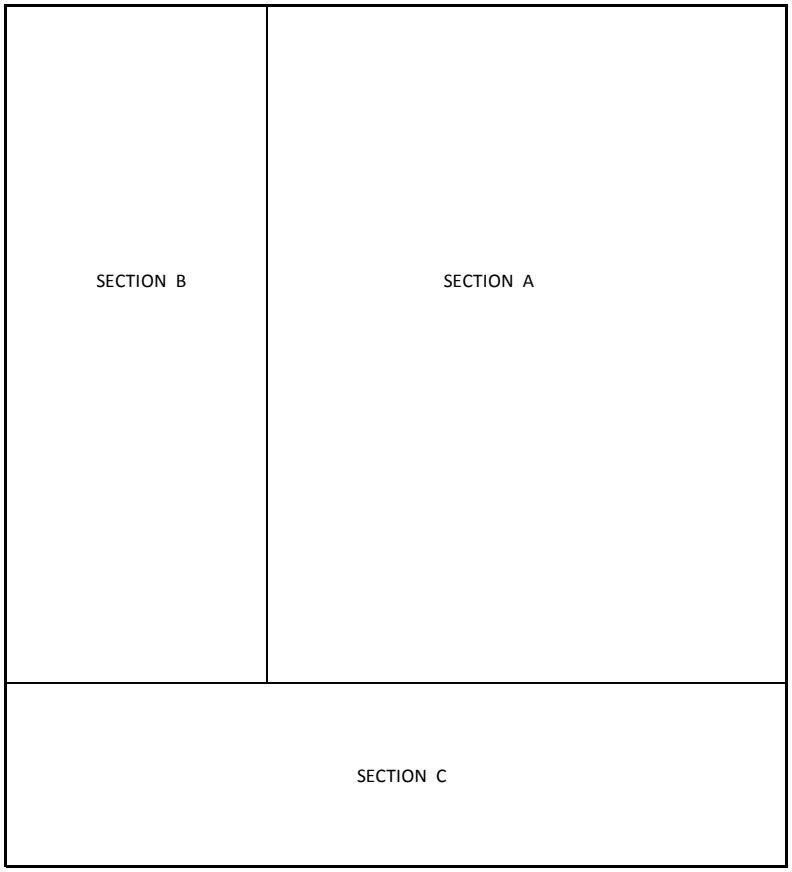
2)_____
Pesquisador responsável: José Carlos Redaelli fones: 98119.7726/3252.5422 - jc@redaelli.com.br

3) _____
Orientador: Prof. Dr. Orlando Fontes Lima Jr. – Engenharia Civil - oflimaj@fec.unicamp.br

ANNEX C – Learning Strategies Conveyed in Classes during Interventions

C01. Strategy – Note-Taking (CORNELL) Strategy–Lectures/ Classes

a) Cornell Method, designed by Walter Pauk, Cornell University

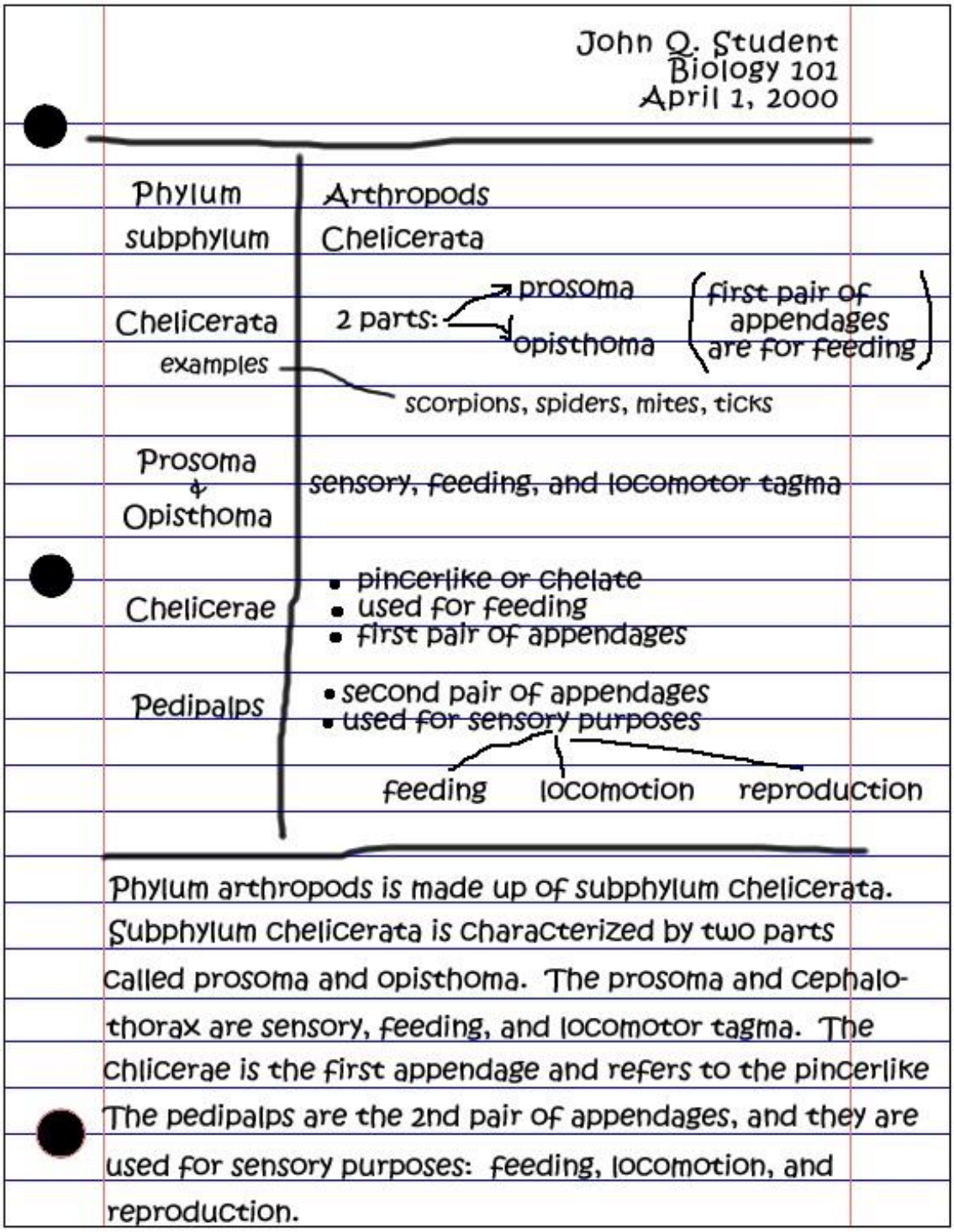


- Divide a sheet of paper into three sections, as the figure above (A, B and C)
- During your class: Section A
- Write your notes; skip a line between ideas and topics
- Don't use complete sentences; use abbreviations
- After class: Section B
- Review your notes as soon as possible
- Write down your main ideas, key points, dates, and people from Section A
- Still after class: Section C
- Write a summary of the main ideas
- Study your notes
- Re-read your notes in the section A
- Spend most of your time studying the ideas in the section B and in the section C
- These are the most importante ideas of your notes

http://lsc.cornell.edu/LSC_Resources/cornellsystem.pdf

http://coe.jmu.edu/learningtoolbox/cornellnotes.html

b) Cornell Method: Example



http://coe.jmu.edu/learningtoolbox/cornellnotes1.html

c) Cornell Method: Template

C02. Strategy – Note-Taking (SQ3R) Strategy – Text Reading

Reading strategy "SQ3R" created by Prof. Francis P. Robinson, Ohio State University, during the Second World War.

S – SURVEY or SKIM

Survey the text you are going to read. Look at headings, bold, highlighted words, and graphics. The idea here is to get an overall impression of the text. Do not read the text now.

Q – QUESTION

Ask yourself some "Wh" questions, "Who", "What", "Where", "When" and "Why". For example: Who is writing this? What do I already know about it?, What do I expect to learn about it?, Where does it take place?

R – READ

Read the whole text, in the first time, and pay attention to the titles, subtitles, and to the highlighted words. Do not mark any text this time. Read again and mark the most important words, keywords. Do this using a pencil because you may change your mind after reading.

R – RECITE or RECALL

At the end of your reading, try to recite or recall what you have just read. This means that you should try to remember what you have just read. Try to answer your questions with your own words.

R – REVIEW

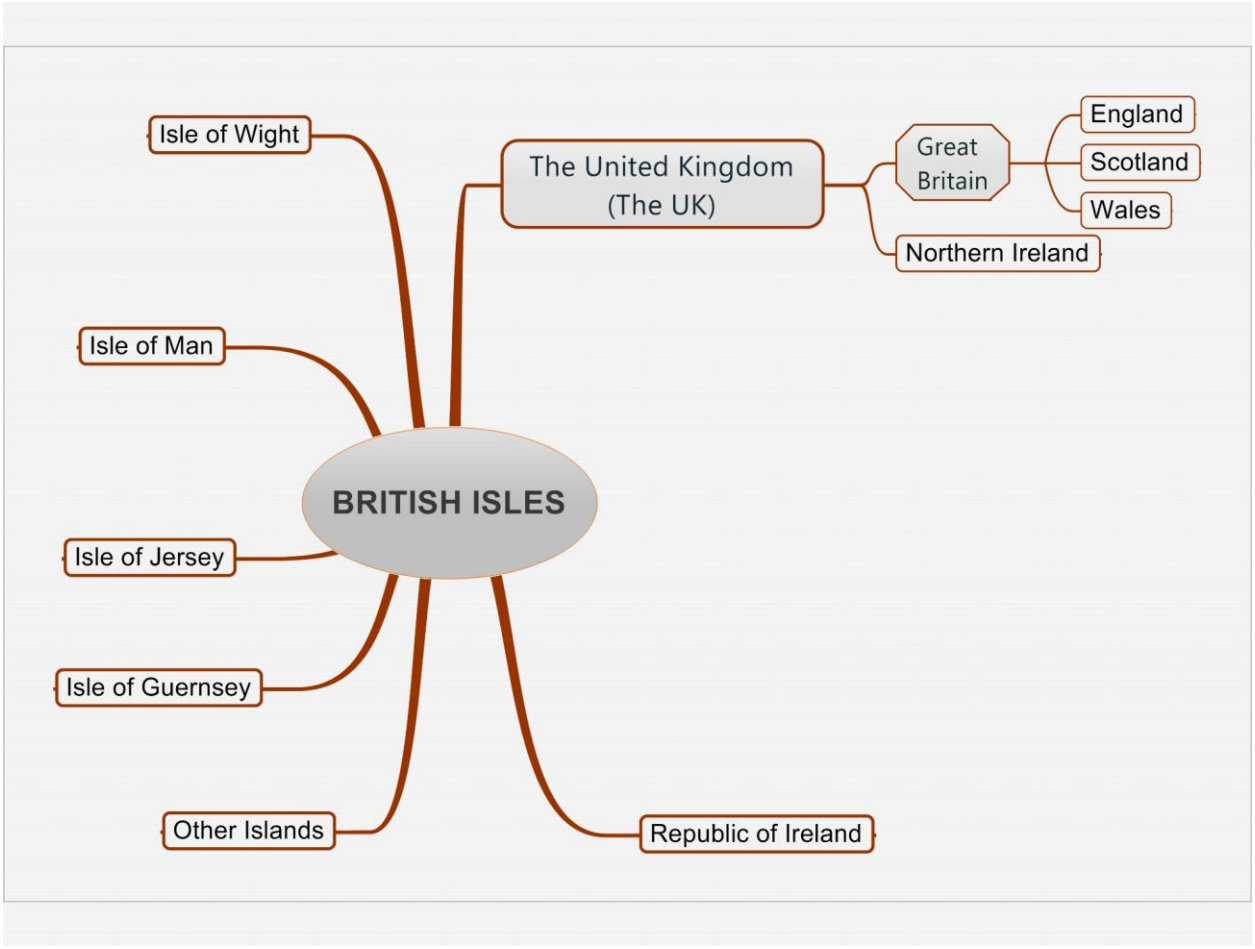
Review your notes with questions and answers, which will be very helpful for you to know the whole text. You call these notes as Flash-notes.

http://www.studygs.net/texred2.htm

http://www.weber.edu/wsuimages/vetsupwardbound/StudySkills/SQ3Rmethod.pdf

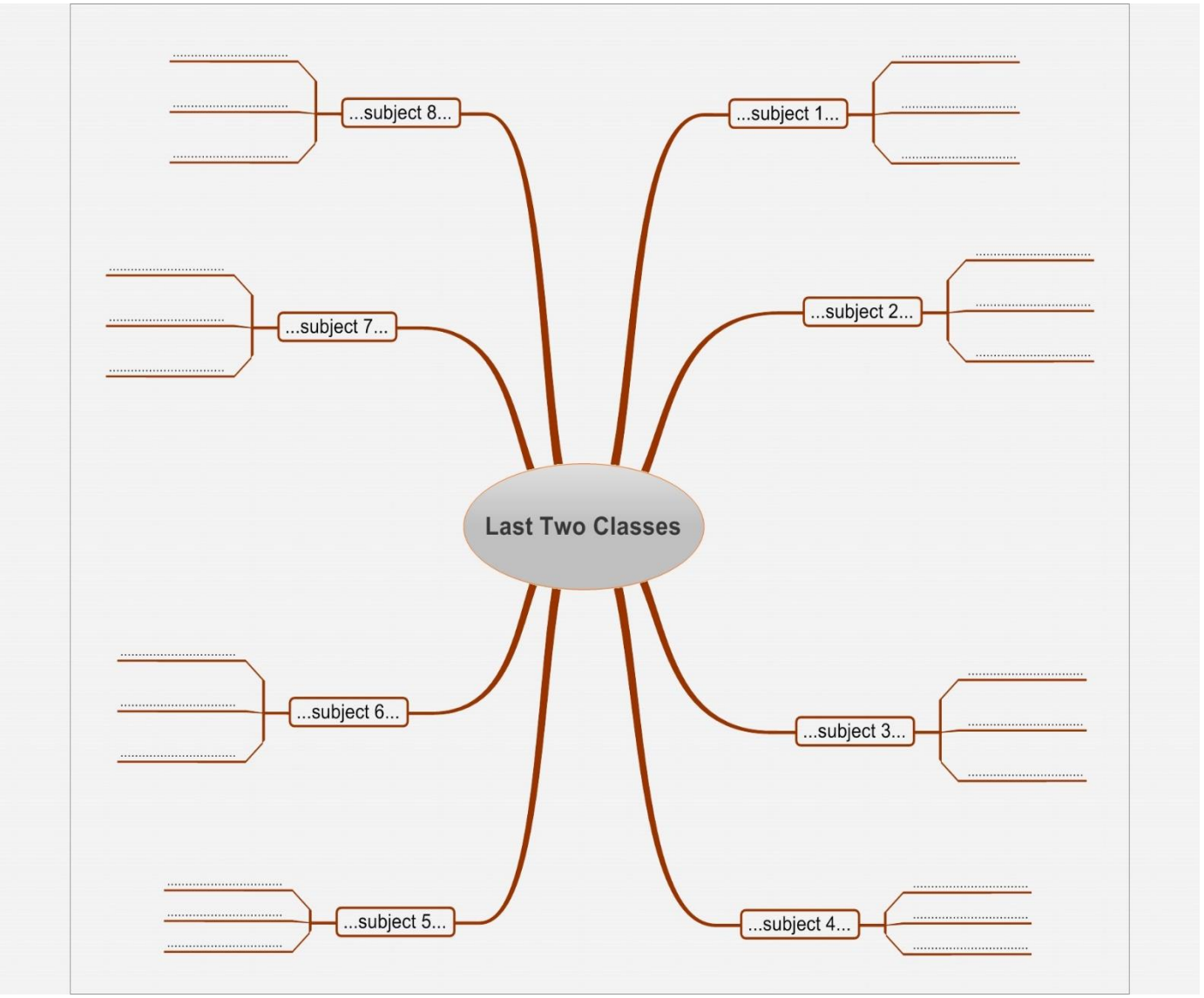
C03. Strategy – Mind Map

a) Example: British Isles



- The central key word or idea here is “British Isles”
- This central part radiates some key elements
- Set the key elements in a clockwise order
- Each element can itself radiate to more elements

b) Homework: Template



- This is homework
- It should recall the last 2 classes
- The elements radiated (branches) from the central part should be related to the subjects studied
- Choose keywords for these elements
- Design them in a clockwise manner starting at the right top
- These elements can radiate more elements

C04. Strategy – Self-Recording

a) Follow-up of Students' activities

SELF-RECORDING						
Year:			NAME:			
WHEN			HOW LONG	WHERE	WHAT	SUCCESS
Day/Month	Weekday	Time	Duration	Local	Activity (any, including the classes)	Achieved/Expected

b) Self-Recording: Example

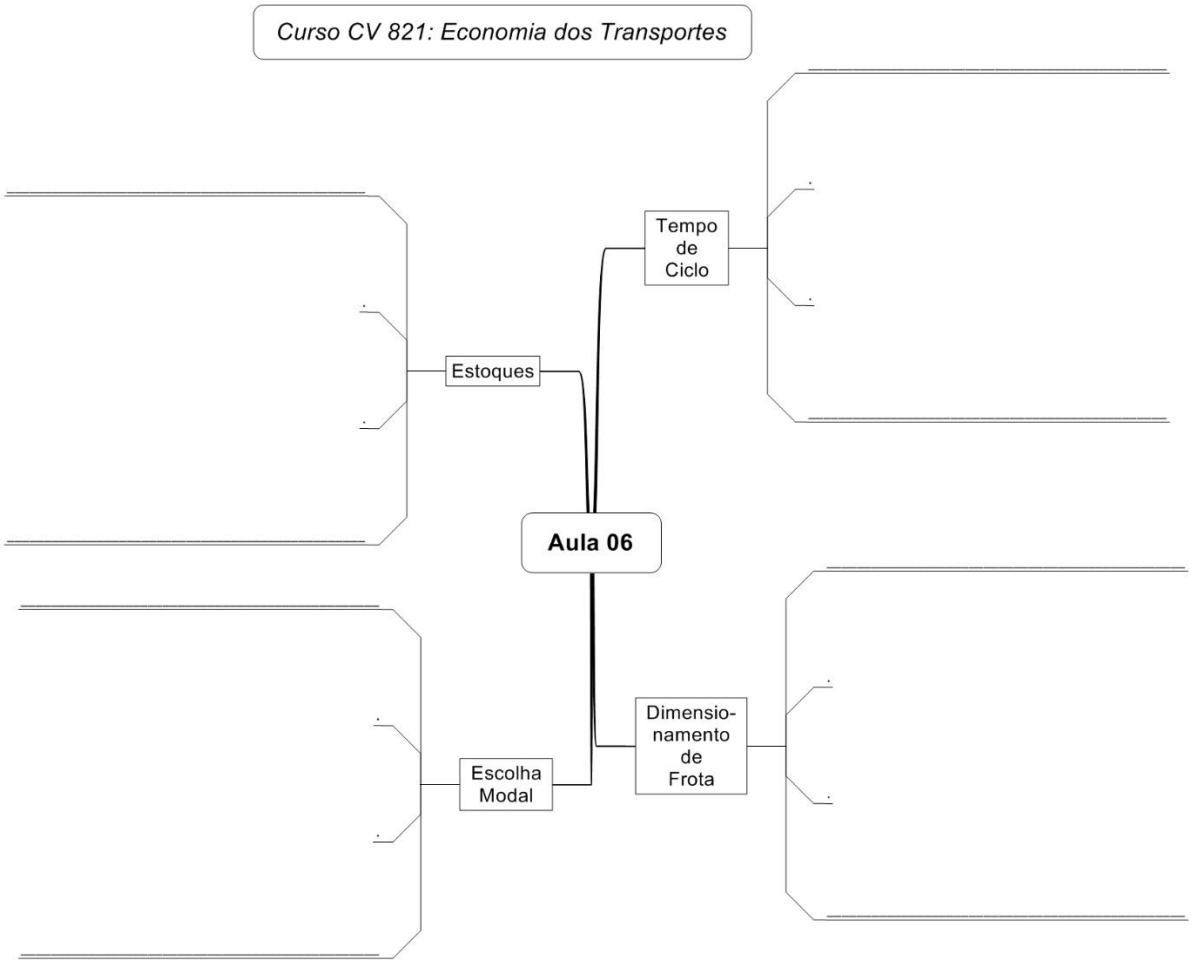
SELF-RECORDING						
Year: 2015				NAME: Robert Silva Almeida		
WHEN			HOW LONG	WHERE	WHAT	SUCCESS
Day/Month	Weekday	Time	Duration	Local	Activity (any, including the classes)	Achieved/Expected
10/Mar	Tue	10 pm	1.5	home: living room	homework - Prof. Goldbert	70/100
11/Mar	Wed	10 pm	0.5	home: bedroom	checking notes of Prof. Mary	90/100
13/Mar	Fri	noon	1.5	school: library	studying for Prof. Chris's test	60/100
16/Mar	Mon	2	2	school	Prof. Chris's test	80/100
17/Mar	Tue	6	3	school	presentation in group: practice	100/100
18/Mar	Wed	2	3	school	Prof. Peter's class: presentation in group	90/100

c) Self-Recording: Template

SELF-RECORDING						
Year:			NAME:			
WHEN			HOW LONG	WHERE	WHAT	SUCCESS
Day/Month	Weekday	Time	Duration	Local	Activity (any, including the classes)	Achieved/Expected

C05. Strategy – Guided Notes using Mind Map

a) Example of one class



ANNEX D – Statistical Analysis

D01. Categorical & Numerical Variables: Undergraduate – Control Groups

Term _	Frequency	Percent
3	67	97.10
5	1	1.45
9	1	1.45

Frequency Missing = 9

Gender	Frequency	Percent
MALE	45	65.22
FEMALE	24	34.78

Frequency Missing = 9

MaritalSt	Frequency	Percent
SINGLE	67	97.10
MARRIED	2	2.90

Frequency Missing = 9

English	Frequency	Percent
YES	69	100.00

Frequency Missing = 9

French	Frequency	Percent
NO	58	84.06
YES	11	15.94

Frequency Missing = 9

Spanish	Frequency	Percent
NO	36	52.17
YES	33	47.83

Frequency Missing = 9

Others	Frequency	Percent
NO	56	81.16
YES	13	18.84

Frequency Missing = 9

NLANG	Frequency	Percent
1	26	37.68
2	29	42.03
3	14	20.29

Frequency Missing = 9

Speak	Frequency	Percent
BASIC	13	18.84
INTERMED	30	43.48
GOOD	26	37.68

Frequency Missing = 9

Read	Frequency	Percent
BASIC	2	2.90
INTERMED	16	23.19
GOOD	51	73.91

Frequency Missing = 9

Write	Frequency	Percent
BASIC	8	11.59
INTERMED	30	43.48
GOOD	31	44.93

Frequency Missing = 9

Listen	Frequency	Percent
BASIC	5	7.25
INTERMED	34	49.28
GOOD	30	43.48

Frequency Missing = 9

Travel	Frequency	Percent
YES	34	49.28
NO	35	50.72

Frequency Missing = 9

Type Travel	Frequency	Percent
STUDY	12	35.29
LEISURE	21	61.76
OTHERS	1	2.94

Ingles Travel	Frequency	Percent
YES	27	79.41
NO	7	20.59

The following tables show the frequency and the variables descriptive statistics for the undergraduate sample 2010 (n=78)

Descriptive Analysis of Categorical Variables for Undergraduate: Control Groups

Descriptive Analysis of Numerical Variables for Undergraduate: Control Groups

VARIABLE	N	AVG	S.D.	MÍN	Q1	MEDIAN	Q3	MAX
Age	69	19.45	1.43	17.00	19.00	19.00	20.00	25.00
COGN1	68	53.90	5.85	38 00	50.00	55.00	57.00	68.00
METAC1	68	72.53	6.96	48.00	68.50	74.50	77.00	82.00
DYSF1	68	17.63	3.13	12.00	15.50	17.00	19.50	27.00
TOT1	68	144.1	11.91	106.0	139.5	146.5	152.0	168.0
COGN2	61	55.36	6.10	44.00	50.00	55.00	61.00	71.00
METAC2	61	70.67	7.86	46.00	66.00	72.00	76.00	86.00
DYSF2	61	16.48	3.04	9.00	15.00	17.00	19.00	24.00
TOT2	61	142.5	12.80	105.0	135.0	142.0	150.0	177.0

D02. Categorical & Numerical Variables: Specialization - Control Groups

The following tables show the frequency and the variables descriptive statistics for the specialization sample - Control Groups (n=30)

Descriptive Analysis of Categorical Variables for Specialization: Control Groups

Gender	Frequency	Percent
MALE	16	57.14
FEMININO	12	42.86

Frequency Missing = 2

MaritalSt	Frequency	Percent
SINGLE	18	64.29
MARRIED	10	35.71

Frequency Missing = 2

English	Frequency	Percent
YES	28	100.00

Frequency Missing = 2

French	Frequency	Percent
NO	23	82.14
YES	5	17.86

Frequency Missing = 2

Espanh	Frequency	Percent
NO	12	42.86
YES	16	57.14

Frequency Missing = 2

Others	Frequency	Percent
NO	22	78.57
YES	6	21.43

Frequency Missing = 2

NLANG	Frequency	Percent
1	7	25.00
2	16	57.14
3	4	14.29
4	1	3.57

Frequency Missing = 2

Falar	Frequency	Percent
SOFRÍVEL	2	7.14
BASIC	4	14.29
INTERMED	8	28.57
GOOD	14	50.00

Frequency Missing = 2

Read	Frequency	Percent
SOFRÍVEL	2	7.14
BASIC	1	3.57
INTERMED	7	25.00
GOOD	18	64.29

Frequency Missing = 2

Write	Frequency	Percent
SOFRÍVEL	2	7.14
BASIC	3	10.71
INTERMED	9	32.14
GOOD	14	50.00

Frequency Missing = 2

Listen	Frequency	Percent
SOFRÍVEL	2	7.14
BASIC	4	14.29
INTERMED	4	14.29
GOOD	18	64.29

Frequency Missing = 2

Travel	Frequency	Percent
YES	19	67.86
NO	9	32.14

Frequency Missing = 2

Type Travel	Frequency	Percent
STUDY	10	52.63
TRABALHO	3	15.79
LEISURE	4	21.05
PROFISSI	1	5.26
OTHERS	1	5.26

Ingles Travel	Frequency	Percent
YES	15	78.95
NO	4	21.05

Especial	Frequency	Percent
YES	9	32.14
NO	19	67.86

Frequency Missing = 2

Descriptive Analysis of Numerical Variables for Specialization: Control Groups

VARIABLE	N	AVG	S.D.	MIN	Q1	MEDIAN	Q3	MAX
Age	28	28.21	5.08	22.00	25.00	26.50	29.50	46.00
COGN1	28	54.64	4.86	45.00	52.00	53.50	59.00	62.00
METAC1	28	72.57	7.52	57.00	70.00	73.00	78.00	85.00
DYSF1	28	18.68	2.21	13.00	17.00	19.00	21.00	22.00
TOT1	28	145.9	11.36	120.0	138.0	148.5	153.0	163.0
COGN2	8	52.75	8.17	42.00	44.00	55.50	59.00	63.00
METAC2	8	72.75	8.19	63.00	66.50	71.50	78.00	87.00
DYSF2	8	19.13	1.55	17.00	17.50	20.00	20.00	21.00
TOT2	8	144.6	15.01	127.0	129.0	148.0	154.5	167.0

D03. Categorical & Numerical Variables: Graduate - Control Groups

The following tables show the frequency and the variables descriptive statistics for the graduate sample: Control Groups (n=29)

Descriptive Analysis of Categorical Variables for Graduate 2010

Gender	Frequency	Percent
MALE	20	71.43
FEMALE	8	28.57

Frequency Missing = 1

MaritalSt	Frequency	Percent
SINGLE	8	28.57
CASADO	20	71.43

Frequency Missing = 1

English	Frequency	Percent
YES	28	100.00

Frequency Missing = 1

French	Frequency	Percent
NO	23	82.14
YES	5	17.86

Frequency Missing = 1

Spanish	Frequency	Percent
NO	13	46.43
YES	15	53.57

Frequency Missing = 1

Others	Frequency	Percent
NO	28	100.00

Frequency Missing = 1

NLANG	Frequency	Percent
1	12	42.86
2	12	42.86
3	4	14.29

Frequency Missing = 1

Speak	Frequency	Percent
SOFRÍVEL	6	21.43
BASIC	5	17.86
INTERMED	8	28.57
GOOD	9	32.14

Frequency Missing = 1

Read	Frequency	Percent
SOFRÍVEL	1	3.57
BASIC	5	17.86
INTERMED	6	21.43
GOOD	16	57.14

Frequency Missing = 1

Write	Frequency	Percent
SOFRÍVEL	2	7.14
BASIC	6	21.43
INTERMED	11	39.29
GOOD	9	32.14

Frequency Missing = 1

Listen	Frequency	Percent
SOFRÍVEL	3	10.71
BASIC	6	21.43
INTERMED	8	28.57
GOOD	11	39.29

Frequency Missing = 1

Travel	Frequency	Percent
YES	18	64.29
NO	10	35.71

Frequency Missing = 1

Type Travel	Frequency	Percent
STUDY	3	16.67
TRABALHO	7	38.89
LEISURE	5	27.78
PROFISSI	2	11.11
OTHERS	1	5.56

Ingles Travel	Frequency	Percent
YES	16	88.89
NO	2	11.11

Especial	Frequency	Percent
YES	16	59.26
NO	11	40.74

Frequency Missing = 2

POSGRAD	Frequency	Percent
MESTRADO	18	64.29
DOUTORAD	10	35.71

Frequency Missing = 1

Descriptive Analysis of Numerical Variables for Graduate: Control Groups

VARIABLE	N	AVG	S.D.	MIN	Q1	MEDIAN	Q3	MAX
Age	28	36.82	8.68	23.00	30.00	36.00	44.50	53.00
COGN1	28	57.46	7.47	41.00	53.00	57.50	63.00	73.00
METAC1	28	74.71	6.90	61.00	70.50	75.00	79.50	87.00
DYSF1	28	19.54	3.27	14.00	17.00	20.00	22.00	25.00
TOT1	28	151.7	13.18	125.0	142.5	152.5	161.5	175.0
COGN2	17	56.29	8.79	32.00	52.00	54.00	63.00	71.00
METAC2	17	71.94	8.84	52.00	67.00	73.00	79.00	88.00
DYSF2	17	18.88	3.60	12.00	16.00	19.00	21.00	25.00
TOT2	17	147.1	17.04	107.0	139.0	147.0	161.0	180.0

D04. Categorical & Numerical Variables: Undergraduate - Experimental Groups

The following tables show the frequency and the variables descriptive statistics for the undergraduate sample: Experimental Groups (n=78)

Descriptive Analysis of Categorical Variables for Undergraduate: Experimental Groups

Term _	Frequency	Percent
1	1	1.33
3	74	98.67

Frequency Missing = 3

Gender	Frequency	Percent
MALE	51	68.00
FEMALE	24	32.00

Frequency Missing = 3

MaritalSt	Frequency	Percent
SINGLE	75	100.00

Frequency Missing = 3

English	Frequency	Percent
NO	1	1.33
YES	74	98.67

Frequency Missing = 3

French	Frequency	Percent
NO	66	88.00
YES	9	12.00

Frequency Missing = 3

Spanish	Frequency	Percent
NO	44	58.67
YES	31	41.33

Frequency Missing = 3

Outras	Frequency	Percent
NO	65	86.67
YES	10	13.33

Frequency Missing = 3

NLANG	Frequency	Percent
0	1	1.33
1	33	44.00
2	32	42.67
3	9	12.00

Frequency Missing = 3

Speak	Frequency	Percent
SOFRÍVEL	4	5.33
BASIC	18	24.00
INTERMED	23	30.67
GOOD	30	40.00

Read	Frequency	Percent
SOFRÍVEL	1	1.33
BASIC	3	4.00
INTERMED	22	29.33
GOOD	49	65.33

Write	Frequency	Percent
SOFRÍVEL	3	4.00
BASIC	11	14.67
INTERMED	30	40.00
GOOD	31	41.33

Listen	Frequency	Percent
SOFRÍVEL	4	5.33
BASIC	11	14.67
INTERMED	28	37.33
GOOD	32	42.67

Travel	Frequency	Percent
YES	30	40.00
NO	45	60.00

Frequency Missing = 3

Type Travel	Frequency	Percent
STUDY	10	33.33
LEISURE	19	63.33
PROFISSI	1	3.33

Ingles Travel	Frequency	Percent
YES	22	73.33
NO	8	26.67

Descriptive Analysis of Numerical Variables for Undergraduate: Experimental Groups

VARIÁVEL	N	AVG	S.D.	MIN	Q1	MEDIAN	Q3	MAX
Age	75	19.47	1.41	17.00	18.00	19.00	20.00	24.00
COGN1	75	53.53	6.07	41.00	50.00	53.00	58.00	68.00
METAC1	75	72.72	6.61	52.00	70.00	73.00	77.00	88.00
DYSF1	75	17.55	3.58	9.00	15.00	18.00	20.00	25.00
TOT1	75	143.8	12.13	118.0	138.0	145.0	150.0	176.0
COGN2	62	53.68	6.65	38.00	49.00	53.00	58.00	71.00
METAC2	62	70.63	7.15	52.00	65.00	70.50	76.00	89.00
DYSF2	62	16.55	3.15	11.00	14.00	16.00	20.00	24.00
TOT2	62	140.9	12.88	112.0	132.0	140.5	150.0	172.0

D05. Categorical & Numerical Variables: Specialization - Experimental Groups

The following tables show the frequency and the variables descriptive statistics for the specialization sample: Experimental Groups (n=37)

Descriptive Analysis of Categorical Variables for Specialization: Experimental Groups

Gender	Frequency	Percent
MALE	9	29.03
FEMALE	22	70.97

Frequency Missing = 6

MaritalSt	Frequency	Percent
SINGLE	17	54.84
MARRIED	14	45.16

Frequency Missing = 6

English	Frequency	Percent
NO	2	6.45
YES	29	93.55

Frequency Missing = 6

French	Frequency	Percent
NO	30	96.77
YES	1	3.23

Frequency Missing = 6

Spanish	Frequency	Percent
NO	18	58.06
YES	13	41.94

Frequency Missing = 6

Others	Frequency	Percent
NO	28	90.32
YES	3	9.68

Frequency Missing = 6

NLANG	Frequency	Percent
0	2	6.45
1	16	51.61
2	10	32.26
3	2	6.45
4	1	3.23

Speak	Frequency	Percent
SOFRÍVEL	4	12.90
BASIC	5	16.13
INTERMED	11	35.48
GOOD	11	35.48

Read	Frequency	Percent
SOFRÍVEL	3	9.68
BASIC	3	9.68
INTERMED	7	22.58
GOOD	18	58.06

Write	Frequency	Percent
SOFRÍVEL	5	16.13
BASIC	5	16.13
INTERMED	8	25.81
GOOD	13	41.94

Listen	Frequency	Percent
SOFRÍVEL	4	12.90
BASIC	4	12.90
INTERMED	7	22.58
GOOD	16	51.61

Travel	Frequency	Percent
YES	15	48.39
NO	16	51.61

Type Travel	Frequency	Percent
STUDY	8	53.33
TRABALHO	4	26.67
LEISURE	3	20.00

Ingles Travel	Frequency	Percent
YES	14	93.33
NO	1	6.67

Especial	Frequency	Percent
YES	4	12.90
NO	27	87.10

Frequency Missing = 6

Descriptive Analysis of Numerical Variables for Specialization: Experimental Groups

VARIABLE	N	AVG	S.D.	MIN	Q1	MEDIAN	Q3	MAX
Age	31	29.03	7.25	21.00	25.00	26.00	32.00	51.00
COGN1	31	57.81	4.62	45.00	55.00	58.00	60.00	67.00
METAC1	31	74.90	6.82	57.00	71.00	75.00	80.00	88.00
DYSF1	31	19.97	2.39	14.00	18.00	20.00	21.00	25.00
TOT1	31	152.7	10.31	122.0	148.0	152.0	161.0	169.0
COGN2	23	54.74	7.53	37.00	52.00	56.00	60.00	64.00
METAC2	23	71.70	7.41	53.00	69.00	73.00	76.00	83.00
DYSF2	23	18.52	3.65	9.00	17.00	19.00	22.00	24.00
TOT2	23	145.0	13.36	111.0	142.0	148.0	153.0	165.0

D06. **Categorical & Numerical Variables: Graduate - Experimental Groups**

The following tables show the frequency and the variables descriptive statistics for the graduate sample Experimental Groups (n=20)

Descriptive Analysis of Categorical Variables for Graduate: Experimental Groups

Gender	Frequency	Percent
MALE	10	62.50
FEMALE	6	37.50

Frequency Missing = 4

MaritalSt	Frequency	Percent
SINGLE	9	60.00
MARRIED	6	40.00

Frequency Missing = 5

English	Frequency	Percent
YES	16	100.00

Frequency Missing = 4

French	Frequency	Percent
NO	16	100.00

Frequency Missing = 4

Spanish	Frequency	Percent
NO	5	31.25
YES	11	68.75

Frequency Missing = 4

Others	Frequency	Percent
NO	12	75.00
YES	4	25.00

Frequency Missing = 4

NLANG	Frequency	Percent
1	4	25.00
2	9	56.25
3	3	18.75

Frequency Missing = 4

Speak	Frequency	Percent
BASIC	3	18.75
INTERMED	7	43.75
GOOD	6	37.50

Read	Frequency	Percent
INTERMED	6	37.50
GOOD	10	62.50

Write	Frequency	Percent
SOFRÍVEL	2	12.50
BASIC	1	6.25
INTERMED	8	50.00
GOOD	5	31.25

Listen	Frequency	Percent
BASIC	2	12.50
INTERMED	3	18.75
GOOD	11	68.75

Travel	Frequency	Percent
YES	14	87.50
NO	2	12.50

Frequency Missing = 4

Type Travel	Frequency	Percent
STUDY	3	21.43
TRABALHO	4	28.57
LEISURE	7	50.00

Ingles Travel	Frequency	Percent
YES	9	64.29
NO	5	35.71

Especial	Frequency	Percent
YES	9	100.00

Frequency Missing = 11

POSGRAD	Frequency	Percent
MESTRADO	12	80.00
DOUTORAD	3	20.00

Frequency Missing = 5

Descriptive Analysis of Numerical Variables for Graduate: Experimental Groups

VARIABLE	N	AVG	S.D.	MIN	Q1	MEDIAN	Q3	MAX
Age	16	33.00	9.17	23.00	26.50	30.00	38.00	54.00
COGN1	16	56.81	6.94	47.00	51.50	55.50	62.00	70.00
METAC1	16	74.13	8.34	58.00	67.50	77.00	80.00	86.00
DYSF1	16	19.00	4.03	10.00	16.50	19.00	21.50	26.00
TOT1	16	149.9	15.83	119.0	136.0	157.0	162.0	176.0
COGN2	15	54.80	5.70	42.00	51.00	56.00	58.00	64.00
METAC2	15	72.07	5.64	59.00	67.00	73.00	77.00	79.00
DYSF2	15	18.40	1.76	15.00	17.00	18.00	20.00	21.00
TOT2	15	145.3	10.83	122.0	136.0	148.0	155.0	158.0

D07. Internal Consistency Analysis of the Scale (Cronbach´s alpha)

Group / Domain	Number of Items	Coeficient*	Items with lower consistency	Correlation with the Total**	Coeficient* (after consecutive withdrawn of items)
Undergrad 2010 Start / Total (n=68)	49	**0.792**	Q32	-0.108	**0.799**
Undergrad 2010 Start / Cognitive (n=68)	19	0.617	Q47	-0.054	0.640
Undergrad 2010 Start / MetaCognitive (n=68)	23	**0.741**	Q40	-0.129	**0.761**
Undergrad 2010 Start / Dysfunctional (n=68)	7	0.576	Q36	0.188	0.576
Undergrad 2010 Final / Total (n=61)	49	**0.825**	Q47	-0.204	**0.834**
Undergrad 2010 Final / Cognitive (n=61)	19	0.691	Q47	-0.066	**0.712**
Undergrad 2010 Final / MetaCognitive (n=61)	23	**0.804**	Q19	0.110	**0.808**
Undergrad 2010 Final / Dysfunctional (n=61)	7	0.565	Q32	0.115	0.589
Spec 2010 Start / Total (n=28)	49	**0.801**	Q32	-0.198	**0.810**
Spec 2010 Start / Cognitive (n=28)	19	0.499	Q5	-0.189	0.548
Spec 2010 Start / MetaCognitive (n=28)	23	**0.808**	Q12	0.016	**0.817**
Spec 2010 Start / Dysfunctional (n=28)	7	0.162	Q39	-0.340	0.417
Graduate 2010 Start / Total (n=28)	49	**0.848**	Q30	-0.397	**0.859**
Graduate 2010 Start / Cognitive (n=28)	19	**0.791**	Q41	-0.133	**0.811**
Graduate 2010 Start / MetaCognitive (n=28)	23	**0.785**	Q40	0.022	**0.794**
Graduate 2010 Start / Dysfunctional (n=28)	7	0.622	Q32	0.088	0.660
Graduate 2010 Final / Total (n=17)	49	**0.914**	Q30	-0.240	**0.919**
Graduate 2010 Final / Cognitive (n=17)	19	**0.881**	Q47	0.187	**0.885**
Graduate 2010 Final / MetaCognitive (n=17)	23	**0.872**	Q12	-0.028	**0.880**
Graduate 2010 Final / Dysfunctional (n=17)	7	0.687	Q32	-0.001	0.751
Undergrad 2011 Start / Total (n=75)	49	**0.801**	Q47	-0.292	**0.813**
Undergrad 2011 Start / Cognitive (n=75)	19	0.678	Q47	-0.193	**0.712**
Undergrad 2011 Start / MetaCognitive (n=75)	23	**0.728**	Q19	0.018	**0.738**
Undergrad 2011 Start / Dysfunctional (n=75)	7	0.680	Q32	0.052	**0.732**
Undergrad 2011 Final / Total (n=62)	49	**0.803**	Q32	-0.306	**0.840**
Undergrad 2011 Final / Cognitive (n=62)	19	**0.748**	Q42	-0.012	**0.763**
Undergrad 2011 Final / MetaCognitive (n=62)	23	**0.763**	Q12	0.047	**0.771**
Undergrad 2011 Final / Dysfunctional (n=62)	7	0.563	Q32	-0.087	0.653
Spec 2011 Start / Total (n=31)	49	**0.778**	Q32	-0.309	**0.792**
Spec 2011 Start / Cognitive (n=31)	19	0.517	Q47	-0.096	0.549
Spec 2011 Start / MetaCognitive (n=31)	23	**0.792**	Q3	0.013	**0.801**
Spec 2011 Start / Dysfunctional (n=31)	7	0.410	Q32	-0.218	0.561
Spec 2011 Final / Total (n=23)	49	**0.840**	Q32	-0.450	**0.852**
Spec 2011 Final / Cognitive (n=23)	19	**0.778**	Q2	-0.170	**0.802**
Spec 2011 Final / MetaCognitive (n=23)	23	**0.798**	Q16	-0.166	**0.816**
Spec 2011 Final / Dysfunctional (n=23)	7	**0.739**	Q32	-0.153	**0.830**
Graduate 2011 Start / Total (n=16)	49	**0.876**	Q41	-0.139	**0.878**
Graduate 2011 Start / Cognitive (n=16)	19	**0.759**	Q41	-0.240	**0.789**
Graduate 2011 Start / MetaCognitive (n=16)	23	**0.809**	Q12	-0.140	**0.821**
Graduate 2011 Start / Dysfunctional (n=16)	7	0.694	Q36	0.151	**0.724**
Graduate 2011 Final / Total (n=15)	49	**0.777**	Q45	-0.606	**0.800**
Graduate 2011 Final / Cognitive (n=15)	19	0.618	Q41	-0.202	0.658
Graduate 2011 Final / MetaCognitive (n=15)	23	0.690	Q45	-0.617	**0.750**
Graduate 2011 Final / Dysfunctional (n=15)	7	-0.363	Q39	-0.334	-0.006

D08. Cross-Sectional Analysis Comparing Control and Experimental Groups

GROUP	VARIABLE	N	AVG	S.D.	MIN	MEDIAN	MAX	P-VALUE*
UNDERGRD/10	COGN1	68	53.90	5.85	38.00	55.00	68.00	P=0.722
	METAC1	68	72.53	6.96	48.00	74.50	82.00	P=0.627
	DYSF1	68	17.63	3.13	12.00	17.00	27.00	P=0.916
	TOT1	68	144.06	11.91	106.00	146.50	168.00	P=0.487
UNDERGRD/11	COGN1	75	53.53	6.07	41.00	53.00	68.00	
	METAC1	75	72.72	6.61	52.00	73.00	88.00	
	DYSF1	75	17.55	3.58	9.00	18.00	25.00	
	TOT1	75	143.80	12.13	118.00	145.00	176.00	

GROUP	VARIABLE	N	AVG	S.D.	MIN	MEDIAN	MAX	P-VALUE*
SPEC/10	COGN1	28	54.64	4.86	45.00	53.50	62.00	**P=0.023**
	METAC1	28	72.57	7.52	57.00	73.00	85.00	P=0.257
	DYSF1	28	18.68	2.21	13.00	19.00	22.00	P=0.057
	TOT1	28	145.89	11.36	120.00	148.50	163.00	**P=0.019**
SPEC/11	COGN1	31	57.81	4.62	45.00	58.00	67.00	
	METAC1	31	74.90	6.82	57.00	75.00	88.00	
	DYSF1	31	19.97	2.39	14.00	20.00	25.00	
	TOT1	31	152.68	10.31	122.00	152.00	169.00	

GROUP	VARIABLE	N	AVG	S.D.	MIN	MEDIAN	MAX	P-VALUE*
GRAD/10	COGN1	28	57.46	7.47	41.00	57.50	73.00	P=0.625
	METAC1	28	74.71	6.90	61.00	75.00	87.00	P=0.951
	DYSF1	28	19.54	3.27	14.00	20.00	25.00	P=0.677
	TOT1	28	151.71	13.18	125.00	152.50	175.00	P=0.845
GRAD/11	COGN1	16	56.81	6.94	47.00	55.50	70.00	
	METAC1	16	74.13	8.34	58.00	77.00	86.00	
	DYSF1	16	19.00	4.03	10.00	19.00	26.00	
	TOT1	16	149.94	15.83	119.00	157.00	176.00	

GROUP	VARIABLE	N	AVG	S.D.	MIN	MEDIAN	MAX	P-VALUE*
UNDERGRD/10	COGN2	61	55.36	6.10	44.00	55.00	71.00	P=0.172
	METAC2	61	70.67	7.86	46.00	72.00	86.00	P=0.750
	DYSF2	61	16.48	3.04	9.00	17.00	24.00	P=0.917
	TOT2	61	142.51	12.80	105.00	142.00	177.00	P=0.421
UNDERGRD/11	COGN2	62	53.68	6.65	38.00	53.00	71.00	
	METAC2	62	70.63	7.15	52.00	70.50	89.00	
	DYSF2	62	16.55	3.15	11.00	16.00	24.00	
	TOT2	62	140.85	12.88	112.00	140.50	172.00	

GROUP	VARIABLE	N	AVG	S.D.	MIN	MEDIAN	MAX	P-VALUE*
SPEC/10	COGN2	8	52.75	8.17	42.00	55.50	63.00	P=0.667
	METAC2	8	72.75	8.19	63.00	71.50	87.00	P=0.982
	DYSF2	8	19.13	1.55	17.00	20.00	21.00	P=0.649
	TOT2	8	144.63	15.01	127.00	148.00	167.00	P=0.946
SPEC/11	COGN2	23	54.74	7.53	37.00	56.00	64.00	
	METAC2	23	71.70	7.41	53.00	73.00	83.00	
	DYSF2	23	18.52	3.65	9.00	19.00	24.00	
	TOT2	23	144.96	13.36	111.00	148.00	165.00	

GROUP	VARIABLE	N	AVG	S.D.	MIN	MEDIAN	MAX	P-VALUE*
POSGR/10	COGN2	17	56.29	8.79	32.00	54.00	71.00	P=0.496
	METAC2	17	71.94	8.84	52.00	73.00	88.00	P=0.895
	DYSF2	17	18.88	3.60	12.00	19.00	25.00	P=0.517
	TOT2	17	147.12	17.04	107.00	147.00	180.00	P=0.692
GRAD/11	COGN2	15	54.80	5.70	42.00	56.00	64.00	
	METAC2	15	72.07	5.64	59.00	73.00	79.00	
	DYSF2	15	18.40	1.76	15.00	18.00	21.00	
	TOT2	15	145.27	10.83	122.00	148.00	158.00	

D09. Longitudinal Analysis Comparing Pre-test/Post-test of each Year

UNDERGRADUATE 2010

VARIABLE	N	AVG	S.D.	MIN	MEDIAN	MAX	P-VALUE*
COGN1	51	53.73	5.45	38.00	55.00	65.00	
COGN2	51	55.45	5.60	44.00	56.00	66.00	
DIFCOGN	51	1.73	5.37	-9.00	2.00	19.00	**P=0.041**
METAC1	51	72.00	7.73	48.00	74.00	82.00	
METAC2	51	71.08	7.36	46.00	72.00	82.00	
DIFMETAC	51	-0.92	5.07	-10.00	-1.00	15.00	P=0.056
DYSF1	51	17.24	3.00	12.00	17.00	27.00	
DYSF2	51	16.29	3.11	9.00	16.00	24.00	
DIFDYSF	51	-0.94	2.52	-8.00	-1.00	7.00	**P=0.004**
TOT1	51	142.96	12.77	106.00	146.00	168.00	
TOT2	51	142.82	12.10	105.00	142.00	166.00	
DIFTOT	51	-0.14	9.44	-21.00	-2.00	34.00	P=0.487

SPECIALIZATION 2010

VARIABLE	N	AVG	S.D.	MIN	MEDIAN	MAX	P-VALUE*
COGN1	6	55.33	4.84	49.00	55.00	62.00	
COGN2	6	55.67	7.26	42.00	57.50	63.00	
DIFCOGN	6	0.33	3.78	-7.00	1.50	3.00	P=0.563
METAC1	6	71.67	6.71	61.00	72.00	82.00	
METAC2	6	75.67	7.26	68.00	74.50	87.00	
DIFMETAC	6	4.00	4.98	-5.00	4.50	9.00	P=0.188
DYSF1	6	19.17	2.14	16.00	19.50	21.00	
DYSF2	6	18.83	1.72	17.00	19.00	21.00	
DIFDYSF	6	-0.33	2.07	-4.00	0.00	2.00	P=0.999
TOT1	6	146.17	11.11	128.00	148.50	160.00	
TOT2	6	150.17	12.95	129.00	148.50	167.00	
DIFTOT	6	4.00	4.73	-3.00	4.50	9.00	P=0.156

GRADUATE 2010

VARIABLE	N	AVG	S.D.	MIN	MEDIAN	MAX	P-VALUE*
COGN1	16	58.31	6.74	41.00	59.50	67.00	
COGN2	16	56.50	9.04	32.00	55.50	71.00	
DIFCOGN	16	-1.81	3.89	-9.00	-2.00	6.00	P=0.080
METAC1	16	74.81	6.12	65.00	74.00	86.00	
METAC2	16	71.75	9.10	52.00	73.00	88.00	
DIFMETAC	16	-3.06	4.97	-13.00	-4.00	4.00	**P=0.022**
DYSF1	16	19.75	3.07	14.00	20.00	25.00	
DYSF2	16	19.31	3.24	14.00	19.50	25.00	
DIFDYSF	16	-0.44	2.68	-7.00	0.00	3.00	P=0.680
TOT1	16	152.88	12.38	128.00	152.50	173.00	
TOT2	16	147.56	17.50	107.00	149.50	180.00	
DIFTOT	16	-5.31	8.00	-21.00	-7.00	8.00	**P=0.022**

Note: P-Value refers to the Wilcoxon test for related samples for variable comparisons between periods

D09. Longitudinal Analysis Comparing Pre-test/Post-test of each Year (cont.)

UNDERGRADUATE 2011

VARIABLE	N	AVG	S.D.	MIN	MEDIAN	MAX	P-VALUE*
COGN1	59	54.02	5.83	41.00	53.00	65.00	
COGN2	59	53.31	6.18	38.00	53.00	68.00	
DIFCOGN	59	-0.71	5.18	-16.00	-1.00	11.00	P=0.281
METAC1	59	72.63	7.09	52.00	73.00	88.00	
METAC2	59	70.24	6.73	52.00	70.00	82.00	
DIFMETAC	59	-2.39	5.46	-14.00	-2.00	10.00	**P=0.002**
DYSF1	59	17.32	3.58	9.00	18.00	25.00	
DYSF2	59	16.53	3.11	11.00	16.00	24.00	
DIFDYSF	59	-0.80	2.87	-7.00	-1.00	6.00	**P=0.040**
TOT1	59	143.97	12.35	118.00	146.00	175.00	
TOT2	59	140.07	11.97	112.00	140.00	166.00	
DIFTOT	59	-3.90	9.53	-26.00	-5.00	20.00	**P=0.002**

SPECIALIZATION 2011

VARIABLE	N	AVG	S.D.	MIN	MEDIAN	MAX	P-VALUE*
COGN1	17	58.06	5.67	45.00	59.00	67.00	
COGN2	17	54.94	7.64	37.00	56.00	64.00	
DIFCOGN	17	-3.12	3.90	-15.00	-2.00	3.00	**P=0.002**
METAC1	17	74.53	7.84	57.00	74.00	88.00	
METAC2	17	70.94	6.13	55.00	72.00	83.00	
DIFMETAC	17	-3.59	4.82	-15.00	-3.00	4.00	**P=0.011**
DYSF1	17	19.59	2.60	14.00	20.00	25.00	
DYSF2	17	18.88	3.82	9.00	19.00	24.00	
DIFDYSF	17	-0.71	2.87	-7.00	0.00	4.00	P=0.392
TOT1	17	152.18	12.41	122.00	152.00	169.00	
TOT2	17	144.76	11.87	118.00	147.00	164.00	
DIFTOT	17	-7.41	4.49	-17.00	-7.00	-1.00	**P<0.001**

GRADUATE 2011

VARIABLE	N	AVG	S.D.	MIN	MEDIAN	MAX	P-VALUE*
COGN1	11	55.36	6.05	47.00	55.00	66.00	
COGN2	11	53.36	5.26	42.00	56.00	59.00	
DIFCOGN	11	-2.00	5.35	-10.00	0.00	5.00	P=0.266
METAC1	11	75.00	6.72	63.00	79.00	83.00	
METAC2	11	71.91	6.06	59.00	73.00	79.00	
DIFMETAC	11	-3.09	6.93	-14.00	-5.00	14.00	P=0.067
DYSF1	11	20.09	3.33	15.00	19.00	26.00	
DYSF2	11	18.45	1.97	15.00	18.00	21.00	
DIFDYSF	11	-1.64	2.16	-6.00	-1.00	1.00	**P=0.043**
TOT1	11	150.45	12.51	133.00	159.00	164.00	
TOT2	11	143.73	11.30	122.00	148.00	156.00	
DIFTOT	11	-6.73	10.20	-19.00	-10.00	15.00	P=0.065

Note: P-Value refers to the Wilcoxon test for related samples for variable comparisons between periods

D10. Cross-Sectional Analysis Among The Courses

GROUP	VARIABLE	N	AVG	S.D.	MIN	MEDIAN	MAX	P-VALUE*
UNDERGRD/10	COGN1	68	53.90	5.85	38.00	55.00	68.00	P=0.054
	METAC1	68	72.53	6.96	48.00	74.50	82.00	P=0.583
	DYSF1	68	17.63	3.13	12.00	17.00	27.00	**P=0.012 (A)**
	TOT1	68	144.06	11.91	106.00	146.50	168.00	**P=0.042 (A)**
SPEC/10	COGN1	28	54.64	4.86	45.00	53.50	62.00	
	METAC1	28	72.57	7.52	57.00	73.00	85.00	
	DYSF1	28	18.68	2.21	13.00	19.00	22.00	
	TOT1	28	145.89	11.36	120.00	148.50	163.00	
GRAD/10	COGN1	28	57.46	7.47	41.00	57.50	73.00	
	METAC1	28	74.71	6.90	61.00	75.00	87.00	
	DYSF1	28	19.54	3.27	14.00	20.00	25.00	
	TOT1	28	151.71	13.18	125.00	152.50	175.00	

DIFERENÇAS SIGNIFICATIVAS:

(A) 'UNDERGRAD'≠'GRAD'.

GROUP	VARIABLE	N	AVG	S.D.	MIN	MEDIAN	MAX	P-VALUE*
UNDERGRD/11	COGN1	75	53.53	6.07	41.00	53.00	68.00	**P=0.002 (A)**
	METAC1	75	72.72	6.61	52.00	73.00	88.00	P=0.190
	DYSF1	75	17.55	3.58	9.00	18.00	25.00	**P=0.003 (A)**
	TOT1	75	143.80	12.13	118.00	145.00	176.00	**P<0.001 (A)**
SPEC/11	COGN1	31	57.81	4.62	45.00	58.00	67.00	
	METAC1	31	74.90	6.82	57.00	75.00	88.00	
	DYSF1	31	19.97	2.39	14.00	20.00	25.00	
	TOT1	31	152.68	10.31	122.00	152.00	169.00	
GRAD/11	COGN1	16	56.81	6.94	47.00	55.50	70.00	
	METAC1	16	74.13	8.34	58.00	77.00	86.00	
	DYSF1	16	19.00	4.03	10.00	19.00	26.00	
	TOT1	16	149.94	15.83	119.00	157.00	176.00	

DIFERENÇAS SIGNIFICATIVAS:

(A) 'UNDERGRAD'≠'SPEC'.

GROUP	VARIABLE	N	AVG	S.D.	MIN	MEDIAN	MAX	P-VALUE*
UNDERGRD/10	COGN2	61	55.36	6.10	44.00	55.00	71.00	P=0.509
	METAC2	61	70.67	7.86	46.00	72.00	86.00	P=0.806
	DYSF2	61	16.48	3.04	9.00	17.00	24.00	**P=0.003 (A)**
	TOT2	61	142.51	12.80	105.00	142.00	177.00	P=0.480
SPEC/10	COGN2	8	52.75	8.17	42.00	55.50	63.00	
	METAC2	8	72.75	8.19	63.00	71.50	87.00	
	DYSF2	8	19.13	1.55	17.00	20.00	21.00	
	TOT2	8	144.63	15.01	127.00	148.00	167.00	
GRAD/10	COGN2	17	56.29	8.79	32.00	54.00	71.00	
	METAC2	17	71.94	8.84	52.00	73.00	88.00	
	DYSF2	17	18.88	3.60	12.00	19.00	25.00	
	TOT2	17	147.12	17.04	107.00	147.00	180.00	

DIFERENÇAS SIGNIFICATIVAS:

(A) 'UNDERGRAD'≠'SPEC'.

GROUP	VARIABLE	N	AVG	S.D.	MIN	MEDIAN	MAX	P-VALUE*
UNDERGRD/11	COGN2	62	53.68	6.65	38.00	53.00	71.00	P=0.364
	METAC2	62	70.63	7.15	52.00	70.50	89.00	P=0.549
	DYSF2	62	16.55	3.15	11.00	16.00	24.00	**P=0.009 (A)**
	TOT2	62	140.85	12.88	112.00	140.50	172.00	P=0.165
SPEC/11	COGN2	23	54.74	7.53	37.00	56.00	64.00	
	METAC2	23	71.70	7.41	53.00	73.00	83.00	
	DYSF2	23	18.52	3.65	9.00	19.00	24.00	
	TOT2	23	144.96	13.36	111.00	148.00	165.00	
GRAD/11	COGN2	15	54.80	5.70	42.00	56.00	64.00	
	METAC2	15	72.07	5.64	59.00	73.00	79.00	
	DYSF2	15	18.40	1.76	15.00	18.00	21.00	
	TOT2	15	145.27	10.83	122.00	148.00	158.00	

DIFERENÇAS SIGNIFICATIVAS:

(A) 'UNDERGRAD'≠'SPEC', 'UNDERGRAD'≠'GRAD'.

ANNEX E – Focus Group Meeting Discussions

Q1	What is your favorite way to study?
	Most of the students answered: *"It depends on the available material for the student"; and "I like to make exercises";* Some students added: *"I also like to study the theory"; and "I also like to make a summary of the class";* One student answered: *"I use the book a lot and I make a summary of the class using the mind map".*
Q2	Do you study all disciplines in the same way?
	All students answered: *"NO"*
Q3	How do you choose the way you study? Does it depend on the teacher or the discipline?
	"For the classes involving more theories, I use mind map"; "It depends on what the teacher delivers. I study theory if the teacher teaches more theory; otherwise I prefer to do exercises"; "It depends on the teacher's behavior. If the teacher is too good and if he does not hold our attention, does not set rules, I do not study. On the contrary, when the teacher is demanding I engage to the class"; "When we know that the teacher gives the same questions on the assessments, I study only these ones"; "The time that you have available to study affects the way you study. We have many tests in the same week. I study those that I have more difficulty"; "We have 10 or 11 disciplines. We cannot study all disciplines we would like to. I try to optimize my time"; "I also prioritize the most difficult ones"; "It is a little of what has been said. You have to plan your study in the right way".
Q4	Has anybody ever talked to you about different ways to study?
	This answer was general: *"No, never"* *"I do not remember if this happened here in Brazil. I studied different techniques abroad where I had an exchange program. That included mind map, dynamic reading, etc. There were many courses given by the university. Any student could enrol in any of them"; "I had an exchange program abroad and I also had some courses like these ones. I also studied how to take notes. In the university where I studied some of the other disciplines, teachers also taught some techniques, strategies about how to learn and study"; "That would be very interesting if we could receive the material in advance; for example, one week in advance. It does not happen; a few times, we receive one week in advance. It should be longer"; "When we receive material here, is on the day before the class and sometimes days after the class. When I studied in my exchange program abroad, I received the class material one week in advance. It was impossible to follow the class without studying the material".*
Q5	Do you ask the teacher for material in advance?
	Everybody answered: *"NO"*
Q6	Do you give feedback to teachers?
	"Talking to the teacher is very difficult. So, if the class is not good, we complain at the end of the term in the general evaluation report from Unicamp"; "I am not so sure that the teachers would accept our demands like this"; "I am sure they would not accept"; "If the teachers are open, I talk, I ask for things. I had one teacher that asked for our feedback. That was an exception"; "If the classroom has many students, like 80, it is not possible to give feedback to teachers. It is difficult to create a link with the teacher and exchange ideas. If the classroom has 15 or 20 students, it is possible to do this"; Everybody agreed with this explanation: *"There are teachers that when they are asked anything they get very hostile. It has already happened to me when I tried to talk to a teacher about my task. It was unbelievable". "There are also teachers that, at the end of the term they ask us if we liked the format of the class and if we had any suggestions".*
Q7	Talk about your favorite ways to follow a class (in the classroom).
	"I do not like to take notes in class. I borrow the notes from my classmates and make some photocopies"; "I have some difficulties in paying attention to classes. A long class is hard for me, unless I have received some material in advance. Every class is a big challenge for me. I always take note otherwise I will do something else that will distract me". *"I have difficulties in paying attention to classes. There are a few exceptions. I pay attention only to those that I have interest and in the other disciplines I borrow my classmates' notes and study on my own"; "If the subject has some practice it is more interesting for me, otherwise I get sleepy. It also depends on the classroom. Some are awful, very hot; an auditorium should never be a classroom because the desks are not appropriate; it is very hard for us to lay our notebooks and take notes"; "In my opinion the teacher makes the difference. I have already attended classes with different formats. Even not liking the subject and watching only slides, which is boring, some teachers can convert these into great classes. Some teachers understand what we need. I had a teacher like this"; "As my native language is Spanish, I record the class and listen to it when I am at home".*

ANNEX E – Focus Group Meeting Discussions (cont.)

Q8	What do you prefer: a 3-hour class or a 1-hour class?
	The participants were divided with this question (50%). *"I'd rather have a 3-hour class. I do not wish to come 3 times to watch a 1-hour class. I can have more contact with the discipline in a 3-hour class"; "I prefer a 3-hour class because I have more contact with the subject. One hour is too short"; "I prefer 1-hour class because I would not pay attention to a long class"; "I believe that 1-hour class is too short. Sometimes the teacher arrives late, or there is a problem with the computer, and then the class is already over. I believe that the ideal would be 1.5 hours".*
Q9	Which terms do you use as meanings of different ways of studying? (e.g. strategy, method, tactic, technique, etc.)
	Everybody answered: *"We do not use any of them because we do not know".*
Q10	How was it for you to use the mind map in the 'Transport Economics' discipline? (some copies of "Guided notes using mind map" of one class were handed out to the students at this moment)
	"I think it was to show an organization of the main topics of that class"; "I did not use the map"; "I did not understand how to use this form. I did not understand what these lines (branches) in each block were for"; "I liked the idea but I created my own map"; "I had the same problem. I created my own map"; "I also created my own map. I did not follow necessarily the mind maps I received"; "I have not used any of them".
Q11	Has anybody asked the teacher for help, and that you did not understand what mind map was for?".
	Everybody answered: *"No, we have not"*.
Q12	Has the use of the mind map made the teaching-learning simpler, easier?
	Everybody agreed. *"Everyone should make their own maps".* *"It made no difference for me"; "I think it was a great innitiative from the teacher to use it in class, even when I preferred to use my own map"; "I think we should have had much more orientation about the purpose of mind map in the class, and how to use it. I used it a little. I would have used more and be more motivated if I had had more explanation about it"; "I believe that there should be more explanations about the topics and branches in the mind map, otherwise they do not make any sense"; "We should create our own";* Everybody agreed with this explanation: *"I believe that in the beginning of the course the teacher should have explained and talked in details about the mind map repeatedly, trying to explain that it was a learning strategy and how it worked. Doing so I believe that I would have enjoyed using it". "If you explain how to use it, explain the technique to use it then the students get more interested in it and more motivated"; "I thought it was a task and that we should give it back at the end of the class".*
Q13	Is there anything else you would like to comment about ways of studying?
	"Regarding evaluation, most of the teachers have 3 different ways of evaluation: two tests, one project and one seminar. I believe this is too much"; "I agree too. Our course is the one, which has the heaviest load in the university. We have too many disciplines".
Q14	What do you thing about the use of a media, as a blog, or whatsapp, as a strategy for learning?
	"Blog is not common anymore. We have some groups in Facebook"; "Yes, we share ideas and doubts in Facebook groups"; "We use also whatsapp but for general things. When we have doubts about the school we use Facebook groups".

ANNEX F – Presented-XL IGIP2011–International Symposium-Engineering Education (Brazil)

March, 27th to 30th 2011

APLICAÇÃO DE ESTRATÉGIAS DE APRENDIZAGEM AUTORREGULADA EM ALUNOS DA GRADUAÇÃO, PÓS-GRADUAÇÃO E ESPECIALIZAÇÃO DA ENGENHARIA CIVIL DA UNIVERSIDADE ESTADUAL DE CAMPINAS – UNICAMP

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Abstract — This paper aims at the implementation of learning strategies for undergraduate, graduate, and specialization students of Civil Engineering of Universidade Estadual de Campinas – Unicamp. A questionnaire "Scale of Evaluation of learning Strategies" was administered in the first term of 2010, aiming at identifying the student´s cognitive and metacognitive strategies, which together with their grades make it possible to understand the student performance in that term. In 2011 this questionnaire will be administered in the same courses, and the teachers, with the current strategies of the students, will be able to organize interviews, launching the Diagnose-Phase, aiming at gathering the student´s motivational difficulties, and strategies. In the Development-Phase, the teacher will teach new strategies and will reinforce the current ones. The project aims at strengthening the capacity of the student by increasing his strategy series making him able to use self-regulation resources.

Index Terms — Self-Regulated Learning, Learning strategies, Engineering Learning, Engineering Education

O ponto central deste trabalho é a aprendizagem autorregulada (AAR), definida como processos proativos que os alunos utilizam para adquirirem habilidades acadêmicas, tais como: estabelecimento de metas, escolha e utilização de estratégias e o próprio automonitoramento da eficiência. AAR tem-se tornado um construto chave na educação nos últimos anos [1]. Há pouca dúvida que a AAR tenha um papel central na influência da aprendizagem e na realização dentro da escola e fora dela. De acordo com [3] a autorregulação é um processo complexo que integra variáveis motivacionais e auto-processos e envolve os estudantes, que proativamente direcionam comportamentos e estratégias para a realização de metas auto-estabelecidas. De acordo com [2], a Autoeficácia tem explicado as variações na motivação pessoal para controlar as realizações de alguém. Do ponto de vista da Teoria Social Cognitiva, os processos autorregulatórios e suas crenças, manifestam-se em três formas cíclicas: (a) pensamento antecipatório, que se refere a processos que precedem os esforços para atuar, criando condições para que o comportamento ocorra; (b) controle de realização ou vontade, que envolve processos que ocorrem durante os esforços que afetam a atenção e ação e (c) processos de auto-reflexão, que ocorrem após os esforços de realização e que influenciam a resposta de um indivíduo em relação àquela experiência. Essas auto-reflexões influenciam o pensamento antecipatório dos esforços para concretizar a ação, completando assim o ciclo autorregulatório. Utilizou-se o instrumento "Escala de Avaliação de Estratégias de aprendizagem" (49 itens, escala Likert, com opções: "sempre", "às vezes", "raramente" e "nunca"), de Boruchovitch & Santos (2008), para avaliar a utilização de estratégias cognitivas e metacognitivas de aprendizagem pelos alunos. A pontuação máxima possível na escala é de 196, mínima de 49. Resultados Parciais: alunos de Graduação (N=94), pontuação mínima=106, máxima=168, M=142,27 e Md=144 e DP=11,88. Pós-Graduação (N=28), mín.=125 e max.=175, M=151,39 e Md=153 e DP=13,32. Especialização (N=40), mín.=120, max.=165, M=145,40 e Md=148 e DP=10,96. Quanto às notas: Graduação, M=6,07 e Md=6,38 e DP=1,60; Pós-Graduação, M=4,14 e Md=3,78 e DP=2,36; Especialização, M=8,14 e Md=8,00 e DP=1,13; Continuidade do trabalho: em 2011, o mesmo questionário será aplicado nos mesmos cursos, em fases pré e pós-intervenção, a ser realizada pelos professores nas salas de aula, através da implementação de novas estratégias cognitivas e metacognitivas para o fortalecimento dos alunos.

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ANNEX G – III Seminário de Inovações Curriculares-2011-POSTER-Dec12-14 2011

APRENDIZAGEM AUTORREGULADA dos ALUNOS de DISCIPLINAS da GRADUAÇÃO, PÓS-GRADUAÇÃO e ESPECIALIZAÇÃO da ENGENHARIA CIVIL

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Introdução

As atuais exigências do mercado de trabalho do engenheiro civil, requerendo novas habilidades e conhecimentos, apontam para a necessidade de métodos de ensino-aprendizagem mais efetivos. A Aprendizagem Autorregulada é definida como processos pro-ativos que os alunos utilizam para adquirirem habilidade acadêmica, auto-motivação, auto-monitoramento e também para cultivar a idéia de eles mesmos terem o controle do sucesso acadêmico e do processo de aprendizagem. O processo de Autorregulação está presente nas pessoas ao longo da vida. O estudo tem como objetivo avaliar a utilização de estratégias de aprendizagem, baseado no Modelo Cíclico da Aprendizagem Autorregulada de Barry J. Zimmerman: anotações em sala de aula, anotações em leitura de texto e mapa mental. Esse modelo é composto por 3 fases: (a) pensamento antecipatório, que refere-se a processos que precedem as ações; (b) realização ou controle da vontade, que envolve processos que ocorrem durante os esforços e afetam a atenção e ação, e (c) autorreflexão, que são processos que ocorrem após os esforços de realização e que influenciam a resposta do indivíduo. Esses processos influenciam o pensamento antecipatório completando assim o ciclo autorregulado. O experimento foi realizado com alunos dos cursos "Introdução à Economia" da graduação,"Modelagem de Sistemas Logísticos e de Transporte" da pós-graduação, e "Gestão da Cadeia de Suprimentos e Logística" da Especialização, da Engenharia Civil.

Modelo Cíclico de Aprendizagem Autorregulada de ZIMMERMAN (1998)

Objetivo

O objetivo deste estudo é mostrar a implementação de estratégias de aprendizagem autorregulada durante intervenções realizadas pelo pesquisador em sala de aula baseada no Modelo Cíclico de Aprendizagem Autorregulada de Zimmerman (1998).

Metodologia

A Escala de Avaliação de Estratégias de Aprendizagem de BORUCHOVITCH (2008), tipo Likert, foi aplicada aos alunos em 2010, (grupo de controle), no início e término do semestre, objetivando identificar as estratégias cognitivas, metacognitivas e disfuncionais utilizadas pelos alunos. Em 2011 esse processo se repetiu porém com intervenções feitas pelo pesquisador, utilizando-se estratégias de aprendizagem em sala de aula, tais como: "tomar nota em sala de aula", "tomar nota em leitura" e "mapa mental". Foram solicitados aos alunos, alguns trabalhos para a prática dessas estratégias envolvendo o conteúdo do curso ministrado. Os alunos responderam as 49 questões da escala com valores variando entre 1 e 4, para "nunca" e "sempre", respectivamente, tendo os valores invertidos quando das estratégias disfuncionais. São 19 relativas às estratégias cognitivas, 23 metacognitivas e 7 disfuncionais, com pontuações mínimas e máximas possíveis de 19 e 76, 23 e 92, 7 e 28 respectivamente, com total entre 49 e 196 pontos.

Resultados

Observou-se através da Análise Transversal entre os Cursos, tabela 1, que os alunos dos cursos academicamente mais graduados, especialização e pós, tiveram pontuações significativamente mais altas que as da graduação.

		Estratégia	Grad.	Pós	Espec.	Valor-P
Início Semestre	2010	Disfuncional	17,63	19,54	----------	0,012
		Todas	144,06	151,71	----------	0,042
	2011	Cognitiva	53,53	----------	57,81	0,002
		Disfuncional	17,55	----------	19,97	0,003
		Todas	143,80	----------	152,68	<0,001
Fim semestre	2010	Disfuncional	16,48	----------	19,13	0,003
	2011	Disfuncional	16,55	18,40	18,52	0,009

Tabela 1: Análise Transversal entre os Cursos

Observou-se através da Análise Longitudinal comparando-se o início e término de cada ano, tabela 2, que somente a graduação em 2010 teve um acréscimo significativo.

		Valor-P		
		Acréscimo	Decréscimo	Estratégias
2010	Graduação	0,041	----------	Cognitiva
		----------	0,004	Disfuncional
	Pós	----------	0,022	Metacognitiva
		----------	0,022	todas
2011	Graduação	----------	0,002	Metacognitiva
		----------	0,040	Disfuncional
		----------	0,002	todas
	Especializ.	----------	0,002	Cognitiva
		----------	0,011	Metacognitiva
		----------	<0,001	todas
	Pós	----------	0,043	Disfuncional

Tabela 2: Análise Longitudinal - Início e Término de cada Ano

Observou-se através da Análise Transversal comparando os grupos de 2010 e 2011, que somente para os cursos de especialização as pontuações das estratégias cognitivas e do total, no início do semestre de 2011, foram significativamente mais altas (P=0,023 e P=0,019 respectivamente) que as do grupo de 2010, no início do semestre. Observou-se também que os alunos de graduação utilizam mais estratégias disfuncionais que os da pós e especialização.

Conclusões

Acredita-se que este tipo de intervenção deva ser implementada no futuro, de uma maneira implícita, isto é, o pesquisador não atuaria em sala de aula. Para tal, isto requer a participação conjunta do pesquisador e professor no novo planejamento do curso, embutindo as estratégias de aprendizagem nas aulas. Sendo assim acredita-se que a pontuação do grupo experimental possa ser maior que a do grupo de controle.

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ANNEX H – Presented in 41st ICL/IGIP 2012 Villach (Austria)

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Application of Self-Regulated Learning Strategies in Undergraduate, Graduate and Specialization Students in Civil Engineering

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Abstract— **The current demand for civil engineering work market requiring new skills and knowledge, points to the needs of new and effective learning methods. This paper shows the implementation of self-regulated learning strategies in undergraduate, graduate and specialization students in Civil Engineering of a Brazilian University. A Scale of Evaluation of Learning Strategies was administered aiming at identifying the student´s cognitive, metacognitive and dysfunctional learning strategies.**

Keywords-Student Performance, Autonomous Study, Teaching Methods

I. INTRODUCTION

The current demand of the work market for engineers requiring new skills, points to the needs of more effective methods of teaching and learning. Several articles report learning experiences in engineering courses, comprising active learning, problem based learning, constructive alignment, and collaborative learning (see [1], [2], [3] and [4] respectively).

This paper investigates a new learning approach within Civil Engineering involving undergraduate, graduate and specialization students. Interventions were performed in classrooms by teaching some learning strategies following the Cyclic Self-Regulated Learning Model from social cognitive theory [5] to enhance the learning and teaching processes.

The strategies used and demonstrated under this model, are called "Self-Regulated Learning Strategies", and will be detailed further on, as well as self-regulated learning (SRL).

An experiment like this comparing three different courses, and using a quantitative method, has never been achieved.

Cyclic Self-Regulated Model

The cyclic self-regulated learning model, Fig. 1, is comprised by three cyclic phases: (a) forethought phase establishes the stage for learning and precedes the actions; they include *goal setting*, where the student decides on specific outcomes of learning; the *strategic planning*, where the student can select a strategy to optimize the performance during the learning attempts; it also has *motivational beliefs*, which involve the student´s outcome expectation, intrinsic interest, goal orientation and self-efficacy (SE); SE is the key motivational process and has a relevant importance in the student's learning; more details about SE can be found further; (b) realization or performance control phase involves processes occurring during the efforts, and the student actively engages in a specific learning activity; the student here has the possibility to employ the *self-control* processes to help them guide the learning, and the *self-observation* processes, that the student uses to monitor the performance; the *self-control* processes can be divided into self-instruction, imagery, attention focusing and task strategies; the *self-observation* process has a main element called self-recording where the students take notes such as how long it took them to do the homework, where and how they did it, and also whether the expectations had been achieved or not; and (c) self-reflection phase occurs after the realization efforts and it evaluates the student´s performance and make adjustments; there are the *self-judgment* and *self-reaction* processes; within the *self-judgment* processes the students have the chance to self-evaluate and have the right causal attributions for the successes or failures; they judge their successes or failures against standards, or their classmates' performance; in the *self-reaction* processes, the student has the chance to observe the levels of satisfaction.

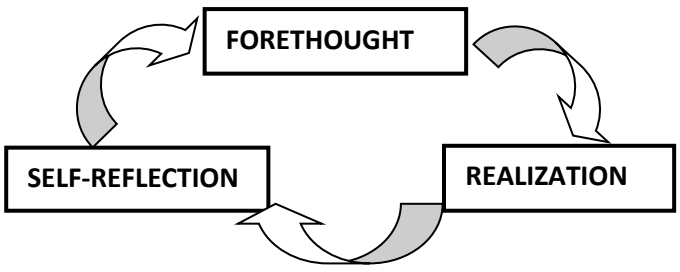

Fig. 1: Cyclic Self-Regulated Learning Model

Self-Efficacy

SE is an important construct which is related to the beliefs which the individual has about achieving a goal [6]. SE has explained the variations in personal motivation to control somenone´s achievements [7]. SE has been shown to be well suited to explaining variations in personal motivation to self-regulate one´s performance [8][9]. SE beliefs are constructed from four main sources of information: 1) enactive mastery experiences; 2) vicarious experiences; 3) verbal persuasion and 4) physiological and affective states [8].

Self-Regulated Learning

Theory and research about academic Self-Regulated Learning emerged in mid-1980s to address the question of how the students could master their own learning process. SRL theory and research include social forms of learning such as modeling, guidance, and feedback from peers, coaches, and teachers. A SRL perspective shifts the focus of education from student learning abilities and environments at school or home as fixed entities to students´ personally initiated strategies designed to improve learning outcomes and environments [10].

Cognitive, Metacognitive and Dysfunctional Strategies

Cognitive strategies help an individual achieve a particular goal (e.g., understanding a text) while metacognitive strategies ensure that the goal will be reached (e.g. seek for help). Metacognition involves active control over the cognitive processes engaged in learning (See [11]). Dysfunctional strategies are those which do not work effectively (e.g. to be distracted with something while reading or studying).

Objective

This paper aims to investigate the effects on the students of three different courses, undergraduate, graduate (master and doctorate) and specialization courses, of the application of learning strategies using self-regulation program in classroom interventions. It was based on the premises of the Cyclic Self-Regulated Learning model. SRL is the core of this project and has become a key construct in education lately, and it has played an outstanding role for the learning influence and for the performance inside and outside of school [5]. The ultimate objective is to know and check to what extent the students know how to choose and use self-regulation strategies to increase their learning and performance before and after the interventions and consequently to enhance or adjust the student's repertoire of study and learning strategies.

II. METHODOLOGY

Participants

This study involved undergraduate and graduate students of Civil Engineering and specialization students under Civil Engineering Department of Unicamp, a Brazilian University in the state of São Paulo. The subjects were respectively, "Introduction to Economics", "Modeling of Transport and Logistic Systems" and "Supply Chain and Logistic Management". There were 69, 28 and 28 students respectively in 2010, and 75, 16 and 31 students in 2011. There were 65%,71% and 57% male students respectively in 2010, and 68%, 62% and 29% male students in 2011. The average ages were 19 and 19 for the undergraduate, 36 and 33 for graduate, and 28 and 29 years for specialization courses, respectively in 2010 and 2011. The undergraduate students were in their first term of the second year of a total of 5 years.

A Scale of Evaluation of Learning Strategies

This study used an experiment method to identify the use of learning strategies by the students. A Scale of Evaluation of Learning Strategies developed by [12] was administered to the students in 2010, in the start and at the end of the term, aiming to identify the student´s cognitive, metacognitive and dysfunctional strategies. In 2011 the same scale was again administered to the students in a similar way, but new students then. They were asked to respond to 49 questions of the scale using a four-point likert scale ranging as "always", "sometimes", "rarely" and "never", and were worth four, three, two and one scores respectively. There were 19 questions related to cognitive strategies, 23 related to metacognitive strategies and 7 related to dysfunctional strategies which the score setting was the opposite, as one score for "always", and four scores for "never". These are some of the questions related to cognitive strategies: "Do you take notes on the texts or on another sheet?", "Do you elaborate questions and answers about the subject being studied?"; some of the questions related to metacognitive strategies: "Do you motivate yourself for the reading and study activities?", "Do you control the anxiety during assessment?"; some of the questions related to dysfunctional strategies: "Do you listen to music, or watch TV while studying or doing homework?", "Do you forget to do homework?".

The Intervention

During the interventions, the researcher provided demonstrations of the learning strategies and led the experiment using the cyclic model. This quantitative experiment relied on self-reports responded by the students using the *Scale of Evaluation of Learning Strategies* [12], administered to the students. In 2010, the researcher administered the scale for the three courses, in the start and at the end of the term (control groups) without any intervention. In 2011 the researcher administered the same scale for the same courses, in the start of the term. The interventions started in the following classes. The researcher used the beginning of the classes for about 20 minutes to implement the interventions. At the end of the term there was the administration of the same scale. In the beginning of the interventions the researcher tried to draw the students´ attention to some of their dysfunctional strategies gathered from their self-reports, worked with and discussed them in groups. The researcher brought some important concepts as SE and SRL strategies. The students were told the importance of being self-regulated and that the academic success could then be under their control, and furthermore, they should be aware of the important link between the strategy use and the success or failure in school.

Three learning strategies were brought into class: *note-taking during class*, *note-taking in reading* and *mind map* (See [13], [14] and [15] respectively). The researcher reinforced the differences of cognitive strategies, using one of those learning strategies to do a specific task, and the metacognitive strategies (e.g. study in a quiet place, seek for help, study in groups, do homework, search for extra material, avoid procrastination). These learning strategies were demonstrated one by one, starting first with *note-taking during class.* The researcher provided the students with homework involving the strategy just explained. In the following classes the same strategy was reinforced, and questions and doubts were answered. For the intervention the researcher used the same procedure in the classes for all three groups.

Forethought Phase

The researcher explained one learning strategy through examples and demonstrations to the students and gave the students some homework. That was the *goal setting* process which also showed the students the specific outcome expected for that homework. The use of the strategy given was part of the *strategic planning* process. Through the explanation the researcher tried to use persuasion to achieve the fact that the strategy given was relevant for their learning. Doing so, the students' SE, one of the motivational beliefs in the forethought phase, could be reached. Direct learning and persuasion are two important sources of SE.

Performance Control (Realization) Phase

In this phase the students engaged in their homework. They used the *self-control* processes to maximize their learning on the homework. They were told to seek for help when needed to achieve the goal. The researcher was present in the following classes to be able to answer questions and doubts. The students were also reminded of having focus on the task.

Self-Reflection Phase

This phase allows the students to reflect on their performance and also make adjustments. The researcher discussed the homework individually and sometimes collectively. This gave the students a feed-back for them to start using the *self-judgment* and *self-reaction* and to adjust the faulty strategies. They were told to check the right attribution of their success or failure doing the homework. They were also asked about how satisfied they were with the homework. In this phase it is normal to judge one's success through the performance of others or through earlier levels of behavior.

III. Results

Cross-Sectional Analysis Among the Courses

Table 1 shows this analysis among the three courses in each group. We can see the differences of the students' scores average for the use of learning strategy, together with the standard deviations. One can see these differences between the courses in the beginning and end of 2010, when no intervention occurred, and the beginning and end of 2011 when there were some interventions in the classes. Only the significant differences (p-value <= 0.05) and highly significant differences (p-value <= 0.01) are shown. The scores average of the undergraduate students are lower than the others. The undergraduate students use more dysfunctional strategies.

Table 1: Cross-Sectional Analysis Among the Courses

Term/ Year	Strat	Underg. Avg (SD)	Grad. Avg (SD)	Special. Avg (SD)	P-Value
Start/ 2010	Dysf.	17.63 (3.13)	19.54 (3.27)	-	0.012 *
Start/ 2010	All	144.06 (11.91)	151.71 (13.18)	-	0.042 *
Start/ 2011	Cog.	53.53 (6.07)	-	57.81 (4.62)	0.002 **
Start/ 2011	Dysf.	17.55 (3.58)	-	19.97 (2.39)	0.003 **
Start/ 2011	All	143.80 (12.13)	-	152.68 (10.31)	<0.001 **
End/ 2010	Dysf.	16.48 (3.04)	-	19.13 (1.55)	0.003 **
End/ 2011	Dysf.	16.55 (3.15)	18.40 (1.76)	18.52 (3.65)	0.009 **

* significant difference ** highly significant difference
Avg: score Average SD: Standard deviation

Longitudinal Analysis Comparing Start-End of Each Year

Table 2: Longitudinal Analysis – Start/ End of each Year

Course/ Year	Term Start Avg (SD)	Term End Avg (SD)	Strat. Used	Increase/ Decrease (p-valuse)
Underg./ 2010	53.73 (5.45)	55.45 (5.60)	Cog.	Incr. (0.041) *
	17.24 (3.00)	16.29 (3.11)	Dysf.	Decr. (0.004) **
Grad. / 2010	74.81 (6.12)	71.75 (9.10)	Metac.	Decr. (0.022) *
	152.88 (12.38)	147.56 (17.50)	All	Decr. (0.022) *
Underg./ 2011	72.63 (7.09)	70.24 (6.73)	Metac.	Decr. (0.002) **
	17.32 (3.58)	16.53 (3.11)	Dysf.	Decr. (0.040) *
	143.97 (12.35)	140.07 (11.97)	All	Decr. (0.002) **
Special./ 2011	58.06 (5.67)	54.94 (7.64)	Cog.	Decr. (0.002) **
	74.53 (7.84)	70.94 (6.13)	Metac.	Decr. (0.011) *
	152.18 (12.41)	144.76 (11.87)	All	Decr. (<0.001) **
Grad./ 2011	150.45 (12.51)	143.73 (11.30)	Dysf.	Decr. (0.043) *

* significant difference ** highly significant difference
Avg: score Average SD: Standard deviation

A longitudinal analysis (Table 2) was done comparing the scores averages of the courses in the start and the end of the terms for 2010 and 2011. This table shows the scores average and standard deviations provided they have significant differences (p-value <= 0.05) and highly significant differences (p-value <= 0.01) between the beginning and at the end of the terms. For each case the table shows if there was an increase or a decrease in the scores average at the end of each term. One can note that only the undergraduate students from 2010 had the scores average of cognitive strategies increased.

IV. Discussion

The cross-sectional analysis showed that the graduate and specialization courses had the total, cognitive and dysfunctional strategies score average higher than the undergraduate and this might have been due to the students´ higher academic history and professional experience. The longitudinal analysis showed that the undergraduate students used more dysfunctional strategies at the end of the term in both years 2010 and 2011 than in the start. This might have been due to the low age average (19), low academic history and little time for practice.

Even with higher age average, academic and professional experience, the graduate students had the total, and metacognitive strategies score average in 2010, and the dysfunctional strategies score average in 2011, decreased at the end of the respective terms. The specialization students had the total, cognitive and metacognitive strategies score average decreased. This might have happened due to little practice and for the strategies not being embedded in the contents of the course.

The researcher had little time to explain, discuss the homework and to use persuasion, an important source of SE, to explain the importance of the learning strategies,.

The resilient sense of efficacy is not created by a few successes and requires learning how to handle adversity and mastering increasingly tougher challenges through perseverant effort. The new skills are unlikely to be used for long unless they prove useful when they are put into practice and the students must experience sufficient success using what they have learned to believe in themselves [8].

It is highly recommended that the teacher be the change agent, making things happen intentionally, supported by his belief system and self-regulatory capabilities [16].

V. Conclusions

This project should be more explored mainly with the undergraduate students who showed to use more dysfunctional strategies. Furthermore, new strategies and reinforcement of old ones should be brought into class and always in a cyclical mode where the feed-back should trigger new forethoughts.

Despite having the potential to be effective, this experiment has a few shortcomings: the interventions should convey only one learning strategy per term to guarantee more opportunities of use, time and a proper feed-back; this intervention process was intrusive, hence it is suggested that the strategies be embedded in the regular classes by the teachers themselves who should be trained to reach fluency with the concepts and strategies. This might set up the right value for the learning strategies to be mastered and brought into class through the courses contents. The more the teachers know about the strategies, the more the class will profit.

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Self-Regulated Learning Strategies Applied to Undergraduate, Graduate and Specialization Students from Civil Engineering

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***Abstract*—The current demand for civil engineering work requires new skills and knowledge and calls for new and effective learning methods. This paper shows self-regulated learning strategies applied to undergraduate, graduate and specialization students from Civil Engineering in a Brazilian University. A Scale of Evaluation of Learning Strategies was administered with a view to identifying students´ cognitive, metacognitive and dysfunctional learning strategies.**

***Index Terms*— Student Performance, Self-Study, Teaching Methods**

INTRODUCTION

The current demand for civil engineering work call for more effective methods of teaching and learning. Several articles have reported learning experiences in engineering courses, comprised of active learning, problem based learning, constructive alignment, and collaborative learning (see [1], [2], [3] and [4] respectively).

This study deals with a new learning approach. It aims to investigate the effects on the students, of self-regulated learning strategies, applied in classrooms. The students were from undergraduate, graduate (master's and doctoral) and specialization courses, from Civil Engineering. The rationale for such approach was to use interventions in classroom to convey some learning strategies to the students. The interventions followed the Cyclic Self-Regulated Learning Model from social cognitive theory [5], and were done by the researcher.

Self-Regulated Learning (SRL), the core of this project, has become a key construct in education lately. It has played an outstanding role in learning and in performance inside and outside of school [5].

The ultimate objective of this study is to investigate to what extent students know how to choose and use self-regulated learning strategies. By doing this, the students might increase their learning and performance after the interventions. Hence, they might enhance or adjust their study and learning strategies.

The strategies used and demonstrated under this model, are referred to as "Self-Regulated Learning Strategies", and will be detailed later in these pages.

The Cyclic Self-Regulated Learning Model, Figure 1, is comprised of three phases: forethought, realization control and self-reflection.

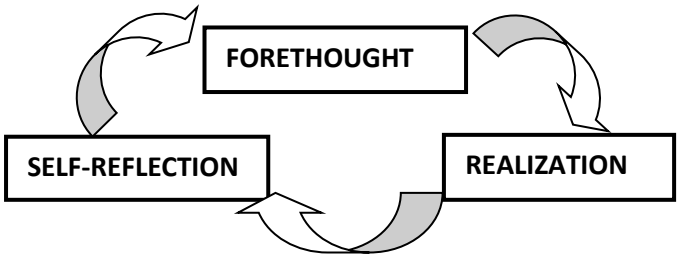

Figure 1: Cyclic Self-Regulated Learning Model

(a) forethought phase establishes the stage for learning and precedes the actions; this phase includes *goal setting*, *strategic planning* and *motivational beliefs*; *goal setting* leads the student to decide on specific outcomes of learning; *strategic planning* leads the student to select a strategy to optimize the performance during learning attempts; and lastly *motivational beliefs* conduct the student to outcome expectation, intrinsic interest, goal orientation and self-efficacy (SE).

SE is the motivational process and plays a key role in the student's learning. It is an important construct related to beliefs which the individual has to achieve a goal [6]. SE has explained variations in personal motivation to control someone's achievements [7]. SE has been shown to be well suitable for explaining variations in personal motivation to self-regulate one´s performance [8][9]. SE beliefs are constructed from four main sources: 1) enactive mastery experiences; 2) vicarious experiences;

3) verbal persuasion and 4) physiological and affective states [8].

(b) realization control phase involves processes such as: *self-control* and *self-observation*. *Self-control* processes help students guide their learning. They can be divided into self-instruction, imagery, and attention focusing and task strategies. Students use *self-observation* processes to monitor their performance. They have a main element called self-recording which is about taking notes such as: how long it took them to do homework; where and how they did it; and also whether the expectations had been achieved or not; and

(c) self-reflection phase occurs after the realization efforts and it evaluates the student´s performance and makes adjustments; it includes *self-judgment* and *self-reaction* processes; in *self-judgment* processes, students have chance to self-evaluate, and to have right causal attributions for successes or failures; Students judge their successes or failures against standards, or against their classmates' performance; in *self-reaction* processes, student has the chance to observe levels of satisfaction with the success achieved.

Theory and research about academic Self-Regulated Learning emerged in mid-1980s to address the question of how students could master their own learning process. SRL theory and research include social forms of learning such as modeling, guidance, and feedback from peers, coaches, and teachers. A SRL perspective shifts the focus of education from student learning abilities and environments at school or home as fixed entities to students´ personally initiated strategies designed to improve learning outcomes and environments [10].

In the forethought phase of the model, the strategic planning deals with strategies used in the learning process. This study covers some Cognitive, Metacognitive and Dysfunctional strategies. Cognitive strategies help an individual achieve a particular goal (e.g., understanding a text) while metacognitive strategies ensure that the goal will be reached (e.g., seek for help). Metacognition involves active control over the cognitive processes engaged in learning (See [11]). Dysfunctional strategies are those which do not work effectively (e.g., to be distracted with something while reading or studying).

This paper aims to investigate the effects on the students, of self-regulated learning strategies, applied in classrooms. The students were from undergraduate, graduate (master's and doctoral) and specialization courses, from Civil Engineering. This was done by the researcher through interventions in classroom, based on the premises of the Cyclic Self-Regulated Learning model.

The novelty of the study lay in the use of this model to convey self-regulated learning (SRL) strategies to students of three courses from Civil Engineering.

METHODOLOGY

The participants in this study were students from Unicamp, a Brazilian University in the state of São Paulo. They were in Undergraduate, Graduate and Specialization courses, from Civil Engineering. They were administered a scale, with 49 questions about learning strategies to be responded. In the courses of 2011, the researcher performed interventions in classrooms, in each course, to convey or reinforce some learning strategies.

Participants

Undergraduate, graduate, and specialization students from Civil Engineering, took part in this study. The courses were respectively, "Introduction to Economics", "Modeling of Transport and Logistic Systems" and "Supply Chain and Logistic Management". The undergraduate students were in their second year. The participants were 69, 28 and 28 students respectively for each course in 2010, and 75, 16 and 31 students in 2011. There were 65%, 71% and 57% male students respectively in 2010, and 68%, 62% and 29% male students in 2011. The average age was 19 for undergraduates in both 2010 and 2011 courses, 36 and 33 for graduates in the 2010 and 2011 courses respectively, and 28 and 29 years for specialization courses.

A Scale of Evaluation of Learning Strategies

The Scale of Evaluation of Learning Strategies developed by [12], aimed to identify the student´s cognitive, metacognitive and dysfunctional strategies. It was administered to the selected students in 2010, at the beginning and at the end of each course. In 2011 the same scale was again administered to the same courses, at the beginning and at the end, with different groups of students. The scale is comprised of 49 questions which the students were asked to respond. It is a scale using a four-point likert type ranging from "always", "sometimes", "rarely" to "never". Each question was worth four, three, two and one scores respectively. There were 19 questions related to cognitive strategies and 23 related to metacognitive strategies. As for dysfunctional strategies, there were 7, and the score setting was in inverse proportion to the others, that is, one score for "always", two scores for "sometimes", three scores for "rarely", and four scores for "never". As the dysfunctional strategies have an inverse score setting, those will eventually be called non dysfunctional strategies. It means, the higher the score, the less dysfunctional the student is. Here are some examples of the questions related to cognitive strategies: "Do you take notes on the texts you read or on a separate sheet?", "Do you elaborate questions and answers about the subject being studied?"; some of the questions related to metacognitive strategies are: "Do you motivate yourself for the reading and study activities?", "Do you control your anxiety during assessment?"; some of the questions related to dysfunctional strategies are: "Do you listen to music, or watch TV while studying or doing homework?", "Have you ever forgotten to do your homework?".

The Interventions

In 2010, the researcher administered the scale at the beginning and at the end of the three courses (control groups), and no intervention took place. In 2011 the researcher administered the same scale at the beginning and at the end of the same courses, with different students (experimental groups). Interventions took place in the

classes and were performed to convey, to the students, aspects involving the cyclic model, mainly learning strategies. The researcher provided demonstrations of learning strategies, explained later in these pages. This experiment relied on self-reports responded by the students to the questions of the scale. The researcher used the first 20 minutes of each class of each course. The researcher drew the students' attention to some of their dysfunctional strategies, which had been gathered from their self-reports. They worked with and discussed those strategies in groups. The researcher conveyed some important concepts such as SE and SRL strategies. The students were told about the importance of being self-regulated learners and that academic success could then be under their control. The students were also told to be aware of the important link between the use of learning strategies and the success or failure in school. Three learning strategies were conveyed to the students along the interventions in the courses in 2011: *note-taking during class***,** *note-taking in reading* and *mind map* (See [13], [14] and [15] respectively). The researcher introduced and reinforced the differences of cognitive and metacognitive strategies. The former ones are used when the student has to study a specific subject (e.g., note-taking, reading, searching for the subject in internet, and making mind maps). The latter ones are related to how the student prefers to study to achieve a goal (e.g., study in a quiet place, seek for help, study in groups, do homework, search for extra material, avoid procrastination). These learning strategies (*note-taking during class***,** *note-taking in reading* and *mind map*) were demonstrated one by one by the researcher along the courses, starting from *note-taking during class.* The researcher provided students with homework involving the strategy in question. In the following classes the strategy was reinforced, and questions and doubts were answered. This happened similarly to the other strategies. The duration of each course was about 4 months.

For interventions, the researcher used the same procedures for the classes of all three courses and followed all phases of the model, as explained ahead.

Forethought Phase

The researcher explained each learning strategy through examples and demonstrations and the students were given some homework. This was equivalent to *goal setting* process which also served to show to the students the specific outcome expected from that homework. The use of the strategy conveyed can be considered part of the *strategic planning* process. The researcher tried to persuade the students that the strategy given was relevant for their learning. Doing so, the students' SE could be increased. SE is one of the motivational beliefs in the forethought phase. Direct learning and persuasion are two important sources of SE.

Realization Control Phase

In this phase the students are involved in their homework. They used *self-control* processes to maximize their learning in assigned homework. They were reminded to seek for help whenever needed to achieve the goal. The researcher was present in the following classes to be able to clarify their doubts. The students were also reminded that they should have focus on the task.

Self-Reflection Phase

This phase allows the students to reflect on their performance and also to make adjustments. The researcher discussed homework individually and at times collectively. This provided the students with feedback on what they did, and then they could start using *self-judgment* and *self-reaction* as they adjusted their faulty strategies. They were told to check the right attribution of their success or failure of their realization. In this phase it is normal to judge one's success against the performance of others or against earlier levels of behavior.

A cross-sectional analysis of the three courses in both years 2010 and 2011, was done using Kruskal-Wallis test. A longitudinal analysis, comparing the start and the end of the classes, for both years, 2010 and 2011, was done using the Wilcoxon test.

RESULTS

Cross-Sectional Analysis of the three Courses

Table I shows the cross-sectional analysis of the three courses in both years 2010 and 2011. It points students' mean score of the use of cognitive (Cog.), and non dysfunctional (NDysf.), or all (All) learning strategy, together with the standard deviations. The mean score of one strategy can be compared among Undergraduate (Underg.), Graduate (Grad.) and Specialization (Special.) courses. This can be seen at four different times: beginning and end of 2010, and beginning and end of 2011.

TABLE I.
CROSS-SECTIONAL ANALYSIS OF THE THREE COURSES

Year		Underg.	Grad.	Special.	
	Strat	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**P-Value**
Start/ 2010	NDysf.	17.63 (3.13)	19.54 (3.27)	-	0.012
Start/ 2010	All	144.06 (11.91)	151.71 (13.18)	-	0.042
Start/ 2011	Cog.	53.53 (6.07)	-	57.81 (4.62)	0.002
Start/ 2011	NDysf.	17.55 (3.58)	-	19.97 (2.39)	0.003
Start/ 2011	All	143.80 (12.13)	-	152.68 (10.31)	<0.001
End/ 2010	NDysf.	16.48 (3.04)	-	19.13 (1.55)	0.003
End/ 2011	NDysf.	16.55 (3.15)	18.40 (1.76)	18.52 (3.65)	0.009

Mean: Mean score SD: Standard deviation

Only the values with significant differences (p-value <= 0.05) and highly significant differences (p-value <= 0.01) are shown.

One can see in the rows of the table that the mean score of undergraduate students are lower than the other courses, that is, graduate and specialization. The undergraduate students use more dysfunctional strategies than the others.

Longitudinal Analysis Comparing Start-End of Each Year

A longitudinal analysis, shown in Table II, was done by comparing the mean score at the beginning and at the end of each course in 2010 and 2011. It points students' mean score of the use of cognitive (Cog.), metacognitive (Metac.), and non dysfunctional (NDysf.), or all (All) learning strategy, together with the standard deviations. The table shows where there was an increase or a decrease in the mean score at the end of each course in each year. One can note that only the undergraduate students had the mean score of cognitive strategies increased at the end of 2010. There was also a decrease in the mean score, for those students, at the end of 2010 and 2011, of use of cognitive, metacognitive, non dysfunctional and all strategies, as shown in the Table. Only the values with significant differences (p-value <= 0.05) and highly significant differences (p-value <= 0.01) are shown.

TABLE II.
LONGITUDINAL ANALYSIS – START/END OF EACH YEAR

Year	Start Mean (SD)	End Mean (SD)	Strat. Used	Increase/ Decrease P-valuse
Underg./ 2010	53.73 (5.45)	55.45 (5.60)	Cog.	Incr. 0.041
	17.24 (3.00)	16.29 (3.11)	NDysf.	Decr. 0.004
Grad. / 2010	74.81 (6.12)	71.75 (9.10)	Metac.	Decr. 0.022
	152.88 (12.38)	147.56 (17.50)	All	Decr. 0.022
Underg./ 2011	72.63 (7.09)	70.24 (6.73)	Metac.	Decr. 0.002
	17.32 (3.58)	16.53 (3.11)	NDysf.	Decr. 0.040
	143.97 (12.35)	140.07 (11.97)	All	Decr. 0.002
Special./ 2011	58.06 (5.67)	54.94 (7.64)	Cog.	Decr. 0.002
	74.53 (7.84)	70.94 (6.13)	Metac.	Decr. 0.011
	152.18 (12.41)	144.76 (11.87)	All	Decr. <0.001
Grad./ 2011	150.45 (12.51)	143.73 (11.30)	NDysf.	Decr. 0.043

Mean: Mean score SD: Standard deviation

DISCUSSION

The cross-sectional analysis points that the mean scores of all, cognitive and non dysfunctional strategies, in graduate and specialization courses, were higher than the corresponding means scores achieved by undergraduate. This might have been due to broader academic background and professional experience, of the graduate and specialization students. The longitudinal analysis shows that undergraduate students used more dysfunctional strategies at the end than at the start of the courses in both 2010 and 2011. This might have been due to much lower average age (19), for 2010 and 2011, than graduate and specialization students. Furthermore, it might have also been due to low academic background and little time for practice.

Even the graduates, having high average age, academic and professional experience, the mean scores of all, and metacognitive strategies in 2010, and the non dysfunctional strategies mean score in 2011, decreased at the end of the respective courses. As for the specialization students, the mean scores of all, cognitive and metacognitive strategies decreased. This might have happened due to little practice and the strategies not being embedded in the course´s syllabus.

It is desirable for the experiment that the students have more opportunities of persuasion from the researcher in classes. Persuasion is an important source of SE, the motivational aspect of forethought phase.

The resilient sense of efficacy is not created by a few successes and requires learning how to handle adversity and mastering increasingly tougher challenges through perseverant effort. New skills are unlikely to be used for long unless they prove useful when they are put into practice and students must experience sufficient success by using what they have learned to believe in themselves [8].

It is highly recommended that the teacher be the change agent, purposefully making things happen, supported by his/her belief system and self-regulatory capabilities [16].

CONCLUSIONS

This project should be further explored mainly with undergraduate students who have used more dysfunctional strategies than the graduate and specialization ones. New strategies and reinforcement of old ones should be conveyed to classes and always in a cyclical mode. The feedback should trigger new forethoughts.

Despite having the potential to be effective, this experiment has a few shortcomings: the interventions should convey only one learning strategy to only one course to ensure appropriate opportunities of use, time and a proper feedback; this intervention process was intrusive, hence we suggest that the strategies be conveyed to the students in regular classes by the teachers themselves. Concepts and strategies proposed by the model should be taught to the teachers responsible for those classes. This might set up the right value for the learning strategies. The more the teachers know about the strategies, the more the class will profit.

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ANNEX J – Glossary

Self-Efficacy (SE)

It refers to people´s judgments of their capabilities to organize and execute courses of action required to achieve designated types of performances. Self-efficacy denotes when the students perceive they are able to learn and act at a certain level and deal with difficulties, and feel competent (BANDURA, 1971;1977a;1997; CLEARY; ZIMMERMAN, 2004).

Social Cognitive Theory (SCT)

Social Cognitive Theory emphasizes the idea that most individuals' learning happen in a social context. By watching others, individuals acquire understanding, regulation, abilities, strategies, beliefs, and convictions. People also learn from modeling, perform according to beliefs they have about their capacities and about the expected results coming from their performances (SCHUNK, 2012). Social Cognitive Theory has some suppositions about learning and behavior performance, like, reciprocity among people, behaviors, and environment; learning vicariously or by doing; difference between learning and performance; and self-regulation role (ZIMMERMAN; SCHUNK, 2003).

Self-Regulated Learning (SRL)

Zimmerman's theory shows that self-regulated learning is a complex phenomenon and includes multiple dimensions. These are comprised of distinct self-regulatory processes to show ways to help learners turn into better self-regulated. Students have to regulate most of the dimensions; it will be a problem, otherwise, because the choice is a critical element of self-regulated learning. The teachers should reconsider that proposal to bring more benefits to the students' learning. If teachers want their student to know and learn regulatory skills, they should allow them to apply the skills. This could not be possible if the students' activities are highly externally regulated (SCHUNK; USHER, 2013)

Human Agency

Agency beliefs are defined by Bandura as the capability to exercise the regulation on what affects the individuals, as well as their quality of lives. Being an agent is meant to be able to evaluate their own capacities, and add them to their beliefs, to predict possible courses of actions and outcomes, to evaluate opportunities and sociocultural limits, as well as to imagine the capacity to regulate the behavior in function of outcomes (BANDURA, 1993;1997).