



## RESEARCH ARTICLE

### THE MAXIMUM-CONJUGATE-TRIPTYCH METHOD FOR TEACHING LEARNERS WITH DIFFERENT ENTRY PROFILES IN THE TECHNICAL HIGHER EDUCATION

Alcides Romualdo Neto Simbo<sup>1,\*</sup> and Humberto Cuteso Matumueni<sup>2</sup>

<sup>1</sup>University of 11 November, Department of Mathematics, Cabinda/Angola

<sup>2</sup>University of 11 November, Department of Computer engineering, Soyo/Angola

#### ARTICLE INFO

##### Article History:

Received 25<sup>th</sup> January, 2020  
Received in revised form  
19<sup>th</sup> February, 2020  
Accepted 27<sup>th</sup> March, 2020  
Published online 30<sup>th</sup> April, 2020

##### Keywords:

Method of Teaching, Specific Clusters of Learners, Different Entry Profiles.

Copyright © 2020, Alcides Romualdo Neto Simbo and Humberto Cuteso Matumueni. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

#### ABSTRACT

The authors, based on a study carried out in two higher polytechnic institutes of Cabinda and Soyo in Angola and shows that didactics must be improved because traditional teaching methods do not always help to raise the level of success of students. There are learners with different entry profiles in technical higher education in Angola and probably in the world. The answer to the question of which method should be used to raise the level of student achievement is developing a method that combines traditional methods of didactic and specific clusters with at least three learners with different entry profiles taking into account the interdisciplinary. Its application to first-year learners shows a positive and significant impact on the learner's success in the higher polytechnic institutes of Cabinda and Soyo in Angola.

## INTRODUCTION

Annually there are student's growing rates in the Higher Education (Salata, 2018), (Governo da República de Angola, 2012), (Almeida & Castro, 2017) and (Alves, Gonçalves, & Almeida, 2012) in Angola and around the world, mainly in the Engineering Faculties. The daily world challenges are changing the rules of the business (Gage, 2009), of the job market (Almeida & Castro, 2017) and it is causing the entrance of many students with different entry profiles at the Technical Higher Institutions. Polytechnics Higher Institutes of Cabinda, Soyo and others lives the similar situation, where the students attends technical specialties such as Clinical psychology, Clinical analysis, Nursing, Forestry engineering, Mechanical engineering, Computer engineering, Organization and industrial maintenance (UON, 2014). Papers and books consider that Didactics must be upgraded for responding technologies challenges and the needs of the new universities students and professors (Casel, 2003). The traditional methods are becoming inefficient lately for elevating the students' successful levels mainly of learners with different entry profiles at the technical higher education in Angola and probably around the world. For example, in the Computer engineering there is a decrease on yearly students' entrance and the unsuccessful is evident at Polytechnic Higher Institute of Soyo (UON, 2019).

In Angola, many problems have been appearing and causing students failure at the Polytechnic Higher School of Namibe, Polytechnic Higher Institute of Tundavala (Patatas, Ventura, & Ribeiro, 2019) and at the University Onze de Novembro etc, because of the poor previous knowledge associated with the different entry profiles of the students in the first year. Most of them are not trained to attend engineering specialties that called "risk students" (Almeida & Castro, 2017). Some professors don't know the effective Didactic of the sciences, don't take enough time to research about the entry profile of their students and how much benefit can be taken from it, don't explore how good it can be for constructing interactive groups. In major the traditional methods of Didactic becomes efficient in engineering if professors know how to apply them for teaching the contents available in the program taking to account his good background, what kind of learners are in the classroom. Non-related training does not help in certain courses. For example, it can happen with two learners where one is from the Social sciences and another is from Pedagogy if they enter for attending Mechanical engineering. Many solutions of the analog problems came from dynamic group learning because it is collaborative and significant (Inocência & Cavalcanti, 2005) and transforms learners from the interactions between the competences and knowledge abilities (Alberti & Abegg, 2014).

In this order, *Witch method of teaching can be used to increase the successful of learners with different entry profiles?*

\*Corresponding author: Alcides Romualdo Neto Simbo,  
University of 11 November, Department of Mathematics,  
Cabinda/Angola.

This paper aimed to develop a teaching method called *Maximum-Conjugate-Triptych* for teaching learners with different entry profiles.

## MATERIALS AND METHODS

### Basic concepts

**Socratic conversations:** Method of teaching that consists on interaction between teacher and students leading the students to discover their relative ignorance and learn from reasoning by questions and answers.

**Partial searching or Heuristic:** Method of teaching that consist on constructing new knowledge step by step making impulse questions to the student through ongoing subject understanding, taking to account previous backgrounds.

**Joint elaboration:** Method of teaching where teacher and students learn from each other getting knowledge about ongoing subject previously prepared by the teacher.

**Exposition:** Method for presenting introductory and general notes of the new contents to the students. Is appropriate for introducing a set of contents with several aspects will be developed in details for relative long time.

**Independent work:** Method for giving problem and precision instruction of searching solution to each student. Is appropriate for measuring how each student can find solutions himself.

**Group work:** Method for giving problem and precision instruction of searching solution to each group of students. Is appropriate for measuring how the members of group can learn each other and together to find the solutions.

**Traditional methods of Didactic:** Set of usual methods of teaching learning process. Include Socratic conversations, Partial searching or Heuristic, Joint elaboration, expository, Independent work and Group work.

**Stratus:** limited groups from a certain population where the integration of each element in the group obeys the same characteristic or propriety of affinity. The elements of each stratus can't appear in other stratus from certain population (Scheaffer, Mendenhall III, & Ott Lyaman, 2006).

**Specific cluster:** limited group of elements with the same code chosen randomly from different stratus (Scheaffer, Mendenhall III, & Ott Lyaman, 2006).

**Maximum-Conjugate-Triptych:** method of teaching and monitoring specific clusters of students involving at least three learners with different entry profiles, conjugating the traditional methods provided by Didactic. It is different of group work on the form of selecting the group elements. The focus is through what a member of the triple can learn from each other and the group for understanding the contents and reach what is aimed on the lesson plan or on the program. Like in group work, this method require that professor must define a precision action plan with focus on solving problems with his mediation in order to facilitate the knowledge absorption from each other and the group, following their construction,

difficulties and helping them during the group interaction as said (Inocêncio & Cavalcanti, 2005).

**Why Maximum:** Limiting groups is very important. This is the requirement for the involvement of each member in different and individual responsibilities. Many students in the group are usually unproductive and almost one of them will not be helpful.

**Why Conjugate:** The method mixes the main traditional method of Didactic, depending on each situation during the class, such as Socratic conversations, Partial search or Heuristic, Joint elaboration, expository, Independent work and Group work.

**Why Triptych:** Each specific cluster is composed with at least three students. In common Triple group bring good results of interaction and is very productive. They easily learn from each other.

## METHODOLOGY

The Maximum-Conjugate-Triptych method has four steps and is based on the theory of stratification and clustering of randomly selection methods of sampling (Scheaffer, Mendenhall III, & Ott Lyaman, 2006) and on the theory of teaching groups (Inocêncio & Cavalcanti, 2005). We selected two Polytechnics Higher Institutes, one of Cabinda province and another of Soyo county of Zaire Province, two disciplines *Web Programming I* of Computer engineering and *Statistic Applied to Clinical psychology I*. For Cabinda we considered the academics years 2012 (25 students of first year) and 2013 (42 students of first year). For Soyo we observed the year 2017 (54 students of first year) and 2018 (35 students of first year). In experimental, we applied this method in those institutions for observing the learners behavior, results and successful levels variation. For the method's validation we compare the results between the two successive groups of each Institute (separating the two academic years) and measured the impact of the differences. The method was applied only with the learners of the years 2013 and 2018.

### How does the Maximum-Conjugate-Triptych Method works?

**STEP1:** Consider Classroom's population of students with different profiles;

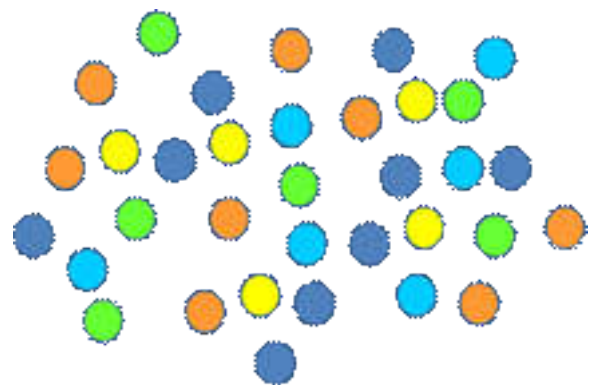


Figure 1. Classroom with different entry profile

**STEP 2:** Form different stratus and codify each element. Use the same code system in different stratus;

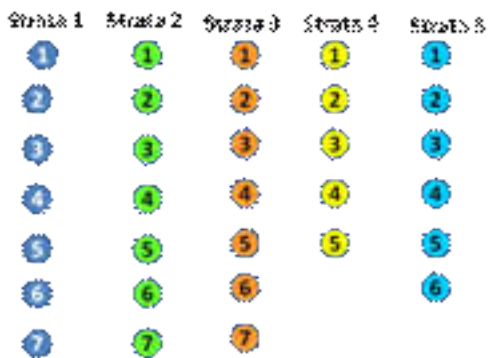


Figure 2. Stratus of students with different entry profiles and coding

**Legend of the colors**

- Strata 1: Dark Blue*
- Strata 2: Green*
- Strata 3: Orange*
- Strata 4: Yellow*
- Strata 5: Light Blue*

**STEP 3:** Chose randomly at least three elements with the same code from different stratus;



Figure 3. Specific clusters of students with different entry profiles

**STEP 4:** Work with the different specifics cluster during the lessons and in activities combining the traditional methods of Didactic, monitor and evaluate them and each of them.

**Environment of Application:** Professors have students with different entry profile; have Didactic knowledge; have an experience and practice to apply and combine traditional methods of Didactic on different situations; charge responsibilities to each member of the groups; and must evaluate the groups and each member of the groups.

**RESULTS AND VALIDATION**

**Results of the method's Applications**

**Table 1: Results of Computer engineering students in Web programming I at Polytechnic Higher Institute of Soyo**

Web Programming I			
Academic Years	Pass	Fail	Total
2017	46%	54%	100%
2018	71%	29%	100%

Source: Computer engineering Department of Soyo Polytechnic Higher Institute

**Table 2: Results of Clinical psychology in Statistic I at Polytechnic Higher Institute of Cabinda**

Applied Statistic to Clinical psychology I			
Academic Years	Pass	Fail	Total
2012	64%	36%	100%
2013	90%	10%	100%

Source: Academic Department of Polytechnic Higher Institute of Cabinda

As shown in the Tables 1 and Tables 2, it has resulted different. We can observe the reduction of failure students, 54% to 29% and 36% to 10%, and the increase of pass students, 46% to 71% and 64% to 90%, respectively. It was a very good experience.

**Method's Validation:** The increase of 26% of successful students and the reduction of 26% on the failure students at Polytechnic Higher Institute of Cabinda and the increase of 25% of successful students and the reduction of 25% of failure students at Polytechnic Higher Institute of Soyo is statistically very significant. This is sufficient for to declare that the method is valid.

**DISCUSSION**

This research is very important because there are several universities, faculties or Higher Institute with a lot of professors that have never study didactic. In many Angolan universities is common to ear that is not necessary to study or to improve didactic background and skills for reaching good results with the students independently of the professor's profiles or the students' entry profiles because they can adapt themselves independently. We think that it influence negative results of education system of Angola as observed (Patatas, Ventura, & Ribeiro, 2019). We did not find any comparison study demonstrating good results reached out of pedagogical or didactic backgrounds. Now we make sure that considering the Maximum-Conjugate-Triptych method when teaching students with different entry profiles, we could reach good results of education as shown in this research. Otherwise, it may cause considerable school unsuccessful and student's failure. The Minister of Higher Education Science, Technology and Innovation of Angola did not design and implement a strong Action Plan to reduce the negative impact of the services of professors without didactic knowledge and the other available current innovation in advanced teaching. This research will be very helpful facilities for the teachers. The University of 11 November is the place that held this original experience and should be the pioneer of this method implementation in its technical higher institutes in Cabinda province and Soyo. This method is extensive to other faculties if necessary because they also receive students with different profiles in the first year. 25% or 26% of the positive impact in the results is statistically significant. These results of the 11 de November University invite their Staff to the reflection and the researcher of the education problems to the continuous innovations in methods of teaching.

**CONCLUSION**

The Didactics must keep seeking for new methods of teaching and the Maximum-Conjugate-Triptych Method Is a very good method for teaching in the cases of having learners with different entry profiles in the classroom. It increases

significantly the success of students almost at the technical higher education where have been observing the significant rates of students unsuccessful. The success of its application is conditioned. The professors must develop Didactic backgrounds previously. It helps them to manage the teaching and learning process and increases chances to improve teaching and learning process in Angola and around the world independently of the kind of contents and specialty.

## REFERENCES

- Alberti, T. F., & Abegg, I. 2014. *Dinâmicas de grupo orientadas pelas atividades de estudo: desenvolvimento de habilidades e competências na educação profissional*. Brasília/Brasil: Bras. Estud. pedagogia.
- Almeida, L. S., & Castro, R. V. 2017. *Ser Estudante no Ensino Superior: As respostas institucionais à diversidade de públicos*. Minho/Portugal: Instituto de Educação, Universidade do Minho.
- Alves, A. F., Gonçalves, P., & Almeida, L. (28 de Setembro de 2012). Acesso e sucesso no Ensino Superior: Inventariando as expectativas dos estudantes. *Revista Galego-Portuguesa de Psicoloxía e educación Vol. 20 (1), Ano 17, 2012. ISSN: 1138-1663*.
- Casel, L. 2003. *Informatics Curricula and Teaching Methods*. Florianopolis, SC, Brasil: Springer.
- Gage, L. 2009. *A Conception of Teaching*. Springer.
- Governo da República de Angola, A. 2012. *Sumário Executivo: estratégia Nacional de Formação de Quadros [ENFQ]*. Luanda/Angola: Luanda: autores.
- Inocêncio, D., & Cavalcanti, C. M. 2005. *O trabalho em Grupo como Metodologia de Ensino em Cursos e Disciplinas Online*. Santo Amaro/Brasil: University of Santo Amaro.
- Patatas, T. A., Ventura, M. M., & Ribeiro, C. M. 2019. *O Insucesso Académico e a Busca da Qualidade: Caso de Duas Instituições de Ensino Superior Politécnicas no Sul de Angola*. FORGES.
- Salata, A. 2018. *Ensino Superior no Brasil das últimas décadas*. São Paulo/Brasil: Tempo Social, revista de sociologia da USP, v. 30, n. 2, pp. 219-253. May-Aug. 2018.
- Scheaffer, R. L., Mendenhall III, W., & Ott Lyaman, R. 2006. *Elementos de muestreo*. USA: Thomson Editores. 6ª edición.
- UON, Uuniversidade Onze de Novembro 2014. *Caderno de Informações Académicas*. Luanda/Angola: KAPA-TÊ Publicações.

\*\*\*\*\*