

FAST-300 – BASED LEARNING: A METHODOLOGICAL PROPOSAL COMBINING TEAM-BASED LEARNING AND THREE HUNDRED METHOD

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Abstract: *Passive classes by means of expository approaches may compromise both the theoretical and practical learning, as well as the development of fundamental competences for the professional exercise. As an alternative, active classes have been reported in several cases in the literature. However, the use of the active methodologies may require adaptations case-by-case. This paper aims at presenting the Fast-300, a methodological proposal combining team-based learning and 300 method, developed for supporting classes of basic cycle disciplines in Sorocaba Engineering College. As a result, the usage in several disciplines provided a significant improvement in the students' performance. In conclusion, the Fast-300 - based learning may be considered a promising approach for student empowerment in an intensive way.*

Keywords: 300 method. Team-based learning. Active methodology.

Resumo: Aulas passivas por meio de abordagens expositivas podem comprometer tanto a aprendizagem teórica quanto a prática, bem como o desenvolvimento de competências fundamentais para o exercício profissional. Como alternativa, aulas ativas têm sido relatadas em vários casos na literatura. No entanto, o uso de metodologias ativas pode exigir adaptações caso a caso. Este artigo tem como objetivo apresentar o Fast-300, uma proposta metodológica que combina o aprendizado baseado em equipes e o método 300, desenvolvido para apoiar aulas do ciclo básico na Faculdade de Engenharia de Sorocaba. Como resultado, o uso em várias disciplinas proporcionou uma melhoria significativa no desempenho dos alunos. Em conclusão, a aprendizagem baseada no Fast-300 pode ser considerada uma abordagem promissora para o empoderamento do aluno de forma intensiva.

Palavras-chave: método 300. Aprendizagem baseada em equipe. Metodologia ativa.

1 INTRODUCTION

Knowledge is transmitted from one being to another, from one generation to the next, from mentors to apprentices, from professors to learners, but never exclusively on a one-way basis, there is always a reciprocal transfer that needs be recognized to be better harnessed (BRESSANE; RIBEIRO; MEDEIROS, 2015, 39p.).

Expository lectures lead students to a passive performance, which usually implies learning limited to memorizing information, without a clear connection with their professional applicability (CHAHUÁN-JIMÉNEZ, 2009; MARION, 2001; FREIRE, 1978).

In the traditional approach, another commitment concerns the development of the professional profile. The passive approach does not contribute to the formation of competences such as cooperation, creativity, and proactivity, limiting the scope of traditional teaching to the training of professionals unable to face the challenges posed by modern society (BRESSANE et al., 2017; MACHADO, 2012; GERALDES; ROGGERO, 2011; TEÓFILO; DIAS, 2009).

The deficiencies caused by passive learning have motivated the development of new teaching practices. Active methodological tools include the Dynamics-based learning (BRESSANE et al., 2017), 300 methodology, Team-based learning, Inquiry Based Learning, Project-based Learning (PRINCE; FELDER, 2006).

Such methods have been applied in a wide variety of disciplines, in the most diverse areas, such as the environmental sciences (BRESSANE et al., 2015); the geography (SPRONKEN-SMITH et al., 2008), and engineering (BRESSANE et al., 2017).

Based on theoretical references by Piaget and Vygotsky, the active methodology proposes the decentralization of the role of the professor, which assumes the function of stimulating and managing the students' performance, who become protagonists of own formation (ROTGANS; SCHMIDT, 2011; CRUZ, 2008; DIMESTEIN, 1997; DEWEY, 1978).

In spite of the wide variety of methods reported in the literature, there are predominant approaches developed for the teaching of thematic and professional disciplines, there being fewer reported cases of usage in disciplines of the basic cycle of engineering such as statistic, physics, algebra and calculus.

The present paper aims to present the ‘Fast-300 – based learning’ a methodological proposal combining team-based learning (TBL) and 300 method, developed by a group of professors for supporting classes of basic cycle disciplines at Faculdade de Engenharia de Sorocaba - FACENS (Sorocaba Engineering College).

Before presenting the methodology proposed in this paper, in section 2 we describe the original methods, team-based learning and 300 method, used in combination to develop the Fast-300 – based learning.

2 TBL AND 300 METHODS: A BRIEF THEORETICAL BACKGROUND

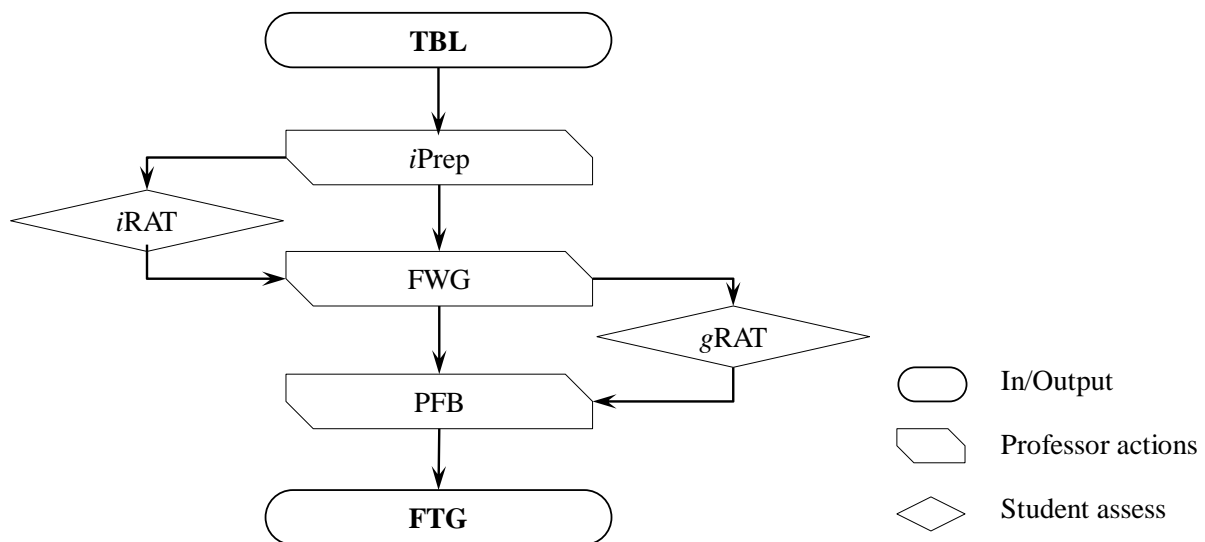
2.1 Team – based learning

Team-based learning (TBL) refers to an education strategy developed by Larry Michaelsen in the 1970s. The TBL method creates in the classroom an opportunity for learning through small groups of 5 to 7 students (BURGUESS; MCGREGOR; MELLIS, 2014). Originally, the proposal was support classes with many students - more than 100 - but the TBL is also applicable in classes with at least 25 students. Taking into account the performance of this method, in 2001 the North American government selected the TBL as an educational strategy to be disseminated by means of which the training of professors from different areas (PARMELEE et al., 2010).

As other active methodologies, TBL method does not intend to fully replace traditional classes but be a complementary activity, commonly as an alternative for assessing the student achievement on a given subject. Working in groups students cooperate in solving problems, exercising communication and other skills such as reflection, leadership and proactivity, important skills for professional performance (BOLLELA et al., 2014).

The use of TBL includes the following steps (Figure 1): (1) Individual preparation - *i*Prep; (2) Individual Readiness Assurance Test – *i*RAT; (3) Formation of workgroups - FWG; (4) Group Readiness Assurance Test – *g*RAT; and (5) Prompt feedback – PFB (HYRNCHAK; BATTY, 2012).

Figure 1 – Principal steps in the Team-based learning method.



Source: produced by the authors.

Individual preparation refers to a prior study by the student based on classes and extra classroom activities. The *i*RAT consists of an individual resolution by the student, without consultation of any material, of a test composed of multiple choice questions. The formation of workgroups is made by the professor, seeking to merge students in a random and balanced way. Finally, in the *g*RAT the same test is solved by each group. For this last one, the students argue over the reasons for individual responses. After all, the groups receive a prompt feedback on the right answers. The final test grade (FTG) is a weighted combination of *i*RAT and *g*RAT (MICHAELSEN, 2002).

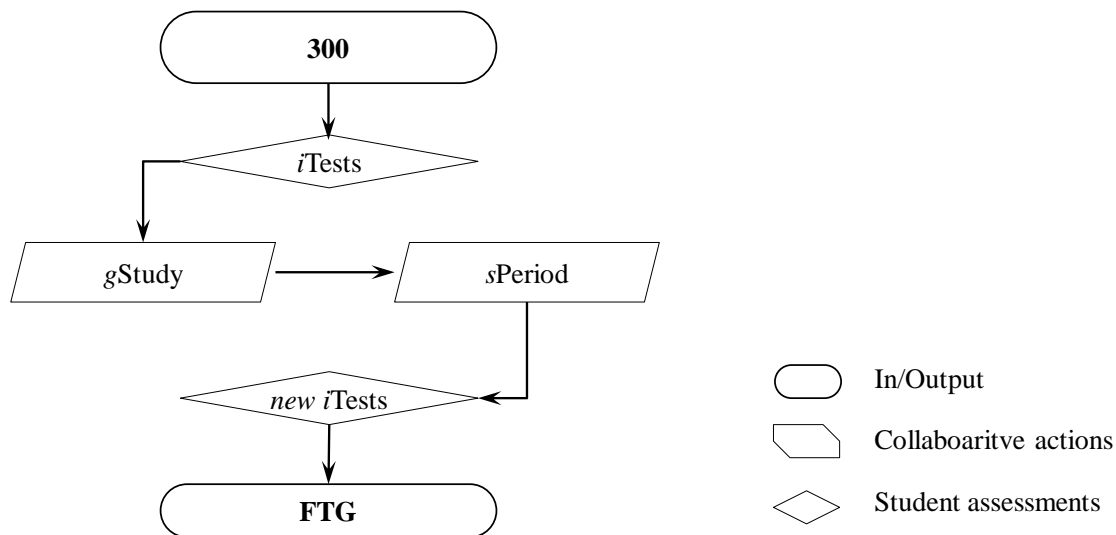
2.2 300 methodology

The 300 methodology was developed by professor Ricardo Fragelli, from the University of Brasília (UnB), in the 2010's. Inspired by the cinematographic work "300", as an educational strategy the 300 method provides a collaborative approach among students (FRAGELLI, 2015). By achieving great results, the methodology has been recognized nationally, receiving the Santander Universidades 2015 Award - Student Support Category (BORGE; SBARDELOTTO, 2017).

According to Fragelli (2015, 860 p.) “*The methodology of the Three Hundreds consists of maximizing the collaboration among students, awakening the learning difficulties of the other*”. For that, students are ranked according to their performance in traditional assessments. Then, heterogeneous groups of study are formed, composed of students with high and low performances. After a pre-defined period of collective studies, only the lowest-performing students can retake the evaluations and thus improve their grades. In turn, the better performing students also obtain increases in their grades, proportionately to performance improvement of the helped students. As a result, Fragelli (2015) reports that the students stated great acceptance of the method, with significant performance improvements in the discipline of calculus.

In a practical way, the application of the 300 methodology can be summarized in four main steps (Figure 2): (1) Individual tests - *iTests*; (2) Formation of study groups - *gStudy*; (3) Collective studies period - *sPeriod*; (4) New individual tests – new *iTests* (FRAGELLI, 2015).

Figure 2 – Main steps of the 300 methodology.



Source: produced by the authors.

Since 2015 the 300 methodology has been used at Faculdade de Engenharia de Sorocaba – FACENS (Sorocaba Engineering College). After the test, the students who achieved high performances help the ones who had low grades to review the subject. In a given period such students should come together to study a series of exercises. The students with low performance take a new test and, in this way, have a chance to increase their grade.

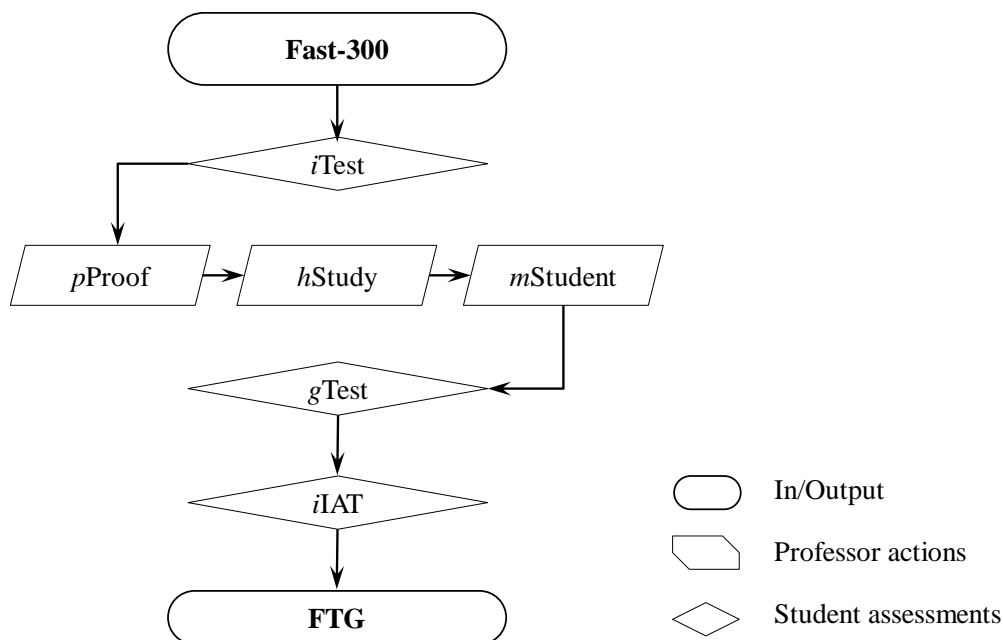
Accordingly, the students with high performance do not take the new test but increase their grades depending on the improvement of the helped students. Therefore, just as in the army of the 300, students who have more knowledge will teach those who have less and "protect" them from a possible failure in the discipline.

3 FAST-300 – BASED LEARNING

The original 300 method commonly takes from two to three weeks and therefore demands a long period (*sPeriod*) that oftentimes cannot be available. Moreover, the collective studies (*gStudy*) are carried out outside the classroom, with little or no accompaniment of the professor, who has no control over the effective participation of the students. From the usage of 300 method at FACENS, the professors have verified little gain in students’ performance since 2015. In the last year, only 15% from a total of 530 students obtained an increase higher than one point in their grades, when the maximum possible increase was seven points.

In view of the foregoing, Fast-300 – based learning was developed by professors from Faculdade de Engenharia de Sorocaba – FACENS (Sorocaba Engineering College), aiming to provide an alternative for student empowerment and performance improvement in an intensive way. For that, the methodological proposal combining team-based learning and 300 method, previously discussed, result in the following main steps (Figure 3): (1) Individual tests - *iTest*; (2) *iTests* proofreading by professor - *pProof*; (3) Formation of heterogeneous groups - *hStudy*; (4) Guidelines and students mobilization - *mStudent*; (5) Group Test - *gTest*; (6) Individual Improvement Assurance Test – *iIAT*.

Figure 3 – Main steps in the Fast-300 – based learning.



Source: produced by the authors.

3.1 Individual tests – *iTest*, proofreading and formation of heterogeneous groups

The Individual tests correspond to a traditional test, with discursive and / or multiple choice questions solved individually by each student. For practical description, the *iTest* occurs in the D-week. Before next week (D+1), the tests are proofreading by professor. Then students are ranked according to their grades in *iTest* in three categories of performance: high (grade ≥ 7.5), medium ($5 \leq$ grade < 7.5), and low ($5 >$ grade).

In a similar way to the 300 method, heterogeneous groups are formed by professor, seeking merge students of different performance categories. However, the groups should be heterogeneous, preferentially have about 5 students and, necessarily, at least one with high performance.

3.2 Guidelines and students mobilization - *m*Student

The students mobilization is mandatory for the good development of the practice. First of all, in the week after the *i*Test (D+1 week), the professor projects with multimedia (or write on the whiteboard) the members of each group (Figure 4). It is recommended to highlight among the students who will be the captain of the team (registration number of student in blue), selected randomly.

Figure 4 – Projection with multimedia of the students members of each group.



Source: produced by the authors.

Secondly, each group, one at a time, is called to the front of classroom and oriented to occupy a seat in the room. Then, the professor summons the captains to a meeting, in which the guidelines of the Fast-300 activity are presented. During this meeting the professor gives the new test with questions and all necessary material to solve the activity to the captain. The captains are responsible for passing the guidelines to the other members of the team.

3.3 Group Test - *g*Test

As in the TBL, the test used in group test (*g*Test) corresponds to the same one used in a traditional test (*i*Test). Whereas captains may have different performances in the *i*Test, they can talk to each other, as a strategy to equalize conditions between groups. Some cases of use of Fast-300 at Facens (*g*Test stage), can be seen in Figure 5.

Figure 5 – Some cases of using Fast-300 at Facens (gTest stage): (a) Physics; (b) Calculus; (c) Linear Algebra; and (d) Fundamentals of Physics and Mathematics.



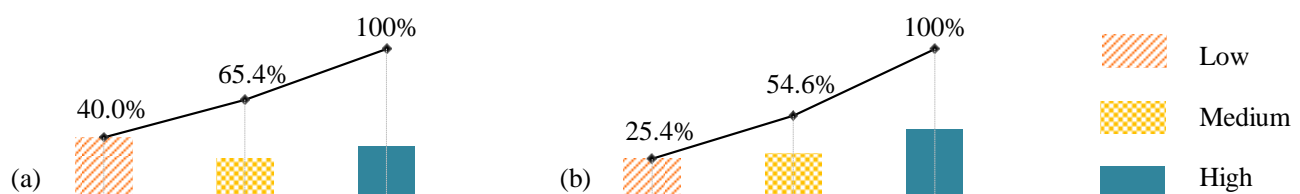
Source: produced by the authors.

At the end of the gTest, only the captain, one at a time, meets the professor. At this meeting the captain hands the answer sheet to the professor and receives the iTest from the members of his/her group. Only then do students know their individual test grades.

3.4 Individual Improvement Assurance Test – iIAT

As the last stage of the activity, the professor summons low-performance students - one at a time - to a meeting. In this meeting the student is asked to solve questions that s/he missed in the iTest. As a final test grade (FTG), if the student demonstrates assertiveness in the resolution, the entire group will have an increase of up to + 1.0 point in the grade obtained in the iTest ($FTG = iTest + 1.0$). Otherwise, the whole group will have a discount of 0.25 points on the accrual score. The increase is 1.0 point if all issues resolved in gTest are correct. As a result of using Fast-300 in different disciplines at Facens, it is noted a gain of performance highly satisfactory. For instance, grades in the discipline Fundamentals of Physics and Mathematics, before and after of the Fast-300 can be seen in Figure 6.

Figure 6 – Performance improvement in the discipline Fundamentals of Physics and Mathematics: (a) before and (b) after Fast-300 – based learning.



Source: produced by the authors.

Analyzing Figure 6, it is noted that the proportion of students with low performance decreases from 40.0% to 25.4% and, in turn, the ones with high performance increase from 34.6% to 45.4%. Therefore, the usage of Fast-300 provided a significantly improvement of the individual FTG.



4 FINAL CONSIDERATIONS

Teaching-learning through active classes has been reported as an alternative with gain in the students achievement in several cases published in the literature. Notwithstanding the use of the active methodologies may require adaptations case-by-case. In this sense, we present the Fast-300, as a proposal combining team-based learning and the 300 method.

In conclusion, from the outcomes of the usage in several disciplines at Faculdade de Engenharia de Sorocaba - FACENS, the Fast-300 may be considered a promising approach for student empowerment and performance improvement in an intensive way. Therefore, the authors recommend the use of this approach for similar cases.

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