

33

MATHEMATICS CONTESTS IN HUAMBO PROVINCE: A PEDAGOGICAL MODEL FOR THEIR DEVELOPMENT

LOS CONCURSOS DE MATEMÁTICA EN LA PROVINCIA HUAMBO: UN MODELO PEDAGÓGICO PARA SU DESARROLLO

José Chiumbo Paiva¹

E-mail: zitopaiva2@gmail.com

ORCID: <https://orcid.org/000-0002-7004-123x>

Eric Crespo Hurtado²

E-mail: ecrespo@uclv.cu

ORCID: <https://orcid.org/0000-0003-3481-6350>

Raúl López Fernández³

E-mail: lopezfernandezruly@gmail.com

ORCID: <https://orcid.org/0000-0001-5316-2300>

Tomás Crespo Borges²

E-mail: tpcrespo@uclv.cu

ORCID: <https://orcid.org/0000-0001-6824-8975>

¹ Escola de Magistério “Ferraz Bomboko” do Huambo. Angola.

² Universidad “Marta Abreu” de Las Villas. Santa Clara. Cuba.

³ Convenio Universidad Metropolitana de Ecuador- Universidad de Cienfuegos “Carlos Rafael Rodríguez” Cuba.

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ABSTRACT

Mathematics competitions, Mathematics Olympiads, have been held in Angola since 2010. Some aims of these Olympiads are the perfection of Mathematics teaching and identifying of young students with talent to study this science. However, such goals are not always achieved. In the present work, the authors reflect on the topic and propose a pedagogical model for its development in the context of the Angolan province of Huambo.

Keywords:

Mathematics competitions, identification of mathematics talent, exercises for mathematics Olympiads.

RESUMEN

Los concursos de matemática, Olimpiadas de Matemática, se desarrollan en Angola desde el año 2010. Estas olimpiadas tienen como algunos de sus objetivos perfeccionar la enseñanza de la Matemática y detectar jóvenes con talento para estudiar esta ciencia, pero tales objetivos no siempre se alcanzan. En el presente trabajo los autores reflexionan sobre el tema y proponen un modelo pedagógico para su desarrollo en el contexto de la provincia Huambo de la república de Angola.

Palabras clave:

Concursos de matemática, identificación de talentos, ejercicios de olimpiadas.

INTRODUCTION

The Republic of Angola celebrated its first national competition of mathematics, denominated Olympics of Mathematics, in the year 2010 four years later the Ministry of the Education of Angola (Angola. Ministry of Educação, 2018) it approved the regulation of this competition, guided for the primary and secondary teaching, in schools that are not of technician-professionals formation.

As it is regulated, the national competition, Olympiads of Mathematics is carried out in three phases:

"The first one belongs together to the competitions of classroom level, school, among different schools of a municipality and among the winners of each municipality (provincial stage).

"The second phase belongs together to the national pre-Olympiad where they compete the winners of each county for of there to select 18 students that compete in the following phase.

"In the third phase and final, 24 contestants participate; being 18 students approved in the pre-Olympiad more 6 of the county that it welcomes to the event.

The objectives of the Olympiads of Mathematics are captured in the article 4° of their regulation and, they are the following ones:

- a) to Recognize the importance of the teaching of the Mathematics.
- b) to Motivate the students to the study of the discipline of Mathematics.
- c) to Contribute for the improvement of the teaching of the Mathematics.
- d) to Detect young talents in mathematics.
- e) to Create opportunity of exchange of experience in the field of the mathematics.
- f) to Select students to participate in international competition of Mathematics.
- g) to Improve the quality of the teaching and learning of the Mathematics, fundamentally for the scientific and technological development.

The referred regulation establishes the regulations for this activity from the classroom until national level, but it is not always fulfilled the required systematically. On one hand, in Angola centers of training do not still exist for the competitions of knowledge, neither professors in the teaching centers in charge from the preparation and the applicants' attention to compete in each one of the stages of the competition of Mathematics. On the other hand,

they are lacking the orientations with specific pedagogic guidelines that serve as base to achieve the objectives that are aspired in the national competition Olympiads of Mathematics.

This has generated particular points of view in the different centers of teaching of the county Huambo as for talented students' detection in mathematics in the first phase of the competition, as well as once detected, they are not offered an attention differed in the academic environment. In addition, the approach used as indicator for the identification of the talents starting from the carried out tests is not efficient, because a talent is a winner.

In the practice, the tests of competitions constitute the main instrument to identify talented students. However, in the same ones they are evidenced a series of regularities that conspire with this selection process, those that next are related:

"It is stimulated more the calculation that the resolution of problems.

"They prevail more the curricular intra-mathematicians contents of the level that study the students those problems that stimulate the creativity.

"There is not a dosage of the tipologies of problems to present neither structuring of the tests chord to each one of the levels in that the competition is developed.

On the other hand, in the different stages of the first phase of the competition reports don't take place and in the other phases records take place with administrative characteristics without mentioning the main difficulties of the contestants in the resolution of the exercises, neither the publication of the contest of carried out tests is authorized. This takes to that one does not have the control on the evolution of a process designed for educational ends, besides limiting the investigators that could contribute for their enrichment.

That exposed bore to conceive a pedagogic model that can respond to the objectives of the competition Olympiads of Mathematics in the centers of teaching of the county of the republic, Huambo.

DEVELOPMENT

To identify the students with talent correctly is not an easy task, still when it is sought to achieve from the competition tests, those that begins the year, where the professors should not know their students well in a first moment.

The characteristic of a student with talent in mathematics according to Werdelin (1958), Moral & Albán (2014), mentioned it is the ability to understand the nature of the

mathematics, problems, symbols, methods and rules; the aptitude to learn them, to retain them in the memory and to reproduce them to combine them with other problems, symbols, methods and rules and, the competition to use them in the resolution of mathematics tasks”.

In general, when they refers to the mathematics talent, the emphasis is made in the easiness of applying its knowledge and the received mathematics procedures, in the general education in a creative way (Fields Palaces, 2006).

Then, the event or failure of the process of the talented students' identification in Mathematics starting from the competitions will depend fundamentally on the characteristics of the test that are applied to the students. In this respect, Blackish, et al (2002), they outline that the environment appraisers should complete a series of requirements: to integrate the curricular contents and the evaluation materials designed to value the competition in the different intelligence (knowledge, abilities, attitudes and work styles)”.

For it, it urges that the tests of the Olympiads of mathematics have problems that value the solidity of the appropriation of the mathematics contents for the students and others that value and stimulate the creativity and the independent thought of the same ones. These problems must be interesting, original, those that cannot be very similar to those that could or could not to solve the contestant in their preparation, in such way that they cannot have a clear idea of their solution a priori.

For the study, the authors of this work proposes a first classification of the mathematics problems for the Olympiads in two types:

Eminently deductive Olympic problem: that whose resolution is already built from the combination of mathematics properties taught to the student from the primary level until the level in which it is, that is to say, in this problem the student should apply in a productive or creative way the precedent mathematics knowledge to the solution of a problematic situation that is new for him.

Examples:

“Problems of plane or space geometry that combine different figures in an only figure.

“Algebra problems that involve the combination of equations of different degrees.

“Demonstrations of mathematics properties, not routine from well-known properties.

Eminently inductive-deductive Olympic problem: it is that whose solution way doesn't belong together entirely in the

contents studied by the student, but with a level of reasonable complexity so that the same one is within its reach; in this case, the student should not apply only the precedent mathematics knowledge, but also his creative genius, arriving to the call lateral thought or solve by means of strategies or non-conventional algorithms.

Examples:

“Problems that induce the student to the solution of problematic situations that constitute advance or properties studied in certain branch of the mathematics one.

“Problems whose resolution induces the student to the generalization by means of the construction of mathematics properties that incite to its demonstration.

The eminently deductive Olympic problems have the function of diagnosing the process of teaching-learning of the Mathematics in each school level, because, beyond detecting the talented student, we should also notice the intra-school content to detect the main difficulties that face in that level, what will allow to conceive more appropriate actions with view to minimize such difficulties.

On the other hand, this typology of problems allows to verify the solidity of the appropriation of the knowledge on the part of the students, besides to impel to that the professors fulfill the programs and the plans of studies of the discipline of Mathematics conceived by the Ministry of the Education.

It is also important to highlight that the same ones contribute to the development of the student's logical and abstract thought, to their critical and creative capacity, through the assimilation of concepts and mathematics methods, of theorems and their demonstrations.

The Olympic problems of the eminently inductive-deductive type beyond that help in the diagnosis of the degree of solidity of the knowledge acquired by the students until at the level where they are, they stimulate in them the creativity and the independent spirit, as well as they direct them to a bigger cognitive autonomy.

This typology problem is characteristic of the competition tests of mathematics in the international environment, allowing the identification of talents like one makes of habit, but they don't always guarantee the motivation of the students for the study of this discipline, since the resolution of such exercises, in many cases, demands more genius than deep knowledge, what has the risk of inducing the student to think that the mathematics of the Olympiads is different from the one that is imparted in the schools.

The application of the two types of problems (eminently deductive and eminently inductive-deductive), can help in

more efficient way to that the competitions of mathematics are good to motivate the students for the study of that discipline, to detect young talents in this domain and to also serve as diagnosis that contributes for the improvement of the teaching of the Mathematics that are some of the objectives of the Competition Olympiads of Mathematics of the Republic of Angola.

The conception of the competition of mathematics with objectives of detecting students with high capacities in that domain and of improving the quality of the teaching and learning of the Mathematics suggests that the tests of the competitions should not be seen as mere instruments to measure the mathematics competitions of the contestants, but as an evaluation process. In this respect, Blackish, et al (2002), point out that the evaluation must guide to the process more than to the product, because this allows us to obtain the student's valuable information while carries out some activity inside the curricular context. The individual profile of the student's intelligence should be traced with the purpose of detecting its dexterities and also its possible lagoons or deficiencies".

This thought line bears to adopt a structure of the test for each stage of the competition, in way to that in the process of the realization of the same one the information is obtained about the potentialities and the students' weaknesses, this with view to contribute to the improvement of the process of teaching-learning of the Mathematics and of the own competition.

On this aspect, it is worthwhile to reiterate that the quantity of problems of the test of the competition and the time limit to solve it is expressed in the parentheses c) and d) of the article 20° of the Regulation of the Competition, Olympiads of Mathematics. Nevertheless, here intends a structure of the test that seen from the didactic point helps to reach the objectives of the same competition, this without affecting the exposed in the article 20°.

Its structures propose for the tests

"For the intra-group competitions of students: 80% of eminently deductive Olympic problems and 20 eminently inductive-deductive % of Olympic problems.

"For the inter-group competition of students: 80% of eminently deductive Olympic problems and 20 eminently inductive-deductive % of Olympic problems.

"For the inter-schools competition (municipal): 60% of eminently deductive Olympic problems and 40% of the eminently inductive-deductive type.

"For the inter-municipalities competition (provincial): 60% of eminently deductive Olympic problems and 40% of the eminently inductive-deductive type.

This structure can help in the evaluation of the process of the teaching-learning of the Mathematics in the context of Angola, to detect students with talent and to serve as base for the preparation of the international Olympics.

Several models that possess indicators conceived for the identification of the talented students exist. Most of the investigators and professionals agree in that an only punctuation in an intelligence test or of yield, it is no longer enough. The first and more important decision that should take in relation to the setting in march of an identification model should be, what conception or definition of the high intellectual capacity goes to be adopted in particular in a school center and what attention it is foreseen to offer.

On the other hand, Williams (1981), mentioned by Fields Palaces (2006), outlines that the individuals talents are defined in the context in that act and that talent is relative and it depends on geographical variables, storms and cultural that change according to the time."

As for the selection of young with abilities in mathematics from the competitions that are developed in Angola, is worthwhile to stand out that the parenthesis e) of the article 20° of the regulation of the competition Olympics of Mathematics guide that they are classified as winners the attendees that achieve the biggest number of answers guessed right in the specified time.

This approach is typical of a competition, but from our point of view, this is not enough to identify young talents in mathematics, because as it is already known, winner is not synonymous of talent. On the other hand, this approach can allow that the organizers of the competition in each one of their stages, stray with relationship the identification of talents current and potential talents in mathematics.

For the author's experience like member of the body of jury of the competition of mathematics in the county of Huambo (Angola), they have registered winners' cases with very low notes and contestants with high abilities that don't arrive to the podium. The selection of winners has taken to the forgetfulness to the students with high abilities that did not arrive to the podium and in some cases; it has rewarded students with only drops notes to have been the adults among the contestants.

Of there, the necessity to settle down in the competitions of mathematics of the county Huambo indicators that allow to identify talented, conquering students or not, in function of the tests to apply by way of deserving a differentiated attention.

They intends this way:

"In the intra-group and inter-group competitions of the students: it would be considered talented the student that were able to solve as minimum 75% of the eminently deductive Olympic problems and 50% of the eminently inductive-deductive Olympic problem or, that were able to solve as minimum 50% eminently deductive Olympic problems and 100% of the eminently inductive-deductive Olympic problems.

"In the inter-schools of the same municipality and inter-municipal (provincial) competitions: it would be considered talented the student that was able to solve as minimum 50% of the eminently deductive Olympic problems and 75% of the eminently inductive-deductive Olympic problems or, the student that was able to solve as minimum 50% of the eminently deductive Olympic problems and 100% of the eminently inductive-deductive Olympic problems.

The identification process constitutes the first step to approach the educational attention of the students with talent and it seeks to determine its capacity and learning rhythm like indispensable indicators to be able to offer educational answers that keep in mind its necessities (Rodríguez, 2004).

The inherent risks to this process according to Ritchert (1987), mentioned by Rodríguez (2004), the diagnosis doesn't seek the evaluation of the student's educational necessities, in order to offer the help and pedagogic, human resources and materials that requires to promote the maximum development of the capacities, but in function of certain family or social expectations".

According to Smith (2008), mentioned for Navarrese (2016), the countries with successes in the international Olympiads have some of the following attributes: a great population, a significant proportion of their populations in good educational formulas, an infrastructure of very organized preparation as support of the mathematics competitions and a culture with value in the intellectual realization. For this author, the base so that the talented students can be developed it is to have help to get ready in an individual way for the competitions, for it in some countries books of high quality and abundance of available resources exist in Internet, included places specialized in Olympiads".

Evidently, in Angola we don't still have conditions neither objective neither subjective to follow the pattern that Smith proposes, although we have a population of more than 24 million inhabitants there are very low rate of secondary education and superior in comparison to the countries with successes in the international Olympiads

as consequence of the colonialism and a civil war that it rough dressed to the country. For what a preparation on the base of the individual study with books of high quality and abundant resources in Internet is even far from our reality, but neither we can resign with the results reached in the field of the education from the independence of our country. Therefore, it is imposed to analyze what we make and to look for solutions characteristic with the resources that we have to make it better, to use the competitions of knowledge and the Olympiad like motivational element to improve the quality of our teaching and to obtain better results in national and international competitions.

This way, before the lack of centers specialized in training for competitions of mathematics in Huambo, of books of high of quality for the effect and the inaccessibility to the available resources in the Internet for most of the student population, we will consider the following actions for the preparation of the students in each stage of the competition Olympics of Mathematics:

"In the intra and inter-group competition, the differentiated attention and the students' preparation will be made by the professors that impart classes in the respective groups, this is, in the square of the curricular and extra-curricular activities. As for that Fields Palaces (2006), it points out that the importance of the identification in the educational environment is very significant, since it allows us to detect the talent or the students' concrete potentials on time and this way to be able to assist its special educational necessities. In this process the professor constitutes a valuable source of information".

"In the inter-schools (municipal) competition it will correspond to the coordination of Mathematics of the municipality to indicate the professors that take charge of the preparation of the winners of this phase with view to a good acting in the following phase. Before the lack of a professor turned into training for competitions, that function should be carried out by the professors whose students were conquering of this phase, because they have the advantage of knowing many of the potentialities of the students and of the aspects on which should deepen.

"In the provincial competition it will correspond to the coordination of Mathematics of the county to indicate professors that take charge of the preparation of the winners of this phase with view to the good acting in the following phase. For other, before the lack of a professor turned in training for competitions, that function should be carried out by the professors whose students were conquering of this phase.

It is important to underline that the identified talents, although they are not conquering in a certain stage of the

competition, they should continue and to deserve an attention differed in the academic environment on the part of their respective educational, because these students continue being talents inside their context. Villarraga & Martínez (2004), reveal that the talent has an evolutionary character in the sense that not only the current talent of an individual is excellent, but rather the potential talent is fundamental, because starting from this it is possible to carry out interventions to foment and to develop the talent”.

On the other hand, in each stage of the competition, the trainers should provide the winners a training with more incidence in the exercises of the olympic type with view to a good acting in the following stage where the weight for this type of exercises is bigger.

In the cases in those that the coordination of Mathematics indicates professors for the preparation of students for following phase of the competition, the selection should relapse in professors with experience. In this respect, Feldhusen (1997), mentioned by Conejeros Lot, Gómez Arizaga & Donoso Osorio (2011), argue that the professor for the high abilities should have some of the same characteristics and his talented students' abilities and in this line, it indicated that the educational ones that worked with students with special talents should also have special abilities and knowledge regarding the characteristics of these children that facilitate his personal, social and academic development.

As for the aspects that should be considered in the programs of the talented student's study, Feldhusen & Wyman, mentioned by Pacheco (2001), present their approach of the basic necessities, which we will take when assisting to the talents in mathematics identified starting from the competitions in the secondary education of Angola:

“Maximum achievement of dexterities and basic concepts.

“Learning activities to level and appropriate rhythm.

“Experiences in creative thought and solution of problems.

“Develop of the convergent capacity, especially of the logical deduction and the solution of problems.

“Stimulation of the imagination and the space capacities.

“Develop of the conscience and acceptance of the capacities, interests and own necessities.

“Stimulation to pursue goals and aspirations of high level.

“Develop of the independence, selfdirection and discipline in the learning.

“Relationship experiences with other intellectual, artistic and indeed very qualified, creative and talented students.

“Wide sources of information on diverse topics.

“Access and stimulation for the reading.

As for the prizes, in case in that these contemplate olympic medals, it is suggested that these are granted alone to the talented winners as they are classified in first, second or third places. This measure can incentivate the winners without medal to a bigger preparation with view to conquer it in the following phase of the competition. The other prizes, they should be such that they contribute for the intellectual and technological development of the winners.

The production of reports allows to control the process of the realization of the competition Olympics of Mathematics. It is from the reports that some of the difficulties of the process of teaching-learning of the Mathematics will be known in the centers of teaching of Huambo and, with that to conceive actions that take to the improvement of this process and of the own competition.

This way, the juries of each stage of the competition will produce a report where if it details the participation of the contestants for gender, age and index the topics in which the students in their generality register bigger difficulties and, to attach to the report the test applied with the respective keys.

Such reports will be correspondents to the coordinators of Mathematics immediate of each stage of the competition, that is to say, the report of the competition intra and inter-school will be a correspondent to the coordinator of the discipline of Mathematics in the school and the reports of the competitions inter-schools (municipal) will be correspondents to the coordination of the discipline of Mathematics in the county.

The reports of each stage can serve as base for the creation of a magazine that in turn can serve of support for the car-preparation of the students with desires of competing in the olympics of mathematics. On the other hand, the reports impel to the juries to that the scientific rigor prevails in the elaboration of the tests of the competition.

CONCLUSIONS

The pedagogic pattern conceived for the development of the competition Olympiads of Mathematics at level of Huambo responds to the general objectives proposed when allowing that the identification of young talents in mathematics by means of the indicators elaborated for each one of the stages of the competition, those that are sustained in the structure of the defined tests keeping in mind the characteristics of the exercises and the percents or proportions in this stages.

The motivation to the study of this discipline on the base of the considerations for the preparation and attention to the contestants. While the diagnosis of the process of teaching-learning of this science, starting from the competitions, those that it is erected like an important source of information for the creation of opportunities and of exchange of experience in the field of the mathematics.

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