

Aalborg University

Master Thesis

**“Problem Based Learning in Economics
Education”**

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2020

Acknowledgements

I would like to thank my supervisor Mona Dahms, that was very patient and provided fundamental orientations and support.

Also, I am very grateful to Aalborg University and their professors from MPBL course.

I also grateful to Prof. Yoshiaki Nakano, Dean at EESP and the mentor of PBL implementation. Professor Priscilla Tavares that provided all the resources and support to the research and helped with the data and statistical issues. Ronaldo Toniete was responsible to help to manage my funding to complete the course and Marcio Swistalski as a technical support for the classes using internet. Patricia Fiuza helped enormously to recover the memory of PBL implementation.

Abstract

The aim of this report is to answer which process competences PBL helps to improve at a private undergraduate school in Brazil. As a supplementary question: if students and professors are positive to PBL. Our case study implemented PBL in 2013 in all mandatory units of the undergraduate course of economics. The design of the research follows the literature review on PBL, with questionnaires for students and professors using Likert scale, method to measure perceptions.

The questionnaire was applied in 2016 for 143 students and in 2017 for 50 professors. As results we can find that students and professors in general perceive that PBL improves process competences and they are positive to PBL. Professors are more convinced that PBL improves process competences than students. Also, students tend to evaluate better the PBL with time specially because professors are more experienced in the new method.

The literature presents mixed effects about the performance on content of students in standard tests in a Problem Based Learning environment compared with traditional method based on lectures. On the other hand, the literature also verified based on students' and professors' perceptions that PBL helps to improve abilities and skills – process competences - like: work in group, engagement, critical thinking, independence in learning, problem solving skills, communication skills, cooperation, leadership skills, etc. The literature on PBL's process competences is very rich in studies using data from engineering and medical schools because these courses were the use more the method than others and this report contributes to fill the gap for undergraduate courses in economics.

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Chapter 1: Introduction

Problem Based Learning is an active method of learning that was implemented first and became more popular between medical and engineering schools. The relevance of the topic is that the literature is very rich in studies in medical and engineering courses, and we will study an undergraduate course in economics in a private school in Brazil that implemented PBL. Some findings say that PBL may fits better in some courses, and that it will be useful put some light in problem based learning in business, social sciences and teacher education (Walker& Leary, 2009).

The literature presents mixed effects about the efficacy of the method and student performance, i.e if it is better in content knowledge than traditional method (Albanese & Mitchell (1993); Albanese (2000); Dochy et al. (2003); Walker & Leary (2009); Strobel & van Barneveld (2009); Schmidt at al. (2009); Schmidt et al. (2011). But the literature also evidence that Problem Based Learning helps to develop other skills like work in group, leadership, communication skills, critical analysis, problem solving, independence in learning, engagement, linking theory and practice, motivation, engagement, etc. (Habib(2006); Strobel & van Bernevald (2009); Schmidt e. al., (2011); Schmidt (2009); Steele et al., (2000); Albanese & Mitsell, (1993); Gurpinar at al. (2009); Musal et al., (2003); Vernon (1995); McLean (2003); Alper (2008); Roche III at al. (2003); Erlinda & Kaitell (2000); Vernon & Blake (1993); Kaufman & Holmes (1996); Tiwari et al. (2006)).

The aim of this report is to answer: **To each extent do students and professors in an economics undergraduate school perceive that PBL helps improve process competences?** In order to answer the research question we will use a case study: Sao Paulo School of Economics in Brazil.

The report has in five chapters, including the introduction. The second chapter presents the literature review on PBL and process competences. The third chapter presents our case study, the problem-based learning in a private school

in Brazil, Sao Paulo School of Economics. The fourth will present the methodology used, data description and, finally the fifth discussion about findings in data following by the concluding remarks.

Chapter 2: Problem Based Learning

The chapter is divided in two sections. The first one we present concepts and key elements of Problem Based Learning and the Maastricht Model of PBL implemented by our case study. In the second part, we present the evidence presented by literature review on students' and professor's perceptions on PBL process competences. For our project is important to understand the distinctive elements of PBL, what PBL promises to improve as an active method, and which evidence the literature presents in relation to students' and professors' perceptions about PBL.

2.1. Concepts and key elements

Problem based learning was implemented first by prof. Howard Barrows in the 1960s to integrate disciplines and to develop problem-solving skills using *case-based problems* in medical courses (Alessio, 2004). The profession specialization is very intense and, in many times, they forget the patient, the *raison d'être* of the profession. To accomplish that, PBL was introduced at McMaster University, and in many other universities and medical schools much later. Today the literature in Problem Based Learning [PBL] is vast in examples of implementation and learning outcomes.

PBL as an "active learning is generally defined as any instructional method that engages student in the learning process" (Prince, 2004:1) with two core elements: student activity and engagement. But, we can say that lecture-based can engage, and offer activities in class, although active learning is based in a different paradigm of learning. The word *active* most of time is used to clarify that the student will participate much more in the process of learning. The student will not seat in classroom "listening" passively what the professor is "saying", which is the *transmission-oriented perspective*, but "work" in class to discover what they will learn, the *interaction-oriented perspective* (Dahlgren et

al., 1998). So, active learning changes the role of the professor and student. As Johnson et al. (1998) correctly pointed out, passive learning is the older paradigm, and the active is the new one. The basis of PBL is that the students learn by doing specific content (for example in economics) and *transferable skills*, i.e process competences (Forsythe, 2002).

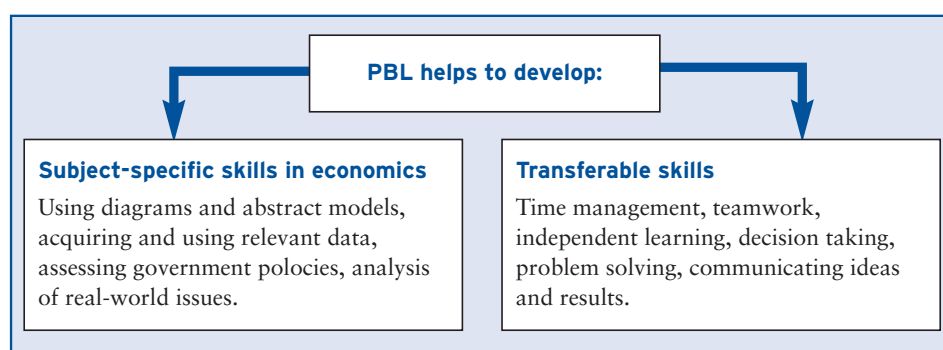


Figure 1 Problem-based learning and skill development

Source: Forsythe (2002: 4)

From the process of solving problems and tasks the *transferable skills* can be developed with more effectiveness than in a lecture-based teaching.

Other important element is the collaborative side, when students work together with a shared goal as in a project, for example. Prince (2004) distinguishes, collaborative from cooperative learning to put light on the relevance of other abilities that the competitive environment cannot develop. In a cooperative environment students work together but they are evaluated individually, for example in tutorial groups. And “[c]ooperation also promotes interpersonal relationships, improves social support and fosters self-esteem.” (Prince, 2004:5)

Problem Based Learning is organized to use problems, cases of a patient to discover what is the disease for example, to motivate and engage students in the learning process. Usually the problem is presented in a small group of students that will give the solutions, working together but assessed individually, in a cooperative learning (Prince, 2004:1).

We can find a variety of definitions of PBL: Barrows (1996) identified its key components, the minimum standards: problems, student centered, teachers act as facilitators and tutors and authenticity (Walker&Leary, 2009, abud Barrows, 1996). Problems are in general ill structured, with multiple, one or no answers that will activate the students' prior knowledge. Student-centered means that they will try to solve the problem with their prior knowledge, but during this process, they realize which are the gaps that need to be learned. Professors will act as tutors/facilitators to engage, to instigate with questions, examples to guide them in identifying the gaps and, after to integrate what they study. Finally, authenticity means integration between areas of knowledge, i.e problems using real world situations and different units of disciplines (Walker & Leary, 2009:14). Small groups can be used a necessary element, but we can have large groups instead using PBL.

Also PBL have some goals like:

“1) structuring the learning that supports problem solving; 2) reasoning process for problem solving; 3) self-directed learning skills, and 4) increased motivation for learning.” (Walker & Leary, 2009: 17 abud Barrows, 1996).

So, their key elements – ill structured problems, tutors, student-centered approach and authenticity - should interact to reach those goals.

In the other hand, Schmidt et al. (2011:793) offers a slightly different list that includes: use of problems, small group collaborative work, professor acts as tutor, limited use of lectures, student centered and time to self-study. We can say that they are very similar, but with the small group as distinctive for PBL that is not essential for Barrows (1996). Dahlgren et al. (1998) lists real life situations as the starting point of knowledge, work in groups and self-direct learning.

As Norman & Schmidt (2000:725) said “PBL is practiced very differently in different institutions”, and they tried to summarize the PBL characteristics looking at more than 303 meta-analysis which are: Individualized, Cooperative,

Small group, With non-expert groups, Self-paced, Self-directed, Using problems, Inquired Based, Instruction to solve problems, Inductive. (Norman & Schmidt, 2000:725). Their conclusion was that we have complex interactions between each item, and we should not try to aggregate, or even give same weight to them. Each implementation emphasizes different aspects.

“PBL is more than simple teaching method. It is better described as a complex mixture of a general teaching philosophy, learning objectives and goals, and faculty attitudes and values, all of which are difficult to regulate and are often not very well defined in research reports. (Vernon & Blake, 1993:560)

We can have different PBL models depending on learning objectives (Savin-Baden in De Graff & Kolmos, 2007): epistemological competence, professional action, interdisciplinary understanding, trans-disciplinary learning and critical contestability. (De Graff and Kolmos, 2007:5)

“All models epitomize the fact that problem-based and project-based learning may vary to a certain degree, inviting people to develop mixed models such as they are practised around the world. The common element in problem and project-based learning is that in both cases, learning is organized around problems. A problem as incentive for the learning processes is a central principle to enhance students’ motivation. Therefore, it is important which problems the students are attracted to on the basis of their own experiences and interests. It could be any type of problem, for instance, a concrete and realistic problem, or a theoretical problem.” (De Graff and Kolmos, 2007:6).

We can say that identifying, analyzing and solving the problems are the common feature that distinguish PBL from other active learning method. They are used to motivate and engage students in learning, using prior knowledge, discovering the gaps, helping to find what knowledge is needed and the new one is

constructed.

Our case study implemented the Maastricht Model of PBL with tutorial groups, problems and tutors. The decision was made mainly because the method was implemented in all courses at Maastricht, with a very structured training sections for tutors and students on PBL, experience with different students' backgrounds and adaptable to Brazilian educational system.

We will see in the next section that Maastricht model uses the 7-step structure to identify, analyze and solve the learning goals – the problem. The meetings are from two kinds: pre-discussion to reach the learning goals, and the post discussion to identify the gaps in the knowledge and to solve the learning goals.

2.2 PBL Practice

PBL has degrees of implementation, in a single unit, in some classes, in a group of units, in entire course using lectures, not using lectures or rarely used. In the literature of PBL implementation we can identify the difficulties and challenges faced by professors, management staff and students related to training staff, cultural change, lack of resources, regulatory problems, conflict between management staff and professors, lack of incentive policies, etc. (Kolmos 2010; Kolmos & De Graaff, 2007)

In some cases, the PBL were fully implemented, involving all the necessary elements for success, but this is not the reality in most implementation cases.

“Some changes manifest at an institutional level when a faculty, a department or a program opts for a total curriculum change. In other cases, the subject is a single course sought infused with innovation by a teacher.” (Kolmos & de Graaff, 2007:31).

Essentially, it's why so many studies reveal the difficulties to analyze and

compare the effects of PBL¹ on students' content performance and perceptions because they aggregate many different versions of it. The context of implementation, the incentives structure, the version of PBL impacts differently the learning outcomes.

PBL needs to create a "powerful learning environment", because it is one of the existing learning methods with can "develop an educational setting where the students' learning is core issue and instruction is defined as learning – enhancing" (Dochy et al., 2005:42).

Some distinctive characteristics of PBL are presented by Barrows (1996), Schmidt et al. (2011) and Walker & Leary (2009): groups from 7 up to 10 students, ill structured real-world problem-based in workbooks, teachers acts as tutors, self-directed learning, student-centered, and limited use of lectures.

"In PBL, the problem comes first. A problem is usually a description of a set of phenomena or events observable in the real world that are in need of an explanation in terms of a theory, an underlying principle, process, or mechanism. The task of the students in PBL is to construct such theory through small-group discussion and through self-directed learning." (Schmidt et al. 2009:228)

When we activate the prior knowledge with problems, the students are prepared to identify what is missing in that knowledge and a better learning can occur, the *activation-elaboration hypothesis* (Schmidt et al., 2011). This is what the literature called *self-direct learning*, when the students perceive which are their learning needs and when they realize their active role as learners (Dochy et al, 2005: 48). In some PBL implementations, they prefer not to suggest the sources for self-study, they leave students free to choose, but it can be very difficult, especially in their first sessions at PBL (Schmidt, 2009:229).

¹ Prince (2004); Vernon & Blake (1993); Norman & Schmidt (2000); Albanese & Mitchell (1993); Colliver (2000); Schmidt et al. (2009); Strobel & van Barneveld (2009).

The main difference between the teacher in a traditional lecture and a tutor in PBL is that, in the first situation he/she expect to transmit content, and assess that in the exam, with control over what will be learned. In PBL the goal is to increase the students' control over their learning, from a teacher centered to a student-centered model.

The tutor will act to stimulate the discussion in each phase of learning process, creating a pleasant environment, optimize the group operation, contributing with examples, stimulating the critical evaluation of ideas and giving constructive feedback and empower students in the acquisition of knowledge and their independence (de Grave et al., 2014).

“Although tutors in PBL operate in a group, their role is more or less the same as in one-on one tutoring. Instead of dispensing knowledge they should try to activate students, stimulate group processes, try to create an atmosphere in which students can optimally participate in the discussions, help students to monitor their own learning, and to stimulate self-study.” (Budé et al., 2009)

The tutor ² will act not as a source of the knowledge but a kind “maestro” from an orchestra that will ensure if all students are “playing” in harmony with the learning goals. I prefer to use this metaphor to demonstrate how important the tutor is in a PBL context, even working with the best “musicians”. The best music needs a variety of elements: instruments, theater, quality sound, musicians well trained, and a good maestro. The tutor can organize the knowledge in a way to help students to perform the best they can. The maestro will activate all technics already learned (prior knowledge) in a new task and will give feedbacks to improve day by day (Barrows & Tamblyn, 1980).

² In the PBL literature there is an important discussion if the tutor content expert is more effective for learning than the non-expert (Schmidt et al., 1993; Silver & Wilkerson, 1991; Kaufman & Holmes, 1998). The results are inconclusive mostly because the different versions of PBL training, concept of what is an expert content (Kaufman & Holmes, 1998).

The interaction between student, problems and tutors also will affect the process in tutorial groups and outside of them:

“[T]utor performance may vary with differences in tutorial group functioning. In general, these studies demonstrate that tutor performance, the structure of PBL-courses, students’ level of prior knowledge, and the functioning of tutorial groups interact with each other in a complex manner. The interaction differs among various contextual circumstances.” Dolmans & Wolfhagen (2005:254)

In PBL the environment takes us to an active learning scenario and the student is in charge of his/her learning process. If everything works, we can expect that student, in general, will be positive to PBL, and will help to develop important abilities required as professionals.

2.2.1 Maastricht PBL

When the Sao Paulo School of Economics [SPSE] decided to change from traditional educational model to PBL in 2013, Brazil had just a few experiences using some version of active learning. Mainly in medical schools like at Marilia School of Medicine (FAMEMA), also in São Paulo State.

Our case study implemented the Maastricht PBL in all mandatory units in the course of undergraduate economics, with very few lectures during the semesters, and the elective courses were free to choose the method.

At Maastricht University the PBL is very structured with specific roles for staff and students, workbooks with problems for each discipline (or unit), manuals and materials about how to use properly the method, how to construct and evaluate problems, annually training sessions for students, staff and how use the problems in an integrated way between students and tutors in the tutorial session, called “7-jump” (see the Appendix 1).

The 7 jump is a guideline how work with problems to reach the goals of PBL, i.e. to create the learning environment. It tells us how to present the problem, to activate prior knowledge, to identify the gaps to solve it, to organize the study, to act as tutor, to act as student and as a group. Another important distinction is that in each tutorial section, one student takes the lead of the group to develop leadership, organization and responsibility for the performance of the group. Another student will take notes and summarize the discussions, the secretary. After the 7th step, the tutor has to give individual and group feedback to continuing engaging and to motivate.

The tutor has to follow through the seven steps using examples, questions, and storytelling to stimulate the process of learning.

But the PBL at SPSE did not changed the units, or changed the curriculum to adapt to active learning. Simply took the units, for example mathematics, microeconomics or political economy, transformed the lecture content in “PBL” problems. In the chapter 3 we will present the implementation strategy and the details concerning the curricula. An important caveat is that in Brazil the graduate courses are under intense and rigid regulation by the Ministry of Education reducing the degree of flexibility.

2.3 Evidence in literature on students’ and professors’ perceptions on PBL

According with literature³ in a PBL environment we can expect positive perceptions from students related to skills they can improve (communication, group-work, engagement, self-study, independence, motivation) and the environment created (small groups, proximity with tutor/supervisor, use of real-world problems, curricula, constant feedback). In addition, there is evidence (Vernon, 1995; Alper, 2008) that positive attitudes towards the PBL have important effects on behavior: “The most frequently identified factors that

³ Habib (2006); Strobel & van Bernevald (2009); Schmidt et. al. (2011); Schmidt, (2009); Steele et al. (2000); Albanese & Mitshell (1993); Gulpinar at al. (2009); Musal et al. (2003); Vernon (1995); McLean (2003); Alper (2008); Roche III at al. (2003); Erlinda & Kaitell (2000); Vernon (1994), Haghparast et all (2007).

influenced performance and learning in PBL were positive attitude and group effort.” (Alper, 2008:830). Lastly, as the literature of PBL implementation shows it is important to know the opinion about PBL by tutors and students to identify problems or topics that need intervention.

It is important to say that most of these results are concentrated in medical and engineering schools where PBL first implemented and data is available.

2.3.1 Students' Perceptions on PBL

For Dochy et al. (2005) students' perceptions of the learning context are the interaction between two variables: the previous experiences of learning and the context of learning. Each student will have a different experience from the learning environment, or as “they experienced it” (Dochy et al. 2005; Dolmans & Wolfhagen 2005; Dolmans et al. 1999; Dolmans et al. 2001; Schmidt, 1994; Alper, 2008).

“(…) [E]xperienced world is a result of the internal processing of the objective information of the learning and teaching context as students receive it, such as the goals of the course, the assessment, the working procedures, etc.” Dochy et al. (2005:49).

For the same authors, most of studies focus on student's “evaluation” of PBL trying to capture how satisfied they are with the learning method, but the most important question is *how they perceive PBL as a method to enhance learning*. Students have positive perceptions about PBL, but the results vary when asked which key element of the method is important for enhancing learning. They have positive perception on tutorial group and problems as important for learning, and the tutor the least important. The group is a key factor, but students' positive attitude to PBL also influences the performance and learning (Alper, 2008).

Another interesting result is that what really matter for students' perceptions is the "instructional context in which is implemented", not the discipline, course or if it is an introductory or advanced subject. (Dochy et al. ,2005:61).

And, besides the importance of all elements of PBL context and the positive feedbacks, " (...) [students] need time to get acquainted and to feel comfortable about working in such a student-oriented learning environment". Dochy et al. (2005:62).

Although we can find that during the transition from traditional learning to PBL students reported dissatisfaction, frustration and uncertainty, once students overcome this period, negative perceptions are reduced. (Alessio, 2004: 24).

In a study at University of Ulster in "introductory economics" students report working with strict time limits but the majority liked the PBL. Students that disliked PBL cited the high workload and preference for lecture. (Forsythe, 2003)

PBL also stimulates the independent learning to deal with different scenarios in class and in working life, and we can create independent students (Surif el al., 2013; Schmidt et al, 2009, Dochy at al. 2005).

In Sulaiman (2010) students have positive perceptions because they are more motivated with the positive feedback in communication and sharing knowledge, and PBL helps to understand concepts related to everyday life. The same result we can find in Gurpinar (2009) where students think that PBL is beneficial to them, and contribute developing interpersonal relationship, teamwork, communication skill, logical thinking, problem solving, self-study and decision-making skills.

In Haghparast et al. (2007) they identified positive and negative students' perceptions on PBL. For the positive perceptions the most cited that PBL is more interactive (68%), allowed to learn on their own (60%), although in the negative

side the students were uncertain by the accuracy of the knowledge acquired (80%) and about the content of materials (60%).

“According to the student responses from the open-ended questions, the advantages of PBL pedagogy as compared with a traditional curriculum were as follows: greater independence, freedom, flexibility, self-responsibility, team work, student involvement, earlier patient contact, better integration between theory and clinical application, no pressure with respect to grades and less memorization”. (Haghparast et al., 2007:18)

In Sim et al. (2011) we found that students report benefits from PBL to enhance communication skills, critical thinking, understanding instead of memorizing, ability to present different arguments in a debate, for different students' cohorts in the medical school at University of Malaya in Asia. The negative perceptions decline with more experienced students. Although, some students prefer not to study with their peers, but alone or just when the problems have different solutions (Alper, 2008).

In general, students evaluate facilitator in a more severe than the PBL as a whole as in Mclean (2003). The students reported that many of facilitators were not aware of the new curricula, or they do not understand the PBL principles. Some examples of student's comments: “They feel out of place relaying information”, “some facilitators misinterpret the information and misinform students”, “some facilitators have no interest”, “they do not seem to know their role in the PBL process”, “some make you panic from the first day”, “Some are not well informed on how they should facilitate and so end up telling us everything or nothing.”⁴ The paper identifies different expectations from facilitator's self-evaluation in PBL and student's evaluation about facilitator's performance. (Mclean, 2003:10)

⁴ See table 7 in Mclean (2003: 7).

2.3.2 Professors' Perceptions on PBL

From professor's perceptions they are positive to PBL specially because improves interpersonal skills, communication, group work, self-study, problem solving skills very similar to students' perceptions as reported by Gulpinar (2009). In the same study, tutors also reported that PBL are more beneficial developing skills than traditional method, especially for tutors in basic sciences in the course of medicine. One negative perception was related to the time consuming to prepare to be a tutor in PBL, especially for those tutors not expert in the subject they facilitate, same result we find in Kaufman & Holmes (1996).

In Mclean (2003) show that, in the case study used, the reasons facilitators participate in the PBL course: 61% for promotional goals, 88% felt that they have responsibility to contribute in the new undergraduate course, 66,7% believed in the philosophy of PBL. Most of them were from academic staff (88%) and received training to support the new activities. Another important finding was that almost 80% of facilitators accepted their new role, and they will not "teach" providing content but guiding the students. But still 57,6% prefer lecture than tutorials.

The most important result is that, even with training, if the professor does not believe in the method, it cannot succeed. (McLean, 2003:10).

The major complain is the time consuming by PBL (Vernon, 1995, Gulpinar et al., 2009; Steele et al., 2000), but they like the method. The positive perceptions from faculty are on: student interest and enthusiasm, student reasoning, tutors' satisfaction and preparation for clinical rotations (specific for medical schools).

In another study performed in a Medical School in Turkey with 153 tutors, the majority of them (66%) said that PBL is beneficial to students, almost 55% said that they are content with PBL and that PBL contributed to "interpersonal relations", "logical thinking", "problem solving skills", and "communication

skills". One interesting finding is that students rated PBL superior than traditional method in respect to improving skills.

In this chapter we learned which are the distinctive elements of PBL as an active learning method: use problems to engage students, small group collaborative work, limited or absence of lectures, student centered and time to self-study and which abilities can be improved: problem solving, communication, group-work, engagement, self-study, independence and motivation. The results available are mainly concentrated in engineering and medicine schools because they implemented the method first and have data.

For centuries we had rooms with one professor teaching and the dozens of students listening and taking notes. It changed since the industrialization era where the discipline and training were crucial for the work force. As the social, political and economic problems became more complex, new technological paradigms, the kind of training and, as a result, the abilities necessary for the work force needed also changed.

Professor Forsythe at University of Ulster performed a pilot on PBL using economics as subject and give us an inspirational statement:

Despite the hard work and occasional periods of tension, I continue to use PBL. As a teacher it is a privilege to witness a dynamic group of students working on their own initiative, fired with enthusiasm, striving to solve an economics-related problem. Such groups become extremely efficient at organizing the learning environment, arranging additional meetings during non- contact periods and exchanging information via summary reports, photocopies, e-mail and fax (in the case of part-time students). This is active student learning at its best and the effort required to achieve it is worthwhile. (Forsythe, 2003:9)

Although PBL has many versions the literature review was crucial to identify which and if PBL helps to improve different abilities from the traditional method or the abilities claimed by their enthusiasts, even using students' and professor's perceptions as data. PBL as an active method appear to developed process competences like: work in group, communication skills, problem solving skills, self study, motivation to study, independence, decision making skills. From the literature we could design questionnaires for students and professors to analyze

if their perceptions about PBL were similar or not in our case study, and if they are positive to the method.

For the purpose of our report we need information about PBL implementation and consolidation at SPSE. This is our main subject in the next chapter.

Chapter 3: Sao Paulo School of Economics

In this chapter we present the description of the PBL implementation at Sao Paulo School of Economics, the motivation and the model implemented. The chapter is organized as follows: a brief history of Sao Paulo School of Economics, motivation to change and implementation strategy.

3.1 Brief History about Sao Paulo School of Economics

Sao Paulo School of Economics [SPSE], created in 2003, is a school of Getulio Vargas Foundation [FGV], a private institution, and the leading Think Tank in Latin America and 15th in the world (non-US)⁵ and 13rd including US Think Tanks.

FGV was created in 1944 to prepare staff to public positions for municipal, state and federal level, measure the GDP (Gross Domestic Product) and responsible for the National Accounts in a period of huge changes in politics and public management in Brazil⁶. The institution has the DNA of innovation since the beginning. Today FGV has undergraduate and graduate courses in Economics, Law, Business, Public Administration, History, International Relations and Mathematics with more than 5000 students in Sao Paulo and Rio de Janeiro cities⁷. Only the school of economics in Sao Paulo implemented PBL in all undergraduate units.

Before the creation of the economic school, the group responsible for the new school⁸ knew that the number of economic courses were diminishing in Brazil. Many of them closed, and the demand declined. The main reason appointed by leading economists and the important employees thought that the course of

⁵ McGann, J. (2016).

⁶ <http://portal.fgv.br/en/think-tank>

⁷ See more www.fgv.br

⁸ The actual Dean and myself included.

economics was not able to prepare professionals with the abilities that market require and students were not capable to use economic models in real situations.

As a result, many firms in the financial sector preferred to hire trainees and professionals from engineering courses⁹. The engineers are very good at mathematics, computing programming and, problem solving. So, they were replacing economists in financial sector. The staff realized that undergraduate economic courses should incorporate more mathematics, statistical instruments and also the pedagogy. But at that time, we did not know nothing about PBL or active learning.

The Dean of new school decided that the undergraduate course of economics will offer a curriculum with more quantitative methods but still using lectures. First, as a goal it should be the top-ranked School of Economics in Brazil, in economic research and at undergraduate level.

During ten years, SPSE expanded the number of researchers, students and courses in all levels, from undergraduate to MBA courses. Since then, hired the well prepared, experienced, cooperative Ph.D researchers in economics from the best Universities in Brazil and abroad, and selected the best graduate and undergraduate students in Brazil. In a very short period of time became a leading economic research institution in Brazil with very competitive admission process for professors¹⁰ and students.

⁹ During decades Brazil produced engineers at universities, but the economy did not have enough demand for them because of the low GDP growth rate, especially in the 80s. Just in the last decades, since the monetary stabilization, Brazil experienced some economic recovery, and the engineers were been absorbed by the infrastructure industry not mainly by the financial sector.

¹⁰ FGV offers a very competitive career opportunities and bonus for academic performance. The educational market in Brazil is divided by public and private universities. FGV is not an university, but a private foundation, more like a Think Tank. In general, using official ranking from federal government, the public universities perform better in research and teaching and attract the best students from high school. On the other hand, they professors have poor environment to improve performance, without correct incentives. The private universities perform poorly in the official rankings and, in general invest much less in research. (see rankings <http://portal.inep.gov.br/web/guest/indice-geral-de-cursos-igc->)

3.2 Vision to change and implementation

The first visit to Maastricht University was in 2010 to know what is PBL and how an entire university implemented it. During one-week visit, the Dean and his staff visited all the areas of Maastricht University responsible for PBL, attended workshops, collected material and had meetings with professors, students and administrative staff. Every part of Maastricht was built to PBL, or to have a PBL environment. For the staff, its model was well structured, using manuals for students, tutors, consolidated and organized training program for tutors, the seven-step model, and a vast experience on the difficulties faced changing method. They believed that PBL model was well structured, tested and transferable to other countries.

In 2011, they visit also Aalborg University in Denmark that had experience in projects, so “Project” Based Learning. As in the previous experience, the group attended the “Workshop on PBL in Aalborg at UNESCO Chair in Problem Based Learning in Engineering and Science”. During that period, the group could understand that PBL has different versions and permits flexibility using lectures, projects and/or problems. At Aalborg the project has to be solved by a fix group of students (4-5) with a supervisor not necessarily expert in the field. For the staff this model, at that time, was not full adaptable to Brazil’s regulation and culture.

The implementation strategy in the undergraduate course of economics was a top-down decision; a department level change in the undergraduate course or mega-level as proposed by Yusof (2005:177) when the change is applied extensively and need a commitment in all levels of organization; and the change occurred in 100% of units of each year course, except in the elective units. The undergraduate course in economics is a four-year course, and the implementation began in the first year in all mandatory courses (see table 1).

Table 1: Schedule for PBL Implementation at Sao Paulo School of Economics

1st year (2011): visit to Maastricht University and presentation of PBL to professors;
2nd year (2012): visit at Aalborg University; defining the trial, tutors training and preparation for curricula change, preparation of workbooks; trial evaluation;
3rd year (2013): PBL in mandatory units from first and second semesters;
4th year (2014): PBL in mandatory units from third and fourth semesters;
5th year (2015): PBL in mandatory units from fifth and sixth semesters; ¹¹
6th year (2016): 100% of curriculum completed and elected units (in elected disciplines professors are free to use traditional method or PBL);

In Appendix 2 we present the 4-year or 8 semesters curriculum for 2013 economics undergraduate course in PBL.

Because of the fact that the literature evidence a huge resistance from professors (Moesby, 2004), only professors that wanted to teach in undergraduate level should use PBL, and the elective courses were free to use any method. Another important information is that SPSE had financial resources to hire new professors to teach in PBL, if necessary.

During the training sessions and meetings, professors were worry about the efficacy of PBL compared with traditional method, after all they will not “teach” the same way anymore. During the transition period the group responsible for PBL implementation put a lot of effort to convince and create an environment for the change.

In the beginning of 2011, the school organized an internal three-day workshop with two Maastricht professors to present the method to professors and to prepare them for the trial. The same workshop occurred in 2012, 2013 and 2014

¹¹ The units from semesters 7 and 8 are elective courses and professors are free to use lectures and/or PBL.

to train new comers and to have a feedback from the group that applied the PBL for the first time, to improve and to exchange experiences.

During 2012, the trials were performed in two disciplines “Computer Programing” and “Probability” and the unit were presented in the form of problems following the 7 jump with the pre and post discussion¹². Each unit could not have more than one lecture per week, for example if a discipline have three meetings per week, can be organized with 3 tutorial or two tutorials and one lecture.¹³ This rule was implemented to give some flexibility to professors, but to put limit on lectures. Today, lecture become less popular between professors and students¹⁴.

The Dean was convinced that “professors cannot teach” in the traditional way, but to be a tutor, it explains why limit the lectures¹⁵. At Maastricht University the lectures were rare and used to present some recent topic on the subject, or research result or even a topic outside the program. Still at SPSE lectures are used to present a topic that was not fully presented in the tutorial sections. On the other hand, the students’ profile at SPSE is changing very fast and it is more positive to active learning methods and less positive to traditional method¹⁶.

¹² The trials were performed by the professor responsible for the units, which was also the coordinator of the economics course.

¹³ The decision had two main reasons: give some freedom to professors to teach in a mixed PBL format but with limits, and to facilitate the logistics of rooms at FGV. The rooms for lectures are bigger with more than 60 students and the tutorials have 15-17 students each. Today, the lectures are very rare and the majority of professors prefer to work in tutorials as the students.

¹⁴ The information comes from the periodical unit evaluations.

¹⁵ Nowadays many professors are using very few lectures but the rule is still valid.

¹⁶ The information was given by the present coordinator in 2019. The school is financing a group to collected data on PBL based on my experience developing the Master Thesis. The school wants to know if students are more positive to active learning strategies. Many colleges in Sao Paulo are implementing some kind of active learning method which introduce earlier the experience avoiding the “cultural battle” when coming to SPSE.

Some important lessons learned from the trials:

1. The participation, although is encouraged by tutors, have to be evaluated (a grade from zero to one)¹⁷ as a strong incentive to student's behavior to be prepared for the tutorials;
2. Clear definition of discussion leader and recorder roles for students and professors;
3. Training students in PBL before the academic year start, to every new comer;
4. Training professors in PBL;
5. Evaluate students and professors' perceptions to PBL;
6. Evaluate the tutors and student's behavior in class during the first semester of implementation;
7. Evaluate the workbooks by a Commission¹⁸ to guarantee the quality and efficacy of problems;
8. Align professors' expectations with students' expectations about each other in a PBL environment.
9. Organization of lectures and tutorials to reduce logistic resources and student's anxiety;
10. Adaptation of study hours to federal regulation system;
11. Constant evaluation feedback;
12. Annual training sessions for tutors;
13. Tutor have to be expert in the subject;

From the trials, and the first year of implementation the school learned that PBL need continuing evaluation, an institutional area to study the students' performance and perceptions during and after PBL experience, and annually

¹⁷ Grade goes from zero to 1, zero is no participation and 1 is participation expected. If the student has 0.7 in tutorial, it will be multiplied by the grade from final exam.

¹⁸ Today the commission is internal to SPSE as a peer evaluation to improve the quality of problems. During the implementation phase every semester the commission had to evaluate the new workbooks. Today, professors adjust the problems using some instruments: coordinator feedback and students' evaluation. During the tutorials, students give feedback too.

training sections for new professors. The trials presented a huge challenge, how to institutionalize and consolidate the PBL after the implementation.

SPSE created in 2017 an area¹⁹ responsible for continuing research, evaluations (problems, tutorials, lectures, students, professors) to improve and enhance the learning environment. Collecting data, analyzing and solving problems concerning the method is the strategy. The undergraduate coordinator is responsible to assign professors to the units, to monitor the students and faculty performances and to report the results to the Dean. In each semester, all units are evaluated by a questionnaire.

3.3 Organization and Structure

In our case study students have classes from 9 am to 10:40 and 11 am to 12:40, in two semesters per year or 4 trimesters, from February to December, with a break in July. The units are as follows:

Table 2: Types of Units

12 week course	trimester	1,5 ECTS	1 day a week	[1 tutorial]
12 week course	trimester	3 ECTS	2 days a week	[1 tutorial + 1 lecture] or [2 tutorials]
24 week course	semester	6 ECTS	2 days a week	[1 tutorial + 1 lecture] or [2 tutorials]
24 week course	semester	9 ECTS	3 days a week	[2 tutorials + 1 lecture] or [3 tutorials]

As said earlier, SPSE have to obey the regulation so they cannot reduce the number of hours in class with professors above the minimum of 3.000 hours in 4-year undergraduate course. The staff knew that for a full PBL implementation

¹⁹ Pedagogical Improvement Lab (Nucleo de Apoio Pedagógico - NAP).

we should change from the traditional curriculum development model to a “constructivism curriculum development” were the contributions from tutor, students are inputs for structural exchanges as in Cowan (2003). It will be easier with no such restrictions to innovations.

In the new method professors need to change “the logic” of a curriculum development in an active learning environment. Cowan (2003:8-9) suggests the model below:

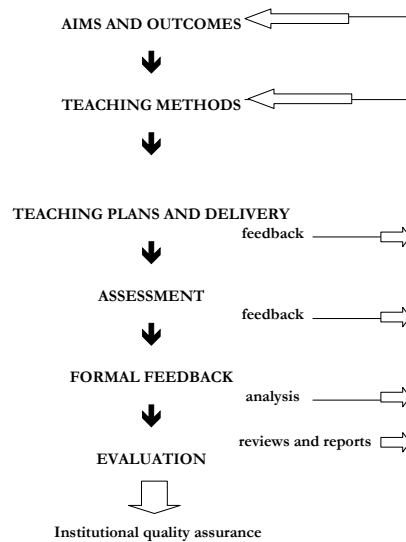


Fig. 3: Traditional Curriculum Development Model

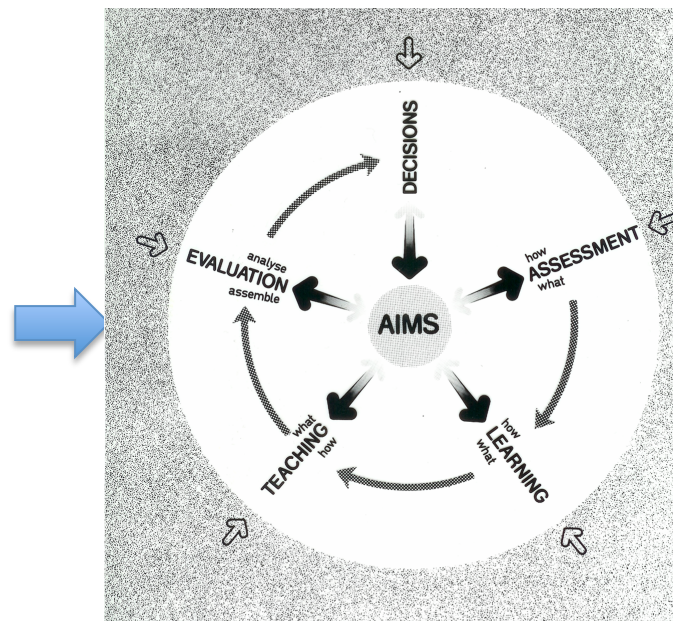


Fig 4: A logical model of Curriculum Development

The traditional curriculum development model follows a chronological structure of the events starting from aims and finishing with evaluation. Figure 4 aligns teaching, learning and assessment with aims, objectives and learning outcomes like in (Biggs 2003):

The 'alignment' aspect refers to what the teacher does, which is to set up a learning environment that supports the learning activities appropriate to achieving the desired learning outcomes. The key is that the components in the teaching system, especially the teaching methods used and the assessment tasks, are aligned with the learning activities assumed in the

intended outcomes. The learner is in a sense 'trapped', and finds it difficult to escape without learning what he or she is intended to learn. (Biggs, 2003: 2)

The transition demands time, effort and investment from the school. As an example in the first semester of PBL implementation the main complaint was that the assignment were “traditional” and with no connection to the tutorials, so no alignment between the intended outcomes and the evaluations. In the first years of PBL at SPSE the focus was on the operational part of PBL: organizing the groups, quality of problems, training, evaluations. After the first group of PBL students, the staff observed that professors are enhancing the way to design the unit program in the direction proposed by Cowan (2003).

In table 3 is a typical week schedule for mandatory units at SPSE in 2013: on Mondays the lectures and from Tuesday to Friday (in grey) the tutorials, i.e small groups with up to 15 students. Each year the school selected 60 students that will be divided in four small groups (15 students each).

Table 3: Week schedule in 2013

2013		12-weeks (1 Trimester)				
		Monday	Tuesday	Wednesday	Thursday	Friday
9h às 10h50		Introduction to Economics Lecture	PBL	Introduction to Economics	Programming and Problem Resolution	Introduction to Economics
11h às 12h50		Mathematics I Lecture		Mathematics I	Financial Mathematics	Mathematics I
12-weeks (2nd Trimester)						
Horário		Monday	Tuesday	Wednesday	Thursday	Friday
9h às 10h50		Brazilian Economic History Lecture	Probability Lecture	Brazilian Economic History	Probability	
11h às 12h50		Mathematics I Lecture	Introduction to Social Sciences Lecture	Mathematics I	Introduction to Social Sciences	Mathematics I
2013 24 week (3rd and 4th trimesters)						
		Monday	Tuesday	Wednesday	Thursday	Friday
9h às 10h50		Microeconomics I Lecture	Methodology	Microeconomics I	Statistics	Microeconomics I
11h às 12h50		Mathematics II Lecture	Statistics Lecture	Mathematics II	Methodology	Mathematics II

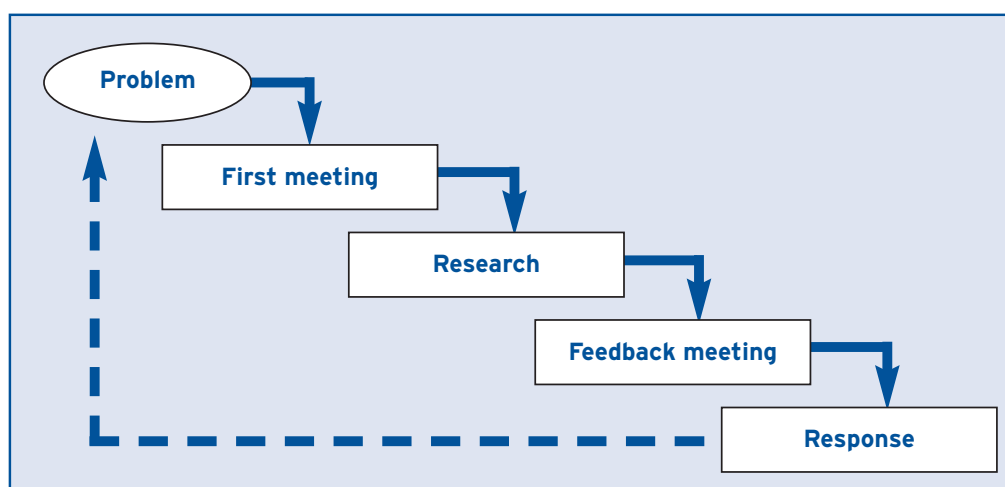
In the first semester they have per week: mathematics (2 tutorials + 1 lecture), introduction to economics (2 tutorials + 1 lecture), financial mathematics (1 tutorial) and programming (1 tutorial). The “PBL” is training sections were introduced to help students in the new methodology and to have permanent feedback during the first experience with PBL. The sections, lecture and tutorials have the same duration of 100 minutes.

During the afternoon students have time to work together, in groups, to achieve the learning objectives. The SPSE provided study rooms for them, tutorial room, and a typical lecture room (see Appendix 5). Some prefer to go to the Library, but the majority stays in study rooms.

3.4 A Tutorial Section at SPSE

As informed earlier, in the tutorials SPSE used the 7-jump structure. In the pre-discussion the students will be presented to the problem. We can summarize the PBL process with the next Figure 1.

Figure 1: PBL Process



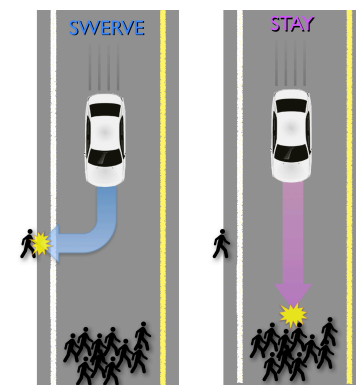
Source: Forsythe (2002: 5)

When the PBL process works properly students will develop the process competences cited earlier.

In the following is an example of a problem from the Political Philosophy workbook which is a mandatory unit for 3rd year student at SPSE.

Problem 12: Tesla Moral Dilemmas²⁰

1)



2)

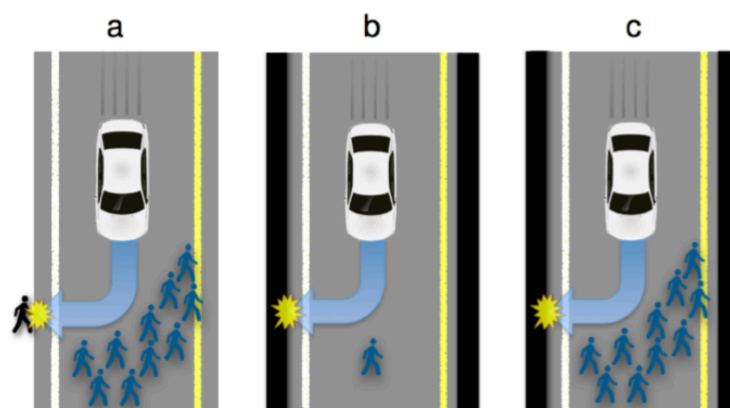


Figure 1: Three traffic situations involving imminent unavoidable harm. (a) The car can stay on course and kill several pedestrians, or swerve and kill one passer-by. (b) The car can stay on course and kill one pedestrian, or swerve and kill its passenger. (c) The car can stay on course and kill several pedestrians, or swerve and kill its passenger.

²⁰ Problem 12 from my workbook on Political Philosophy

Source: Bonnefon et al. (2015) *Autonomous Vehicles Need Experimental Ethics: Are We Ready for Utilitarian Cars?*, p.3

Reference:

Kymlicka, W. (2006), cap. 2.

The 7-jump works as follows:

Step #1: Clarification of terms

The problem is presented to students and the objective is to check if every student understands the task. This is the pre-discussion session.

In general figures, examples from newspapers, books or storytelling are used to construct a problem. Here I opt to use a figure from a paper about Tesla's experiments on the autonomous cars' algorithm. The algorithm is a program but we humans are the programmers, so we can ask which one fits to us.

Step #2: Problem definition

The group formulates one or more problem definitions as a starting point for the discussion.

For our example they usually discuss why to swerve or not in each situation. In the first they have 2 options: swerve or not, but in the second three.

Step #3: Problem analysis

Here the students start to present formulations, possible explanations for the problem activating the prior knowledge. Finding what they know and do not know about the problem.

Many students in Brazil do have philosophy at school so they can use the prior knowledge here. Many ask the tutor if they have to think as a pedestrian or as the driver. Others say that it does not matter for the problem.

Step #4: Systematic inventory

In this step, students will organize the possible answers presenting arguments to them.

From my experience this step occurs simultaneously since the 1st step. The secretary goes to the blackboard to take notes while the group are discussing.

Step #5: Formulate learning objectives

After trying to present arguments and possible answers, they will organize what they need to study, the learning objectives. The 1 to 5 steps occur in the same tutorial session.

The learning objectives are: Why the first scenario is morally different of the second? In the second scenario why swerve in all situations? If we are the driver or pedestrian the results will be the same? Why?

The pre-discussion ended and in the next meeting they will present answers and discuss based on references and research.

Step #6: Self study

Students will search for literature and other sources and study to reach the learning objectives.

Step #7: Report and synthesize

In a new tutorial session (post discussion session), students will answer the learning objectives for with new acquired knowledge.

In this step start our post discussion. The secretary presents the inventory or the learning objectives. Students start to present their research to answer the questions above.

During all steps the tutor ask questions, stimulate with examples, changes the situations, for example: asking if in the second scenario the pedestrian on the side were someone the drives likes very much. After the step 7, the tutor gives feedback to the group and individually. As reported by the implementation staff, the individual feedback was the most difficult element for tutors. In the first year of PBL implementation many reported the difficulty to grade participation, or to give grade zero when student was not prepared for the tutorial or, some cases, students that became silent during all 7 steps²¹. At SPSE all tutors are specialized un the unit they were assigned, although at Maastricht University the tutor does not.

²¹ For the first group of students at PBL the first zero was hard. Brazilian culture is an important variable because we are known as a society with very loose attitude on rules. But by the 2nd year of PBL implementation the economics course already built a reputation. A students' joke at that time "SPSE are imposing a new method: "the Netherlands Method".

Additional rules were included after the trials:

1. 10-minute delay tolerance for students: after that student are not allow to join the group and will be grade zero in the tutorial;
2. Use of electronical devices not related to the unit are not allowed;
3. Is not allowed to eat during the tutorials;
4. Is not allowed to use ear plugs;
5. Professors are not allowed to “teach in tutorial” but to be a tutor;
6. Professors have to give feedback for students;

The way PBL was implemented created an ethos in the school, and many of them were incorporated.

The PBL implementation on our case study followed a structured and organized strategy that included: resources, planning, pilots, training for professors and students and a clear vision for change. Since the selection of “PBL version” until the commissions to evaluate the workbooks, our case study prepared to cope with all the challenges that a paradigm change imposes. Without those elements, the probability to fail would be very high, because PBL is not a technique, but a new culture of learning. The adaptation to Brazilian regulations and culture were crucial to strategy design.

Chapter 4: Methodology

After our literature review on PBL and our case study PBL implementation and structure, the methodology chapter presents the RQ with the research design that includes a quantitative research. The literature review gave to us the framework for the questionnaires and how to measure the perceptions. Finally, we present the data collection from students and professors.

4.1 Research Design

Problem definition: **To each extent do students and professors in an economics undergraduate school perceive that PBL helps improve process competences?** In order to answer the research question, we will use a case study: Sao Paulo School of Economics in Brazil.

Our research is quantitative research for a case study using questionnaires²² for students and professors at SPSE. The questions were formulated in accordance to the theoretical model of PBL, i.e the process competences the method expect to enhance and the literature review.

Research design: to measure our variable “perceptions on PBL” we use Likert Scales. Likert Scales is a quantitative method commonly used in educational interventions to measure attitudes. In general, ranges from 1=strongly disagree to 5= strongly agree (Jamieson, 2004).

“Likert methodology is one of the most commonly used methodologies in all fields of research, but particularly so in allied health, medicine and medical education” (Carifio & Perla ,2008: 1151)

²² We follow the recommendations from Nemoto & Beglar, 2013.

It is possible to use Likert scales to indicate opinions, feelings, attitudes about some particular issue (Nemoto & Beglar, 2013:2). Some of the advantages are:

“(a) data can be gathered relatively quickly from large numbers of respondents; (b) they can provide highly reliable person ability estimates, (c) the validity of the interpretations made from the data they provide can be established through a variety of means, and (d) the data they provide can be profitable compared, contrasted, and combined with qualitative data-gathering²³ techniques, such as open-ended questions, participant observation, and interviews.” (Nemoto & Beglar, 2013:2)

Before constructing the questionnaire²⁴, the researcher needs to indicate what will be measure or the construct, in our case *students’ and professors’ perceptions on PBL ability to improve process competences*, and as a supplementary question *if they are positive to PBL*. We designed the questionnaire avoiding complex language, instead used easy-to-understand and straightforward questions, in the native language (Portuguese). In addition, no use of conjunctions (*and, or, but*) that could give impression of more than one question in the same sentence.

Another important decision is the outcome space, like *disagree/agree, not usefull/usefull, like/dislike* and the number of point scale. Nemoto & Beglar (2013) suggests 6-point scales because it increases measurement precision and avoid the neutral answer²⁵. We apply the next scale:

Table 4: Outcome space

1	2	3	4	5	6
Strongly	Disagree	Slightly	Slightly	Agree	Strongly

²³ I presented the questionnaire in English for this Master Thesis, but the questionnaire was in Portuguese.

²⁵ When we have a neutral answer, people try not to reveal his actual opinion see more in Weijters, Cabooter, & Schillewaert (2010), Nowlis, Kahn, & Dhar, (2002) e Tourangeau, Groves & Redline (2010).

disagree		disagree	agree		agree
----------	--	----------	-------	--	-------

Another important step in constructing a questionnaire is use pilot to evaluate the performance of the items, but for reasons of time we could not execute it. One important cohort of PBL was finishing the course and we will lose the opportunity to apply the questionnaire for them.

We prepared a questionnaire for students (see Appendix 1) with 26 items organized in 2 groups: first items (12) to capture the perceptions about PBL, the second group of items (14) were specific to process competences as presented by the literature review.

Some questions from group 1 and group 2:

1. Answer below your perceptions about PBL

The tutorial sessions are more engaging than lectures;

The tutor feedback contributes to my learning process;

Real world problems help to appreciate the importance of understand instead of memorizing.

2. Which personal abilities do you think that PBL helps to improve or develop?

Communication skills;

Decision-making skills;

Critical thinking;

Manage a group discussion

A questionnaire for professors (see Appendix 2) was organized in 2 groups of questions: first items (13) to capture the perceptions about PBL, the second group of items (14) were specific to process competences, and the same items from students' questionnaires.

4.2 Data Collection

The PBL was implemented in 2013 and in 2016 the first group of students finished the course using the new method. So, our sample has the first group which completed the entire undergraduate course with PBL. Students range from 17 to 21 years-old, and professors from 31 to 58 years old, all of them with more than 10 years teaching experience.

In the case of professors, we sent the questionnaire only to those that gave at least one course as tutor or supervisor in the undergraduate course of economics. Not all professors at school of economics participated in economics undergraduate course, especially those involved in MBA courses. Our population contained 50 professors.²⁶ The professors are experts in the subject as a mandatory condition in the SPSE PBL method.

For the purpose of our research, the questionnaire was applied as follows:

Table 5: Targeted respondents

Year entrance	2013	2014	2015	2016	Total
Students ²⁷	32	32	34	45	143
Professors	--	--	--	--	50

The students' questionnaires were applied between October and December 2016 and for professors on March 2017. For students we deliver on paper, and for professors electronically. The responses were anonymous for both.

²⁶ Different from students, we opt to use Survey Monkey, an electronic platform to perform pools.

²⁷ Data from September 2016 counts just active enrolled students in the course.

Table 6: Response rates

Students	35,6%
Professors	62%

Table 7: Response rates by Students' Cohort

Co-hort	2013	2014	2015	2016	Total
n	20	7	11	14	51
%	62,7	21,8	32,3	31,1	35,6

Our response rate for students was 35,6%, although with different response rates for each cohort, as Table 7 shows. From 2014 student's cohort we had just 7 answers (21,8%) and 6 of them did not complete the questions 11 to 26. For this cohort we do not have information about their perception on process competences²⁸.

Table 8: Students Questionnaire – Responses by Question

Question Number	1	2 to 10	11 and 12	13 to 26
Responses	50	51	38	39

²⁸ We considered just the valid answers.

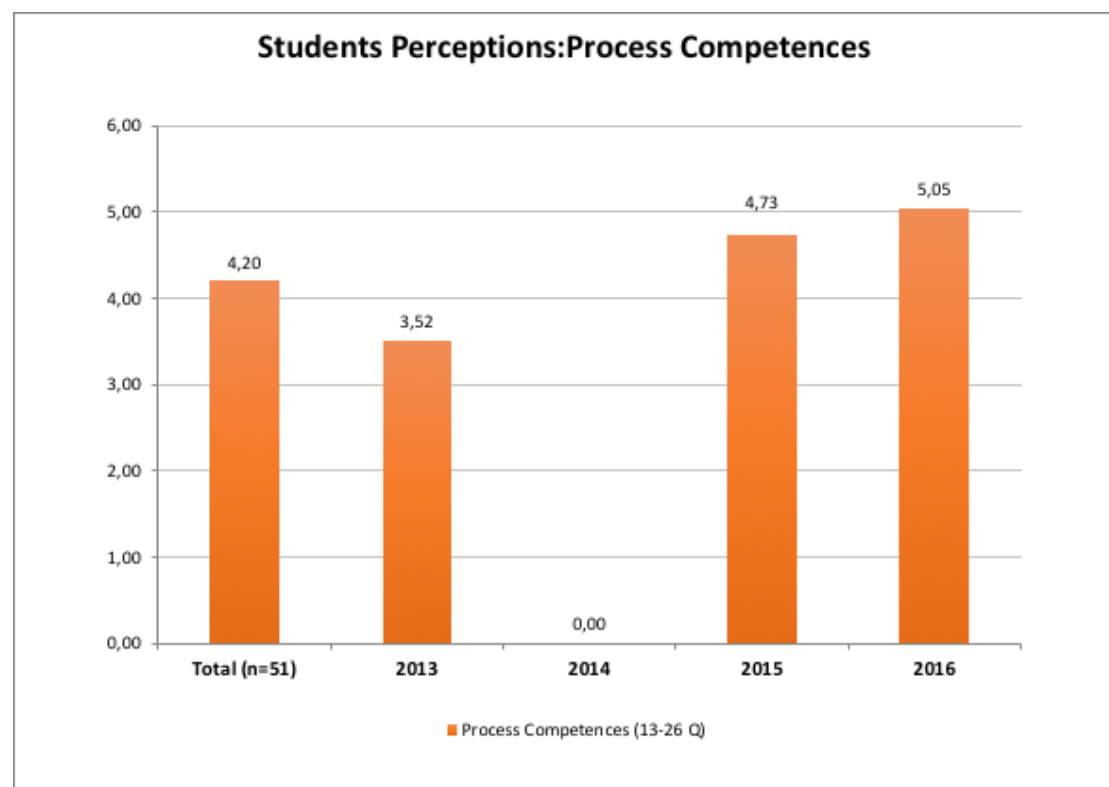
Chapter 5: Data Results and Discussion

In this chapter we present data results for Students' and professors' perceptions on process competences and on PBL as a method to answer our research question. We finish the chapter with a discussion about the results.

5.1 Student's Perceptions on Process Competences

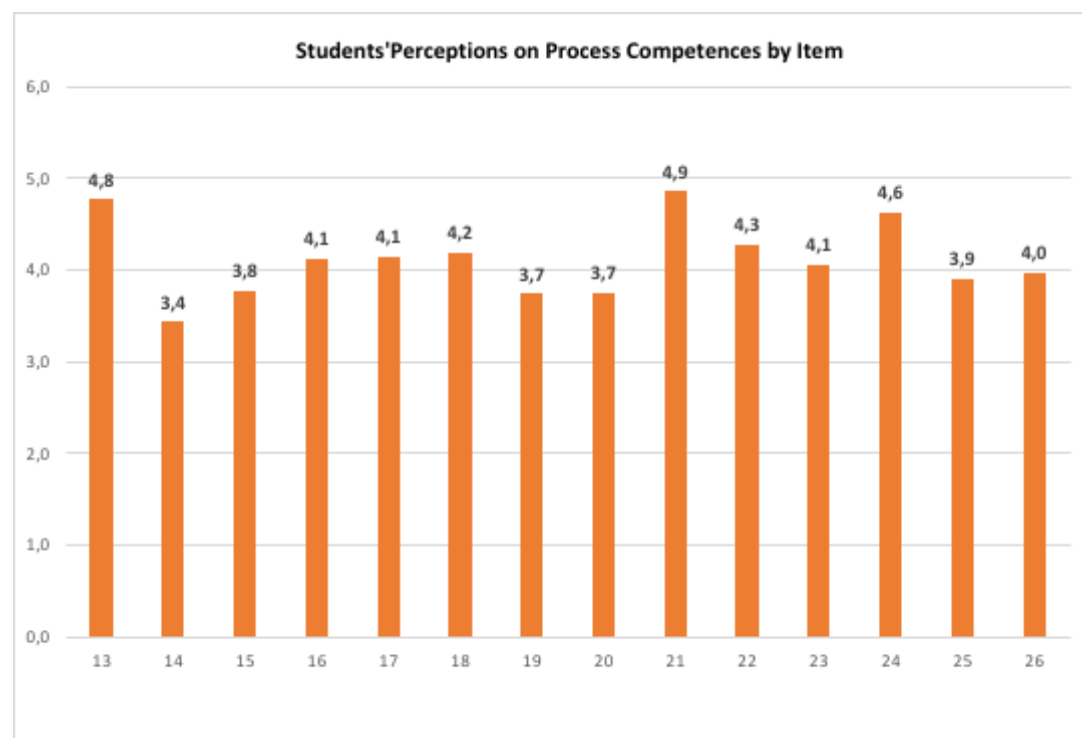
First, we present descriptive data on students' perceptions on process competences. As pointed earlier, the response rate by students is different between cohorts, for example for 2014 we do not have answers for questions about process competences. Although, it is possible to say from Figure 1 that the students' perceptions on process competences is becoming more positive with time from 2013 to 2016, from 3,52 to 5,05. Remember that from 1 to 6 ranges from disagree to agree.

Figure 2: Students' Perceptions on Process Competences Mean by Cohort



In Figure 3 we can see the mean by item. Communication skills, manage a group discussion, work in group, problem solving skills, self-study, confidence in discuss economics in public, independence in learning process and select relevant information to solve problems are the competences that students evaluated with higher scores (above 4). Instead, critical thinking, motivation to study, and decision-making skills were evaluated with lower scores. The positive perceptions on PBL ability to improve process competences follow the literature specially from Sulaiman (2010), Gurpinar (2009), Haghparast et al. (2007) and Sim at al. (2011).

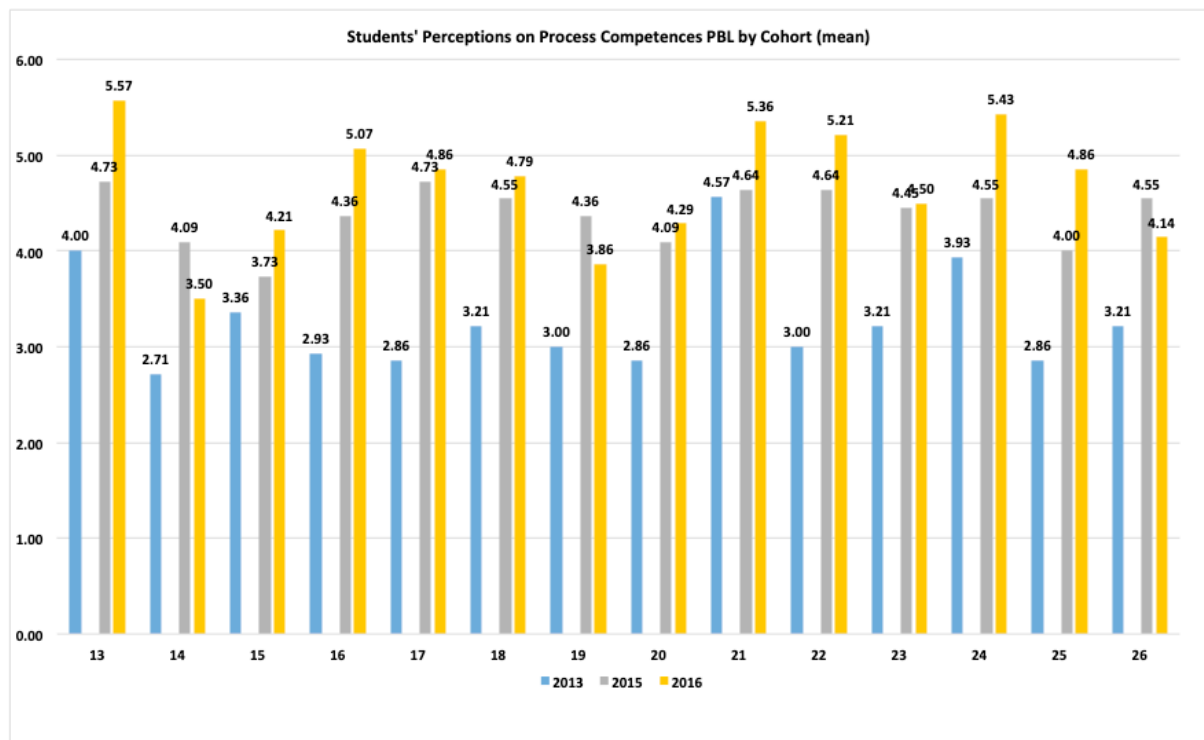
Figure 3: Students' Perceptions on Process Competences (mean by item)



** Average all respondents*

13. Communication skills	20. Understand instead of memorizing
14. Decision-making skills	21. Self study
15. Critical thinking	22. Confidence to discuss in public economic topics
16. Manage a group discussion	23. Identify gaps in my knowledge
17. Work in group	24. Independence in learning process
18. Problem-solving skills	25. Leadership
19. Motivation to study	26. Select relevant information to solve problems

Figure 4: Students' Perceptions on Process Competences PBL by Cohort



13. Communication skills	20. Understand instead of memorizing
14. Decision-making skills	21. Self study
15. Critical thinking	22. Confidence to discuss in public economic topics
16. Manage a group discussion	23. Identify gaps in my knowledge
17. Work in group	24. Independence in learning process
18. Problem-solving skills	25. Leadership
19. Motivation to study	26. Select relevant information to solve problems

In Figure 4 the first cohort on PBL in 2013 appears to be less confident on PBL process competences with lower means in all item comparing to 2015 and 2016. But we need to test if the difference is statistically significant, our next step.

To perform statistical tests we group the co-hort 2013 with 2014²⁹, and 2015 and 2016. The results are in Table 9 descriptive statistics and t-test of student's perceptions on process competences. The higher scores are for Communication skills (5,2), Self-study (5,04), independence in learning process (5,04), work in group (4,8) and manage a group discussion (4,76). The most import result is that students from 2015-2016 evaluate with higher scores all process competences than the group 2013-2014, the difference in perception on process competences is statistically significant for all items³⁰. When students overcome the transition period from traditional method to PBL the negative perceptions are reduced in line with Alessio (2004). Also, they need time to understand the new roles and feel comfortable (Dochy et al.: 2005). In addition, the cohorts from 2015 e 2016 have more experienced professors and staff on PBL, as pointed earlier the first years of implementation were a period of adjustment and for PBL consolidation. More training sections for tutors, improvement of problems, curriculum alignment etc.

²⁹ 2014 cohort do not have data on process competences.

³⁰ At 1% confidence interval.

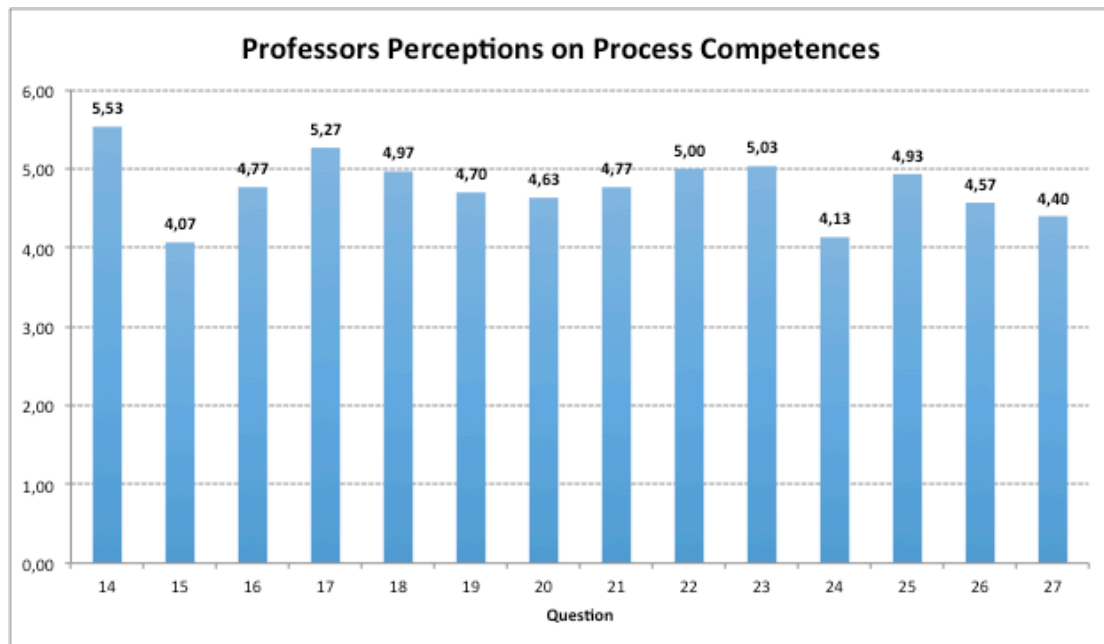
Table 9: Student's Perceptions on Process Competences by Item

Competency	Category	N	Mean	SD	t	df	Sig.
Communication skills	2013-2014	27	2,22	0,41	-6,44	50	0,0000
	2015-2016	25	5,20	0,19			
Decision-making skills	2013-2014	27	1,59	0,33	-4,97	50	0,0000
	2015-2016	25	3,76	0,27			
Critical thinking	2013-2014	27	1,96	0,40	-4,16	50	0,0000
	2015-2016	25	4,00	0,26			
Manage a group discussion	2013-2014	27	1,63	0,33	-8,02	50	0,0000
	2015-2016	25	4,76	0,19			
Work in group	2013-2014	27	1,59	0,33	-7,84	50	0,0000
	2015-2016	25	4,80	0,22			
Problem-solving skills	2013-2014	27	1,89	0,38	-6,00	50	0,0000
	2015-2016	25	4,68	0,26			
Motivation to study	2013-2014	27	1,59	0,36	-5,00	50	0,0000
	2015-2016	25	4,08	0,34			
Understand instead of memorizing	2013-2014	27	1,52	0,31	-6,37	50	0,0000
	2015-2016	25	4,20	0,28			
Self study	2013-2014	27	2,59	0,49	-4,43	50	0,0000
	2015-2016	25	5,04	0,23			
Confidence to discuss in public economic topics	2013-2014	27	1,74	0,38	-7,08	50	0,0000
	2015-2016	25	4,96	0,23			
Identify gaps in my knowledge	2013-2014	27	1,81	0,35	-6,04	50	0,0000
	2015-2016	25	4,48	0,26			
Independence in learning process	2013-2014	27	2,15	0,41	-6,13	50	0,0000
	2015-2016	25	5,04	0,21			
Leadership	2013-2014	27	1,63	0,35	-6,97	50	0,0000
	2015-2016	25	4,48	0,19			
Select relevant information to solve problems	2013-2014	27	1,89	0,39	-5,34	50	0,0000
	2015-2016	25	4,32	0,22			

5.2 Professors' Perceptions on Processes Competences

We also ask professors about the same process competences and they evaluate with positive scores see Figure 5. Professors' perceptions are that PBL helps to improve students' process competences like: communication, manage a group section, discuss in public economic topics, self-study and work in group. They are less convinced about identifying gaps in learning, decision making skills and select relevant information to solve a problem, but still positive perceptions.

Figure 5: Professors' Perceptions on Process Competences (mean by item)



14. Communication skills	21. Understand instead of memorizing
15. Decision-making skills	22. Self study
16. Critical thinking	23. Confidence to discuss in public economic topics
17. Manage a group discussion	24. Identify gaps in my knowledge
18. Work in group	25. Independence in learning process
19. Problem-solving skills	26. Leadership
20. Motivation to study	27. Select relevant information to solve problems

We can compare professors and students' perceptions on process competences and say if the difference is statistically significant. The Table 10 shows that professors are more convinced than students that PBL improves process competences and is statically significant at 1% confidence interval in all items, exception for "identify gaps in my knowledge" with significant at 5% ($p=0117$). For all items, professors gave higher scores (means). This result we do not find on the literature review, and we think it can be explained by some facts: professors were trained every year of implementation period, evaluations were performed with feedback to all, the institution provided resources and structure to PBL implementation and they believe in the method. We will discuss next.

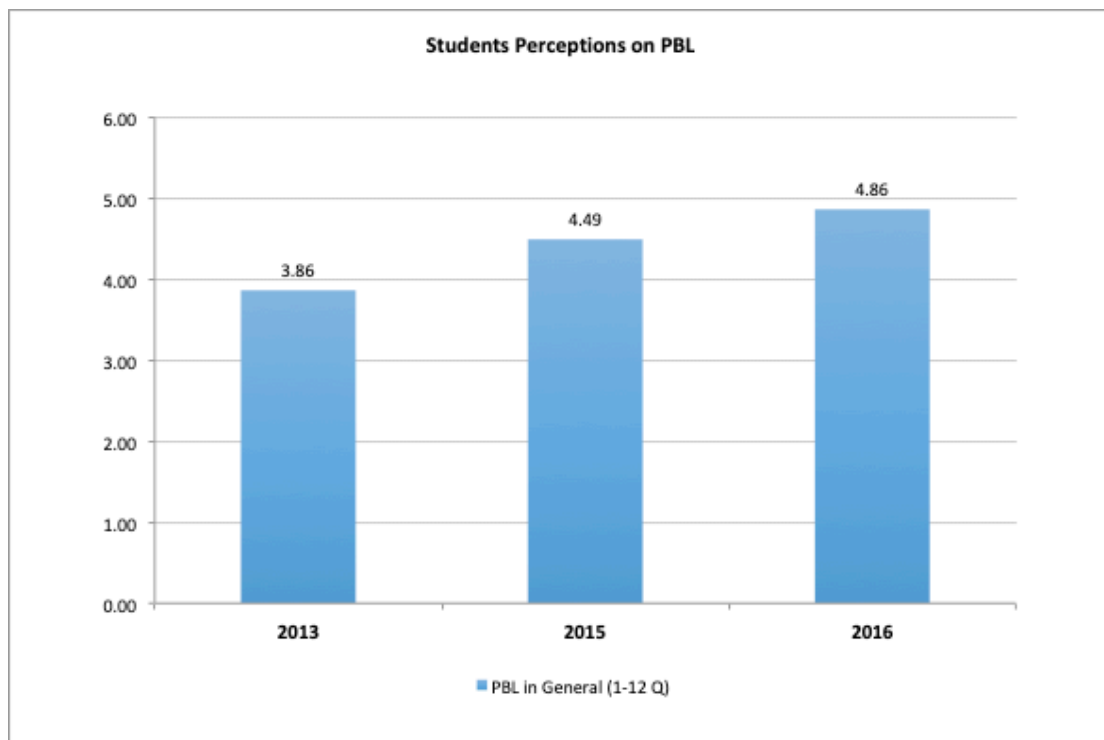
Table 10: Perceptions on Process Competences by Students and Professors

Competency	Category	N	Mean	SD	t	df	Sig.
Communication skills	students	52	3,65	0,31	-4,54	80	0,0000
	tutors	30	5,53	0,09			
Decision-making skills	students	52	2,63	0,26	-3,70	80	0,0004
	tutors	30	4,07	0,22			
Critical thinking	students	52	2,94	0,28	-4,45	80	0,0000
	tutors	30	4,77	0,23			
Manage a group discussion	students	52	3,13	0,29	-5,30	80	0,0000
	tutors	30	5,27	0,15			
Work in group	students	52	3,13	0,30	-4,18	80	0,0001
	tutors	30	4,97	0,24			
Problem-solving skills	students	52	3,23	0,30	-3,43	80	0,0010
	tutors	30	4,70	0,21			
Motivation to study	students	52	2,79	0,30	-4,43	80	0,0000
	tutors	30	4,63	0,16			
Understand instead of memorizing	students	52	2,81	0,28	-4,90	80	0,0000
	tutors	30	4,77	0,20			
Self study	students	52	3,77	0,32	-2,78	80	0,0069
	tutors	30	5,00	0,17			
Confidence to discuss in public economic topics	students	52	3,29	0,32	-4,04	80	0,0001
	tutors	30	5,03	0,13			
Identify gaps in my knowledge	students	52	3,10	0,29	-2,58	80	0,0117
	tutors	30	4,13	0,18			
Independence in learning process	students	52	3,54	0,31	-3,29	80	0,0015
	tutors	30	4,93	0,15			
Leadership	students	52	3,00	0,28	-3,80	80	0,0003
	tutors	30	4,57	0,23			
Select relevant information to solve problems	students	52	3,06	0,28	-3,39	80	0,0011
	tutors	30	4,40	0,18			

5.2 Perceptions on PBL

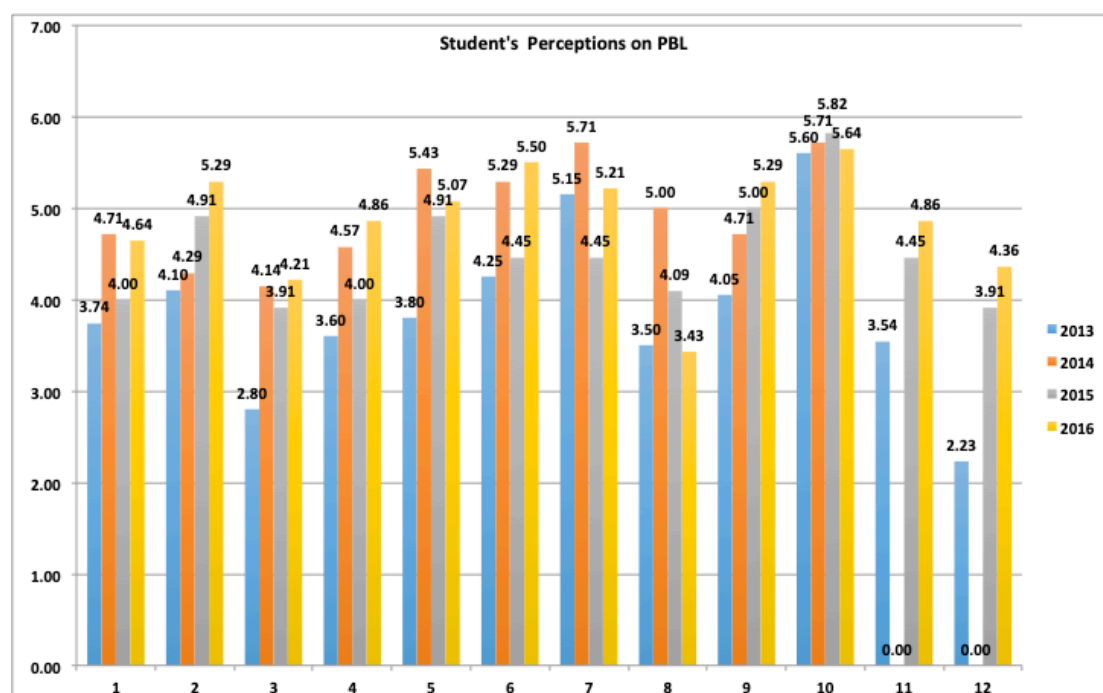
In Figure 6 we present descriptive data on students' perceptions on PBL. Again, older cohorts evaluate less positive specially comparing 2016 (4,86) with 2013 (3,86).

Figure 6: Students' Perception on PBL (Mean by Cohort)



In Figure 7 we have by item and by cohort, and again students from 2013 gave lower means to all items in comparison to 2015, and 2016. The 2014 cohort have just 7 observations, but 21% of the target group.

Figure 7: Students' Perception on PBL (Mean by Item)



1	PBL motivates to study
2	The tutorial sessions are more engaging than lectures
3	I like tutorial sessions
4	Problems transforms the learning in a more exciting experience
5	Real world problems helps to appreciate the importance of understand instead of memorizing
6	I feel more close to tutors than in lectures
7	Tutors are important in the PBL learning process
8	The tutor feedback contributes to my learning process
9	I understand that the learning environment of PBL is created to develop other skills beyond the content in economics
10	Develop other skills (communication, leadership, work in groups etc) is important for my career
11	I think that I learn "economics" with PBL
12	I like PBL

To confirm if students evaluate statistically different between cohorts we present the results in Table 11. The groups of students 2013-2014 and 2015-2016 evaluate the elements of PBL equally, so there is no statistically significant difference between them on: motivation to study, critical thinking, work in group etc., and the difference in scores are not statistically significant at 1% confidence interval. Although, students from 2015-2016 like PBL more than 2013-2014 students ("I like PBL"), and they think they "learn economics with PBL" in a higher score, at 1% confidence interval. Also, they score higher the item "I understand that the learning environment of PBL is created to develop other skills beyond the content of economics".

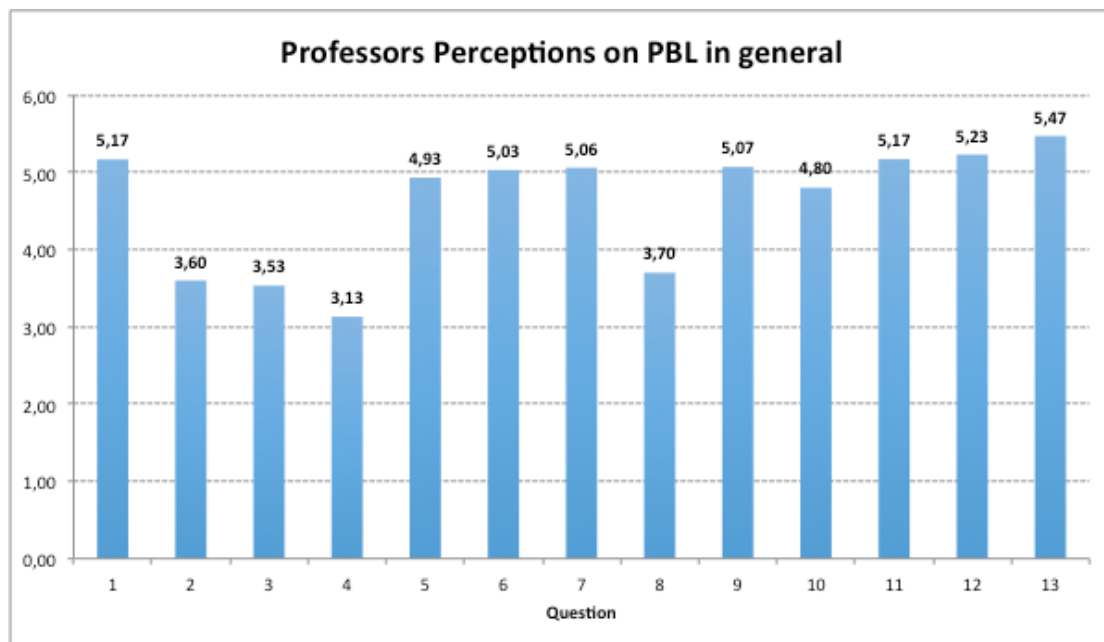
Table 11: Students' Perceptions on PBL by group

Competency	Category	N	Mean	SD	t	df	Sig.
PBL motivates to study	2013-2014	27	3,85	0,29	-1,17	50	0,2451
	2015-2016	25	4,36	0,32			
Problems transforms the learning in a more exciting experience	2013-2014	27	3,85	0,24	-1,69	50	0,0972
	2015-2016	25	4,48	0,29			
Real world problems helps to appreciate the importance of understand instead of memorizing	2013-2014	27	4,22	0,29	-2,01	50	0,0493
	2015-2016	25	5,00	0,25			
I feel more close to tutors than in lectures	2013-2014	27	4,52	0,28	-1,37	50	0,1760
	2015-2016	25	5,04	0,25			
Tutors are important in the PBL learning process	2013-2014	27	5,30	0,17	1,28	50	0,2052
	2015-2016	25	4,88	0,28			
The tutor feedback contributes to my learning process	2013-2014	27	3,89	0,33	0,33	50	0,7381
	2015-2016	25	3,72	0,38			
I understand that the learning environment of PBL is created to develop other skills beyond the content in economics	2013-2014	27	4,22	0,26	-2,77	50	0,0077
	2015-2016	25	5,16	0,21			
Develop other skills (communication, leadership, work in groups etc) is important for my career	2013-2014	27	5,63	0,11	-0,52	50	0,6029
	2015-2016	25	5,72	0,14			
I think that I learn "economics" with PBL	2013-2014	27	1,85	0,38	-6,34	50	0,0000
	2015-2016	25	4,68	0,22			
I like PBL	2013-2014	27	1,11	0,26	-7,92	50	0,0000
	2015-2016	25	4,16	0,28			

We also ask professors about PBL with different questions. Professors are positive to PBL as we can see in Figure 7. They agree that tutorial sections are more engaging than lectures (5,17), tutor has to be an expert on the subject (4,93), they like tutorial sections (5,03), the school provided enough resources for the implementation (5,06), and that learning environment of PBL is created to develop other skills beyond economics (5,47).

Below a 4 as mean sometimes is a positive perception like: act as supervisor/tutor for the first time was a huge challenge (3,6) they partly disagree, "The temptation to "explain the subject" in a tutorial section is still a challenge for me" (3,53), "I think that students do not learn all the content planned in tutorial sessions" (3,13) and "PBL need to demonstrate that improves student's performance to convince me about it" (3,7), respectively. For these items the mean above 4 is a good sign.

Figure 8: Professors' Perceptions on PBL (mean by item)



1. The tutorial sessions are more engaging for students than lectures	8. PBL need to demonstrate that improves student's performance to convince me about it
2. Act as supervisor/tutor for the first time was a huge challenge.	9. I am confident as a tutor after my experience on PBL at EESP.
3. The temptation to "explain the subject" in a tutorial section is still a challenge for me	10. I think is important to offer occasional lectures to students
4. I think that students do not learn all the content planned in tutorial sessions	11. I use feedback from coordinator and students as tools for improvement as supervisor/tutor.
5. I think that the tutor has to be an expert in the subject;	12. I know PBL philosophical principles.
6. I like tutorial sessions	13. I understand that the learning environment of PBL is created to develop other skills beyond the content in economics
7. The Dean's office provided enough training for PBL implementation	

5.3 Students and Professors on PBL

Although the questionnaires for students and professors are different, we have two items to compare their perceptions on PBL. In Table 12, professors like the tutorial sections more than students³¹ and also think that tutorial sections are more engaging than lectures³².

³¹ Statistically significant at 1% confidence interval.

³² Statistically significant at 10% confidence interval.

Table 12: Students and Professors Perceptions on PBL

Competency	Category	N	Mean	SD	t	df	Sig.
The tutorial sessions are more engaging than lectures	students	52	4,62	0,20	-1,84	80	0,0693
	tutors	30	5,17	0,20			
I like tutorial sessions	students	52	3,60	0,20	-5,35	80	0,0000
	tutors	30	5,21	0,17			

In addition, there is a high correlation (89%) between students that “like PBL” and those who said that “think that I learn economics with PBL”. Also, professors that “like PBL” usually perceive that “tutorial sessions are more engaging than lectures”, with correlation of 56% (Table 13).

Table 13: Correlations that Like PBL versus Learning

	I like PBL/tutorial sections	N
I think I Learn Economics with PBL	0,8981	52
Tutorial Sections are more engaging than lectures	0,5613	30

5.4 Data Discussion

Our RQ is: **To each extent do students and professors in an economics undergraduate school perceive that PBL helps improve process competences?**

Based on our results we can say that students and professors perceive that PBL improves process competences, especially communication skills, manage a group section, discuss in public economic topics, self study and work in group. Professors are more convinced that PBL improves those processes competences than students.

Students need time to get used to PBL (Dochy et al., 2005) and the negative perception decline with more experienced students (Sim at al, 2011; Gurpinar

2009; Haghparast el al.,2007; Surif et al., 2013; Schmidt et al, 2005). Our results show that students for more recent cohorts evaluate PBL more positive.

Unfortunately for 2014 co-hort we had a very low response rate and just for the first group of question for PBL as method. The students from 2013-2014 are more negative to PBL, confirming what found in Alessio (2004) during transitions students report a lot of discontent. Although SPSE performed two pilots as preparation for implementation they faced a cultural change to a new paradigm.

At that time, the students mainly from cohorts 2013 and 2014 were still getting used to the “rules of PBL”: tutorial groups behavior, evaluation of each tutorial participation, workbook problems, etc. They said informally to professors that serve as *guinea pig*, and PBL was a cultural shock for everybody. As pointed out by Dochy et al. (2005) students need time to feel comfortable with the method, but with time negative perceptions diminish as in Alessio (2004) and Sim et al (2011). During the first year of PBL implementation, the coordination performed evaluations on tutors, and in all tutorial sections, the staff had an internal³³ observer trained in PBL to give feedback to the tutor. In the subsequent years, the school did not used this evaluation method.

The results for students’ 2015-2016 cohorts which are more positive to PBL and more convinced that the method improves process competences can be interpreted as a consequence of solidification of PBL philosophy and the experienced professors after the first years of implementation.

Professors are more positive to PBL and perceived that the method helps to improve process competences than students. With more experienced professors,

³³ Professors that participated since the first workshop on PBL and volunteer to contribute. I was one of observers. My role was to identify if the tutorial section performed as the 7 jump, the rules I cited earlier, and the professors’ and students roles. The content part was not observed because the workbook was already evaluated by another group.

periodic evaluation of problems, improvement of learning environment we can expect that students become more positive with PBL as reported by literature.

The results from students and professors at school of economics are in line with the literature about PBL perceptions in schools of medicine and engineering. As students became more positive to PBL, more positive are the perceptions on the method and the perceptions on improving process competences. In the literature of PBL implementation these are key elements for success: resources, training and feedback. After four years of implementation the professor is confident as tutor, we find the same result as in Vernon (1995), Gulpinar et al (2009) and Steele et al (2000) that reported professors positive to PBL even not sure about if superior to traditional lectures.

Mostly of PBL implementation cases show that professors are not convinced by the efficacy of the method. As McLean (2003) reported if professors are not convinced about PBL method the performance as tutor is worse. We can say that is the case Sao Paulo School of Economics professors perceive that PBL improves process competences.

PBL at school of economics motivates to study and improve the competence to understand subject not to memorize and to solve problems. Although some professors need to be convinced about PBL efficacy, the perceptions about other skills that the method can improve are clear.

As limitations of our study is the low rate of students' responses mainly from cohort 2014, but we still can have some important information from that. We did not use a complementary qualitative method, as interviews for example that could give us more information about students and professors. And finally, we just had at the time 4-year data on PBL implementation without results from the performance of students in work life.

6 Concluding Remarks

Implementing PBL is a challenge for any university because it is a paradigm change and faces resistance from students, professors, administrative staff. In our case study, a private school of economics in Brazil seems that overcome the challenges of PBL implementation and now is trying to evaluate students' performance. In this report we presented students and professors perceptions on process competences and PBL using Likert scale. The literature on PBL is very rich on engineering and medical courses, but do not put much light on economics courses. The results for our case study are in line with literature; students and professors become more positive to PBL with time, more confident and aware of the new abilities learned. They perceive that lectures do not engage as tutorial groups, and PBL helps to improve abilities like: communication, solving problems, manage group work, self-study, understand instead of memorizing, independence in the learning process.

As the time pass and the method became the new culture, students and professors are more confident about their new roles and his efficacy. Even with the positive perceptions from students and professors, the school has to monitor the method for a lifetime culture. Periodic training for the experienced professors and for the new comers is essential for a long run implementation. As a future work, the observation of the cohort of students during their period at school can bring us more information about the evolution of learning. Student performance in the labor market will be a fundamental tool to measure the efficiency of PBL on content in economics and the process competences.

From the literature of PBL implementation we know that training, information, understanding of roles and philosophical principles are important to the quality of the transition and evaluation for professors and staff.

The report shows a case of full implementation of a version of PBL in Brazil, in an economics undergraduate school. In spite of the fact that the implementation was not our focus, it shows how difficult and time consuming for a cultural

change in education. Without the clear vision to the future, excellent staff and resources, the change from traditional to active learning can be more harmful than good. Fortunately, finishing the report in 2020, I can say that students and professors are positive to PBL and the methodology is one of choice factors to students come to SPSE. The reputation was built in very solid principles and what they learned from Maastricht University and Aalborg University were crucial to SPSE's PBL success. As we know a case is not for generalizations, but PBL improves process competences and fits better to the new generation of students. In addition, PBL is not just for medical or engineering schools, but to all social sciences and programs.

Even with so many restrictions imposed by regulation, it is possible for active learning be the goal for other universities in Brazil.

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APPENDIX 1

The 7-jump problem solving process from Maastricht University work as follows:

Step #1: Clarification of terms

The problem is presented to students and the objective is to check if every student understands the task. This is the pre discussion session.

Step #2: Problem definition

The group formulates one or more problem definitions as a starting point for the discussion.

Step #3: Problem analysis

Here the students start to present formulations, possible explanations for the problem activating the prior knowledge. Finding what they know and do not know about the problem.

Step #4: Systematic inventory

In this step, students will organize the possible answers presenting arguments to them.

Step #5: Formulate learning objectives

After trying to present arguments and possible answers, they will organize what they need to study, the learning objectives. The 1 to 5 steps occur in the same tutorial session.

Step #6: Self study

Students will search for literature and other sources and study to reach the learning objectives.

Step #7: Report and synthesize

In a new tutorial session (post discussion session), students will answer the learning objectives for with new acquired knowledge.

APPENDIX 2

4 year ECONOMICS PROGRAM*

	créditos	
	total	ECTS
1 semestre		
1 trimestre		
PROGRAMAÇÃO E RESOLUÇÃO DE PROBLEMAS	2	3
INTRODUÇÃO À ECONOMIA	6	9
MATEMÁTICA FINANCEIRA	2	3
PBL	2	3
MATEMÁTICA I	6	9
Total	18	27
2 trimestre		
INTRODUÇÃO ÀS CIÊNCIAS SOCIAIS: Nação, Brasil e identidade Nacional.	4	6
PROBABILIDADE	4	6
FORMAÇÃO ECONOMICA DO BRASIL	4	6
MATEMÁTICA I	6	9
Total	18	27
2 semestre		
1 trimestre		
MATEMÁTICA II	6	9
ESTATÍSTICA	4	6
TEORIA MICROECONÔMICA I	6	6
METODOLOGIA E TÉCNICAS DE PESQUISA - PROJETO I	2	3
Total	16	24
2 trimestre		
MATEMÁTICA II	6	9
ESTATÍSTICA	4	6
TEORIA MICROECONÔMICA I	6	9
METODOLOGIA E TÉCNICAS DE PESQUISA - PROJETO I	1	1,5
Total	16	25,5
3 semestre		
1 trimestre		
MATEMÁTICA III	6	9
ECONOMETRIA I	6	9
TEORIA MICROECONÔMICA II	6	9
Total	18	27
2 trimestre		
MATEMÁTICA III	6	9
ECONOMETRIA I	6	9
CONTABILIDADE SOCIAL E INTRODUÇÃO A MACRO	4	6
Total	16	24

4 semestre**1 trimestre**

ECONOMETRIA II	4	6
TEORIA E POLÍTICA MACROECONÔMICA I	6	9
TEORIA MICROECONÔMICA III: ESTRATÉGIA, EVOLUÇÃO E COMPLEXIDADE	6	6
METODOLOGIA E TÉCNICAS DE PESQUISA - PROJETO II	1	1,5
Total	16	22,5

2 trimestre

ECONOMETRIA II	4	6
TEORIA E POLÍTICA MACROECONÔMICA I	6	9
CONTABILIDADE E ADMINISTRAÇÃO FINANCEIRA	6	9
METODOLOGIA E TÉCNICAS DE PESQUISA - PROJETO II	1	1,5
Total	16	25,5

5 semestre**1 trimestre**

ECONOMETRIA III	4	6
TEORIA E POLÍTICA MACROECONÔMICA II – ECONOMIA MONETÁRIA E FINANCEIRA	6	9
DIREITO E ECONOMIA	2	3
HISTÓRIA ECONÔMICA GERAL	4	6
FINANÇAS I	4	6
Total	20	30

2 trimestre

ECONOMIA INTERNACIONAL	6	9
HISTÓRIA ECONÔMICA GERAL	4	6
FINANÇAS I	4	6
ECONOMIA INDUSTRIAL E DE REDES	6	9
Total	20	30

6 semestre**1 trimestre**

FINANÇAS II	4	6
MACROECONOMIA DO DESENVOLVIMENTO	4	6
ECONOMIA BRASILEIRA	4	6
TÓPICOS II	4	6
METODOLOGIA E TÉCNICAS DE PESQUISA - PROJETO III	1	3
Total	16	27

2 trimestre

FINANÇAS II	4	6
CIÊNCIA POLÍTICA BRASILEIRA E ÉTICA	4	6
ECONOMIA POLÍTICA: CRESCIMENTO E DESENVOLVIMENTO	4	6
ECONOMIA DO SETOR PÚBLICO	4	6
METODOLOGIA E TÉCNICAS DE PESQUISA - PROJETO III	1	1,5
Total	16	25,5

7 semestre**1 trimestre**

HISTÓRIA DO PENSAMENTO ECONÔMICO	4	6
GRANDES ECONOMISTAS - à distância	1	1,5
ELETIVAS	12	18
MONOGRAFIA	1	1,5
Total	17	27

2 trimestre

HISTÓRIA DO PENSAMENTO ECONÔMICO	4	6
GRANDES ECONOMISTAS - à distância	1	3
ELETIVAS	12	18
MONOGRAFIA	1	1,5
Total	17	28,5

8 semestre**1 trimestre**

INTERPRETAÇÕES DO BRASIL - à distância	1	1,5
ELETIVA	8	12
Total	9	13,5

2 trimestre

INTERPRETAÇÕES DO BRASIL - à distância	1	1,5
ELETIVA	8	12
Total	9	13,5

* 2013 implementation curriculum

APPENDIX 3

1. Students Questionnaire

Gostaria de pedir sua ajuda para coleta de informações para um trabalho acadêmico que estou fazendo para completar um curso de pós graduação sobre PBL. Obrigada LILIAN FURQUIM

Que ano você entrou na FGV/EESP? : 20__

3. *Responda abaixo sobre as suas percepções a respeito do PBL/Answer below your perceptions about PBL.*

1. Discordo fortemente 2. Discordo 3. Discordo um pouco 4. Concordo um pouco 5. Concordo 6. Concordo fortemente

1. PBL motivates to study/ <i>PBL motiva a estudar</i>	1	2	3	4	5	6
2. The tutorial sessions are more engaging than lectures/ <i>Os tutoriais engajam mais que as lectures</i>	1	2	3	4	5	6
3. I like tutorial sessions/ <i>Eu gosto dos tutoriais</i>	1	2	3	4	5	6
4. Problems transforms the learning in a more exciting experience/ <i>Problemas transformam o aprendizado numa experiência mais interessante</i>	1	2	3	4	5	6
5. Real world problems helps to appreciate the importance of understand instead of memorizing/ <i>Problemas do mundo real ajudam a perceber que é mais importante compreender do que memorizar.</i>	1	2	3	4	5	6
6. I feel more close to tutors than in lectures/ <i>Me sinto mais próximo dos tutores do que dos professores em lectures</i>	1	2	3	4	5	6
7. Tutors are important in the PBL learning process/ <i>Tutores são importantes para o processo de aprendizado no PBL</i>	1	2	3	4	5	6
8. The tutor feedback contributes to my learning process/ <i>O feedback dos tutores é importante para o meu processo de aprendizado</i>	1	2	3	4	5	6
9. I understand that the learning environment of PBL is created to develop other skills beyond the content in economics/ <i>Eu entendo que o ambiente de aprendizado do PBL foi criado para desenvolver outras habilidades além do conteúdo de economia</i>	1	2	3	4	5	6
10. Develop other skills (communication, leadership, work in groups etc) is important for my career/ <i>Eu acho que desenvolver outras habilidades (comunicar, liderar, trabalhar em equipe, etc.) é importante para minha carreira</i>	1	2	3	4	5	6

11. I think that I learn “economics” with PBL / <i>Eu acho que aprendo Economia com o PBL</i>	1	2	3	4	5	6
12. I like PBL / <i>Eu gosto do PBL</i>	1	2	3	4	5	6

2. Quais habilidades pessoais você acha que o PBL ajuda a melhorar ou desenvolver? Which personal abilities do you think that PBL helps to improve or develop?

1. Discordo fortemente 2. Discordo 3. Discordo um pouco 4. Concordo um pouco 5. Concordo 6. Concordo fortemente

13. Communication skills/ Comunicação	1	2	3	4	5	6
14. Decision-making skills/ Tomada de decisão	1	2	3	4	5	6
15. Critical thinking/ Pensamento crítico	1	2	3	4	5	6
16. Manage a group discussion/ Dirigir uma discussão em grupo	1	2	3	4	5	6
17. Work in group/ Trabalhar em grupo	1	2	3	4	5	6
18. Problem-solving skills/ Habilidade resolver problemas	1	2	3	4	5	6
19. Motivation to study/ Motivação para estudar	1	2	3	4	5	6
20. Understand instead of memorizing/ Compreender ao invés de memorizar	1	2	3	4	5	6
21. Self study / Auto estudo	1	2	3	4	5	6
22. Confidence to discuss in public economic topics/ Confiança em discutir em público sobre questões econômicas	1	2	3	4	5	6
23. Identify gaps in my knowledge/ Identificar lacunas no meu conhecimento	1	2	3	4	5	6
24. Independence in learning process/ Independência no processo de aprendizagem	1	2	3	4	5	6
25. Leadership/ Liderança	1	2	3	4	5	6
26. Select relevant information to solve problems/ Selecionar informações relevantes para resolver problemas	1	2	3	4	5	6

APPENDIX 4

2. Professor's Questionnaire

1. *Responda abaixo sobre as suas percepções a respeito do PBL/ Answer below about your perceptions about PBL*

1. Discordo fortemente 2. Discordo 3. Discordo um pouco 4. Concordo um pouco 5. Concordo 6. Concordo fortemente

1. The tutorial sessions are more engaging for students than lectures	1	2	3	4	5	6
2. Act as supervisor/tutor for the first time was a huge challenge.	1	2	3	4	5	6
3. The temptation to “explain the subject” in a tutorial section is still a challenge for me	1	2	3	4	5	6
4. I think that students do not learn all the content planned in tutorial sessions	1	2	3	4	5	6
5. I think that the tutor have to be an expert in the subject;	1	2	3	4	5	6
6. I like tutorial sessions	1	2	3	4	5	6
7. The Dean's office provided enough training for PBL implementation	1	2	3	4	5	6
8. PBL need to demonstrate that improves student's performance to convince me about it	1	2	3	4	5	6
9. I am confident as a tutor after my experience on PBL at EESP.	1	2	3	4	5	6
10. I think is important to offer occasional lectures to students	1	2	3	4	5	6
11. I use feedback from coordinator and students as tools for improvement as supervisor/tutor.	1	2	3	4	5	6
12. I know PBL philosophical principles.	1	2	3	4	5	6
13. I understand that the learning environment of PBL is created to develop other skills beyond the content in economics	1	2	3	4	5	6

2. *Quais habilidades pessoais você acha que o PBL ajuda a melhorar ou desenvolver nos alunos? Which students' personal abilities do you think that PBL helps to improve or develop?*

1. Discordo fortemente 2. Discordo 3. Discordo um pouco 4. Concordo um pouco 5. Concordo 6. Concordo fortemente

14. Communication skills/ Comunicação	1	2	3	4	5	6
15. Decision-making skills/ Tomada de decisão	1	2	3	4	5	6
16. Critical thinking/ Pensamento crítico	1	2	3	4	5	6
17. Manage a group discussion/ Dirigir uma discussão em	1	2	3	4	5	6

grupo						
18. Work in group/ Trabalhar em grupo	1	2	3	4	5	6
19. Problem-solving skills/ Habilidade resolver problemas	1	2	3	4	5	6
20. Motivation to study/ Motivação para estudar	1	2	3	4	5	6
21. Understand instead of memorizing/ Compreender ao invés de memorizar	1	2	3	4	5	6
22. Self study / Auto estudo	1	2	3	4	5	6
23. Confidence to discuss in public economic topics/ Confiança em discutir em público sobre questões econômicas	1	2	3	4	5	6
24. Identify gaps in my knowledge/ Identificar lacunas no meu conhecimento	1	2	3	4	5	6
25. Independence in learning process/ Independência no processo de aprendizagem	1	2	3	4	5	6
26. Leadership/ Liderança	1	2	3	4	5	6
27. Select relevant information to solve problems/ Selecionar informações relevantes para resolver problemas	1	2	3	4	5	6

Supervisor: responsible by the discipline workbook;

Tutor: uses material from supervisors at tutorial sections, but they are experts;

APPENDIX 5

A: Typical PBL Study Room at SPSE



B: Tutorial Section at SPSE



C: Tutorial Section



D: Lecture

