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Scientific Communication

DIDACTIC ENGINEERING AS A METHODOLOGY OF RESEARCH AND AS AN EDUCATIONAL PROPOSAL IN MATHEMATICS

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Mathematics Education Session

Abstract: The following research is cut out of a doctoral research which analyzed the results of a didactic sequence that involved a ludo-didactic collaborative activity (LISBOA, 2019) [1]. The activity focused on the learning of the point and line to students of the third year of public high school of the Federal District, in the capital of Brazil. This is a case study and a participatory research that used the Didactic Engineering (ARTIGUE, 1996) [2] as a methodology of research and as an educational proposal in mathematics. Brum and Schuhmacher (2013) [3] warning that the Didactics of Mathematics is not reduced to researching the best way or teaching method for a specific idea or scientific concept. In the same way, Artigue (1996) [2] mentions that a scientific investigation methodology is needed to gather the relations between research and action in the system based on pre-established didactic knowledge. Therefore, the Didactic Engineering as a methodology is characterized as a didactic object that involves a teaching plan, the creation of didactic materials and an experimental scheme, all based on the didactic situations of the classroom (ARTIGUE, 1996; BRUM, SCHUHMACHER, 2013) [2] [3]. Thus, we present the development of the Didactic Engineering along with the accomplishment of the constituent phases of the method.

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CREATIVITY IN THE PERSPECTIVE OF 6TH STUDENTS OF A PUBLIC SCHOOL

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Mathematics Education

Abstract: This paper discusses the creativity in perspective of elementary school students and aims to analyze the concepts and definitions of creativity from the point of view of 6th grade students, where it relates to the concepts already existing in the vision of scholars in the area. The importance of the theme for both school and social development is highlighted here. This study starts from a bibliographic and field review, with a qualitative and quantitative research. It is also worth mentioning that you use the quiz application to search for relevant data. In the field research, questionnaires are applied to 25 (twenty-five) students of the 6th grade of Elementary School II, from a public school, in order to recognize what is their point of view regarding creativity and what are the your next perspectives on classroom creativity. Therefore, it can be concluded that this work has relevance on the reflexes of the creativity processes and the difference from the point of view of the students in relation to the scholars of the area, where there may be important reflexes. In this case, the results will be shown at the end of the analysis, being made as comparisons of collected data, it was possible to perceive the students' view of the evidence, evidence of how general creativity is the creation and innovation of something, and is present in all that exists. Each time you look for more creativity people in our daily lives, this shows the importance of creativity in our life.

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INTEGRATION OF RESEARCH EXPERIENCES AND CONTINUING EDUCATION OF EARLY YEARS TEACHERS

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Mathematics Education Session

Abstract: This work present partial results of an integration experience between three training proposal that focused on the continuing education of Early Years of Elementary School mathematics teachers of the municipal school system. The authors, training professors and researchers in the area of Mathematics Education, met periodically to analyze the statements of early years mathematics teachers that participated in di erent training pro- posal: PNAIC 2017/2018, managed by the State Secretariat of Education of Territorial Center of Education 11 (NTE 11), research-training project developed during the years of 2016 and 2017, as eld of study of the Doc- torate Course in Education and, in 2019, the continuing education program of the Municipal Secretariat of Education. This analysis aimed to iden- tify the contributions of training proposals in the production of knowledge, by teachers who supported the adoption of di erentiated work practices in the classroom, speci cally in mathematics classes. The joint work of the researchers-trainers made it possible to follow changes in the organization of the teachers' pedagogical work, as they, in the dynamics of the training process, became authors of this process, indicating their training needs and ways more coherent with their realities for the implementation of the pro- posals in the classroom. It is intended that this experience be transformed into a research-training as advocated by Longarezi and Silva (2013) and, for this purpose, it is given more priority to promote training more than to collect data, adopting the principle of exhibility regarding the content inves- tigated at each moment and, teachers are proposed situations in which they can develop and produce their own knowledge and feel challenged to study educational theories that contribute to the understanding and explanation of their practices. In this context, the teachers collaborated with their own training, suggesting, questioning, registering the students' actions, evalua ting their cognitive development, analyzing the results of their work. The next step is to intensify the registering of actions in the classroom by both the students and the teachers in order to produce narratives that are moments to think about the work and to direct discussions about the construction of their professional identity.

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MATHEMATICAL LEARNING OF STUDENTS WITH INTELLECTUAL DISABILITIES: RESEARCH FELD

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Abstract: The purpose of this paper is to map the academic production about mathematical learning of students with intellectual disabilities in Brazil, as well as the analysis of methodological design, objectives and results Gil (2010). The theme was defined as mathematical learning of the student with intellectual disability and the period between 2000 and 2019. The research sources were the repositories of the universities, the Brazilian Institute of Information on Science and Technology (IBICT) and the Capes Portal Thesis and Dissertation Bank. The main search criterion was to find a relationship between a term on Mathematical Education and one on Intellectual Disability, necessarily mentioning both. This procedure aimed to constitute the research field of mathematical learning of people with Intellectual Disabilities. Methodological aspects were analyzed and recurrences, convergences and divergences in the methodologies could be verified. The qualitative approach was predominant, and it was possible to realize the need for rigor in the description of the method, as well as the epistemological base positioning. Regarding the results, the research pointed learning possibilities and advances in didactic-pedagogical aspects, aiming at the development of mathematical learning in the inclusive perspective.

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PERIMETER AND AREA WITHIN THE SCOPE OF SPECIAL EDUCATIONAL NEEDS – VISION IMPAIREMENT

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Abstract: Inclusive education is legally guaranteed nationally and internationally. In Brazil, the right to inclusive education is based, for example, on the Child and Adolescent Statute (Law nº 8,069 from 1990) and in the National Education Guidelines and Framework Law (1996). Internationally, there is the World Declaration of Education for All (1990) and the Salamanca Statement (1994), among others. These documents establish that students with special educational needs must receive specialized assistance, as well as that inclusive teaching should preferably take place in the regular school system. For this reason, it is necessary to prepare schools to receive these students and, therefore, it is essential that the teachers are able to offer specific attention to the needs of these students. To this end, it is necessary that there are didactic support materials that make possible a greater degree of understanding of the contents to be taught, minimizing the limitations faced by these students, which happens in different degrees. Among these students with special educational needs we have the visually impaired (DV), the focus of this research. This work aims to present a tactile didactic material, developed by two volunteers and guided by two professors of the Federal Institute of Brasilia (IFB) – campus Estrutural, from a PIBIC (Institutional Scientific Initiation Scholarship Program) project linked to PIBID (Institutional Scholarship Program for Initiation in Teaching). Such material was thought and built, with the intention of teaching the perimeter and area contents to visually impaired (DV) students. It is also intended to report the experience of application of a didactic sequence, using the material built, made in a primary school in Brasilia to two DV students. The material was made from MDF wooden plates in which geometric cutouts (square and rectangle) were made, so that the DV students could fit units of golden material, each unit has one centimeter of edge, inside each geometrical shape. This way, it became much simpler, to DV students, to find the measurements of the figures worked, as well as to understand and absorb, in fact, the content taught. The sequence was applied with the purpose that the students to learn a mathematical content associating it directly with their daily lives, thus applying, a real sense to what was worked on. The sequence and the didactic material developed showed a result of enormous satisfaction, since it reached all the determined goals and, beyond that, it brought us greater perspectives for an evolution of the developed sequence.

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TEACHER FORMATION AND THEMATIC EVALUATION: DUO SOMETIMES DISTANT

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Abstract: As part of a doctoral research, a questionnaire was applied to teachers of mathematics in basic and public education of Brasília. This excerpt present data on professional experience, initial and continuing education of these teachers and adhesion to the Formative Evaluation proposal, which is the officially recommended perspective. Just over half of the respondents say they take up this proposal in their classrooms. Despite the absolute majority having a degree in the area in which they teach and having invested in their continuing education in the last five years and/or in graduate school, the topic of evaluation of learning is not recurrent, 49% of them only saw the topic in one of their training and for 11.4% of the respondents the topic never constituted an object of studies. Teachers adopt a variety of evaluative tools and procedures, but to those who adhere to formative evaluation there is greater number of tools and procedures used. The collected point to possible fragility regarding the training of those who teach mathematics in the approach to evaluate their students' learning in the basic education classroom.

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MODEL GENERATION BY LOGISICAL REGRESSION TO PREDICT AND EXPLAIN THE APPROVAL OR FAILURE IN DISCIPLINE

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Abstract: Researchers debate the best practices to solve the problem within the educational scope that, despite the availability of a large database that management has, it is necessary to translate them into information that is useful for implementation of public policies [3]. The present study addresses this issue in the following aspect: how to use modern analytical techniques to identify students with a high risk of failing, aiming at greater effectiveness in the directing resources to the most vulnerable group. The issue of evasions reflects not only academic performance, but also a range of personal, economical aspects and institutional factors [2]. Therefore, highlighting the different mechanisms that contribute to the student's success can guide educational managers on the implementation of public policies [1]. In addition, the construction of tools capable of identify precociously the greater risk of evasion would refine the school and educational intervention programs. Thus, the following questions become congruent: Which elements and/or conditions explain or assist in the understanding school success and how can we measure it by statistics tools? Is it possible to develop a model that is sensible to the point of perceiving these conditions aiming preventive action from the teaching institution? Considering this problem, this work consists of understanding the factors that lead to approval/failure in the Fundamentals of Mathematics (FM) component of the Mathematics Licenciante Degree Course of the Federal Institute of Brasilia (IFB) – campus Estrututal. To this end, it was executed the organization of data, Exploratory Analysis, Inference and construction of the best explanatory and predictive model, based on Cross Industry Standard Process for Data Mining (CRISP – DM) methodology. With the available data, we randomly divided 70% as the model's training base and the other 30% as test. We applied Logistic Regression using the R language reaching the following results: the variables that were significant together to explain the approval/failure effect were region (naturalness) and number of failures of students in FM. The constructed model performed well, reaching an accuracy of 94.17% in the training stage and 88.64% in the testing stage and is consistent with others modeling tests given the evaluation metric. The area of the ROC curve was of 96.3% in training and 90.4% in test. The results and their interpretation will be presented. It is considered an initial study that will serve as pedagogical support tool in the future for the Mathematics Licenciante Degree Course, Federal Institute of Brasilia (IFB) – campus Estrututal, promoting preventive actions against failure, one of the indirect factors of school evasion. A posterior study with a larger number of data and refinement of the model will enhance the interventions and implementation of public policies of educational management. This work was carried out under the guidance of professor Pedro Carvalho Brom (IFB).

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COOPERATIVE GAMES AND THE INCLUSION PROCESS IN MATHEMATICS TEACHING

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Abstract: The genesis of games is connected to the processes of development of man itself. So much so that Huizinga (2017) affirmed that it is in the Game and through the game that civilization emerges and develops. Games are found in culture, in war, in law and in jurisprudence. In all these applications the game becomes a mediator of interactions and of knowledge construction. According to Brugère (1997), an universal definition for games cannot be found in the literature. Thus, researchers who assess and analyze these tools should build and defend a concept of Game themselves. In our own understanding, we should not define games, but rather characterize them. In this sense, games can comprise both a free play activity (voluntary), carried out within certain limits of time and space; and activities with rules that should be accepted and enforced by the players; they are endowed with an aim in themselves and accompanied by feelings of tension and joy (HUIZINGA, 2017). Games can be categorized as competitive or cooperative. In competitive games you play against the other while in cooperation you play with the other. In Mathematics teaching the game is gradually introduced and its use has gained importance among educators and within an emancipatory pedagogical praxis that presents itself as a need for students to effectively take action their process of knowledge building. In this context, the objective of this communication is to discuss the contributions of cooperative games for the inclusion of students with Specific Educational Needs in the teaching of Mathematics. We will present the results of a systematic literature review for the research developed in this field in the past five years. We highlight some of the characteristics described in cooperative games, which may favor the process of educational inclusion, such as: the achievement of individual goals which are, partly, a consequence of the action of other members and the fact that players become more sensitive to each other's requests, promoting mutual help and balancing contributions and participation.

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REPORT OF HYBRID TEACHING EXPERIENCE APPLIED IN GEOMETRY TEACHING TO MIDDLE SCHOOL STUDENTS

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Abstract: One of the teacher's great challenges today is to make his classes as attractive as the rampant bombardment of information, stemming from the technological advance in which society is immersed. Contrary to what one might think, it is not viable to combat the use of technological tools or resources by students, quite the opposite, combining these tools with the teacher's repertoire makes the teaching and learning process contextualized and contemporary. In this context, hybrid teaching emerges which consists of the combination of so-called traditional classes with information and communication technologies. According to Bacich and Moran (2015), hybrid means blended and the education is mixed or hybrid, combining various spaces and activities for learning. This work aims to report a hybrid teaching experience with students of middle school, who participate in an extension project promoted by the Department of Mathematics of the Federal University of Amazonas. As claimed by Bacich and Moran (2015), in the hybrid teaching there is an organization of four main models: rotation, flex, à La Carte and enriched virtual. The object of knowledge addressed was Geometric Solids and the chosen model was the rotation one, which is divided in workstations so that each station had an objective well defined by the teacher, linked to the objective of the class. Each group passed all the stations within a time defined by the teacher. According to the theory, at least one station must be involved with the use of technology (ANDRADE; SOUZA, 2016). The activity was developed in four classes, in a total of six hours/class and were developed by academics from the Mathematics Licenciature Degree course which participated from the creation to the application of classes and acted as advisors in the processes of building students' knowledge. From the observations made during the application of hybrid teaching, we could perceive the involvement of students in the proposed activities, demonstrating the potential these methodologies have to transform the learning process into an active experience, where students are active and, consequently, collaborative subjects in their learning development.

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CONCEPTION OF A MATHEMATICS TEACHING LABORATORY: FROM IMPLEMENTATION TO FIRST ACTIVITIES

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Mathematics Education Session

Abstract: The present text addresses the results of a research that aimed to use teaching methodologies using didactics material from the Mathematics Teaching Laboratory (LEMA) that help in the expansion of the Mathematical knowledge of Basic Education contents linked to students' day by day problem situation. To this end, we investigated the process of conception and implementing a LEMA, and the teaching activities development to a first year class of High School of a western Bahia school. The research has a qualitative character, since this type of investigation allows subsidizing the procedures and information seeking to understand the student's behavior, studying their particularities and individual experiences, focusing on the problem under study. The methodology adopted was the action research, where the researcher is a research participant and allows qualifying his/her practice through an intervention. As research development, we elaborated and developed an Action Plan divided into five activities where were worked methodologies involving problem solving, didactics materials, history of mathematics and computer as the use of software as didactic resource for teaching the mathematical content of the Cartesian plan. As theoretical reference we are based on Fiorentini; Lorenzato (2006), Lorenzato (2009), Luckesi (2014), Mendes (2009), Smole; Diniz; Milani (2007), Rêgo; Rêgo (2009). Preliminary results allow us to infer that the use of different didactics-methodological resources in teaching promoted attribution of meaning to the content worked for the students and a reorientation in the practice of the teacher-researcher. The teaching became slower initially, however in the sequence of didactics content, there was a compensation in time and mainly in quality, because the pace of comprehension was faster due to the acquired comprehension.

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CREATIVITY WORKSHOP IN MATHEMATICS: INVESTIGATING THE BODIES' MOVES

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Abstract: According to Alencar and Fleith (2003), every human being shows creative potential, which needs improvement and training, through practice, appropriate techniques and favorable environmental conditions. Then, the Creativity grows from the not only individual conception, but obtained in the middle of a sociocultural process, considering the motivational factors that can lead the individual to dedication and involvement in what can give him pleasure and satisfaction (CSKISZENTMIHALYI, 1996). Based on these conceptions, we present the “Creativity Workshop in Mathematics”, a project idealized and promoted by Grupo PI – Researches and Investigations in Mathematics Education, from the Department of Mathematics of the University of Brasilia. The project carried out an intervention with eight creativity workshops in the field of mathematics, in two classes of early years of a public school in the Federal District, in which the students were motivated to employ their own strategies to solve mathematical problems. In addition, another intentionality of the workshops was to place students in an environment favorable to the development of mathematics creativity, where playful and relaxed spaces replace the environmental pressures of the classroom (GONTIJO; FONSECA; ZANETTI, 2018). In this study we intend to analyze one of the workshops of the project in question: the workshop “Investigating the Bodies’ Moves”, in which the students designed and built a balloon-powered car to understand the scientific ideas related to rockets propulsion. They used also the mass and force ideas to discover ways to improve the distance traveled by the car. Therefore, we have tried to provide participating students with a playful, creative and interactive experience in Mathematics, aimed at building cars with sustainable materials.

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ASSESSMENT INTERVENTION IN MATHEMATICS TO THE CRITICAL AND CREATIVE THINKING PERSPECTIVE: BOUNDARIES AND POSSIBILITIES

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Mathematics Education Session

Abstract: By promoting assessment strategies which takes into account the encouragement of the development of critical and creative thinking, the teacher who evaluates can move other bias not affected by the current evaluation system and have different results. Gontijo (2007) believes the execution of programs, training and use of creative techniques in the school environment can contribute to the development of students' creative potential. For Bailin (1987), critical thinking and creative thinking have distinct, but complementary characteristics: creativity is the ability to generate "intellectual" products; critical thinking is the ability to thinking carefully, strategically and critically about the quality of these "products". Taking into account such factors, in the present study, which is set up as an ongoing doctoral research project, we propose to investigate what are the boundaries and potentialities of the assessment interventions performed by the teachers in Mathematics classes in the early years, in the perspective of development of critical thinking and creative thinking, so that methodological strategies can be proposed that include formative assessment actions. For that purpose, we envision discussing about spaces, moments, approaches and possibilities offered to this aim, as ways of perceiving the formative assessment in the development of mathematical learning. In this research, of exploratory, bibliographic, observational and documental nature, we intent to gather of data through documental and bibliographic analysis and interviews with teachers. We also appreciate taking into consideration researches by some of the main methodological trends focused on the mathematics teaching-learning process, such as: teaching practices, conceptions and teacher's knowledge, assessment practices and the sociocultural context of mathematical learning (KILPATRICK, 1994 apud FIORENTINI and LORENZATO, 2006).

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CHESS GAME IN THE MATH LEARNING PROCESS IN A FORMOSA STATE COLLEGE – GOIÁS

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Abstract: The purpose of this paper is to verify whether there are benefits in using the chess game as a factor of considerable importance in the teaching-learning process of mathematics. An analysis that requires observation and reflection on this teaching and learning method, also recognizing the importance of the Chess Game in the school and social environment. Nonetheless, this study aims to prove the best from chess game in this method in a playful and applied way, allowing the students from the school involved, a broader view of what is Mathematics and its features, promote simulations of problem situations with diverse methods for learning math. In this sense, it is aimed to understand the stimuli which the application of the Chess Game performs concerning the teaching-learning process of Mathematics in students from a state school in Formosa - Goiás. And with this objective, the three aspects to be observed in specific objectives were triggered and it was expected to: a) Recognize ways to acquire knowledge, which are different from the traditional format, using the Chess Game; b) Identify how to bring down the barriers regarding mathematics being difficult or impossible and that it is not possible to learn by using chess game as a teaching methodology; c) Encourage the practice with the theory in the classroom by using the Chess Game. To achieve that, authors such as Becker (2006); Moreira (2019); Vygotsky (2007) among others supported this study with theory. It is worth mentioning this study has a bibliographic nature, applying a mixed, qualitative and quantitative methodology, by using the following instruments: questionnaires and semi-structured interviews and student observation. Thus, it was applied the chess Game to a sample of students, aiming to analyse the development of the teaching-learning process of theirs. Therefore, it was possible to conclude clearly that the use of chess in the teaching-learning process in Mathematics is crucial since it brings a significant meaning to the cognitive development of the students, and it is with this view and with the purpose to obtain results that the reflections and questions in the course of this study made the chess game be seen as a tool that supports in the teaching-learning process in math.

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MATHEMATICS: TEACHING, KNOWLEDGE AND RECREATIONS THROUGH HISTORY

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Mathematics Education Session

Abstract: Our professional and bibliographical experience has shown us a number of evidences of deep links in the mathematical context between recreation, teaching and knowledge, including the notions of rigor and validity of a theory. Moreover, when one of these three elements is in focus, the other two often emerge at some point. Thus, we believe that despite the strong resistances still presented today in the academic context of mathematics, especially by teachers at all levels, the quintessential place of recreation is in the context of mathematics, either in the production of pure mathematical knowledge or in the teaching process. and learning. Therefore, we aim in this text to make some reflections on Mathematical Recreations, Mathematical Knowledge and Mathematical Education throughout history, trying to establish some convergences and relationships between these three categories.

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THE MATHEMATICS TEACHING PROCESS IN ELEMENTARY SCHOOL EARLY GRADES AT FORMOSA - GO PUBLIC SCHOOLS

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Abstract: The developed study approaches the process of mathematics teaching in the initial and final grades of elementary school public schools in Formosa - GO, which offer elementary school in the final grades, whose lags were observed on mathematical prerequisites. From this demand, the present research starts from the following problem question: is the learning difficulty during the elementary school initial grades related only to the practices developed by the teachers or also to their mathematical formation? The overall objective is based on the analysis of the relationship between the difficulties presented by 6th grade students and the numbering process. For this, it was necessary to know the curriculum matrix of the Mathematics discipline of the Pedagogy course, to analyze the Mathematics Teaching Plan regarding the practices and content applied in the Elementary School of the initial grades, to verify the contribution of Mathematics teaching in the grades to the students' difficulties in the development process in the following stages of education. The methodology adopted is the descriptive with qualitative focus. The research instruments were questionnaires directed to the elementary and junior high school teachers. The results of the questionnaires show that most teachers in the initial grades do not feel mathematically prepared to work the subject, for this reason, many times they do not deep the content for lack of security, but they use diversified practices in their classes. As for the teachers of the 6th grade, they report a lag in numbering, which hinders the continuous development of the mathematical knowledge construction for this stage of teaching. Although the teachers in initial grades accomplish continuing education, according to the research, the mathematical approach during the pedagogy course, pursuant to the matrix, does not contemplate enough to them feel safe in the execution of mathematics classes. The research had as theoretical background mainly on BNCC (2018), D'Ambrósio (1989 and 2013), PCN (1997), PCN: Mathematics (2001), Romanowski (2012) and Sebach (2018).

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THE USE OF ROUTINE AND NON-ROUTINE COMBINATORIAL QUESTIONS AND ANALYSIS OF STUDENT RECORDS AS REFLECTION TOOLS FOR TEACHING PRACTICE

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ABSTRACT: The interest among Brazilian researchers in Mathematics Education increased in understanding the mathematical conception in High School, having as a tool to support the official evaluation system, such as the Basic Education Assessment System (SAEB). Thus, we defend the use of the results of an evaluation and analysis of the student records as pillars in the search for the reorientation of the teaching work. The present study aims to make use of the analysis of student records as a basis to identify the main strategies and difficulties presented by them, when dealing with combinatorial problems in routine and non-routine questions, as well as, to use the analysis of the records as an instrument of reflection for the teaching practice. The questions were selected in textbooks, used by the students at school and in previous editions of the National High School Exam (ENEM), in order to cover concepts from the fundamental counting principle to groupings. In an initial study, 246 students from 3rd year of High School of a public school in the Federal District. The use of calculators was allowed and the maintenance of attempts at the answers was encouraged. The results showed that the students were more successful in the routine question; they had low interpretative capacity in the non-routine question; they presented an interpretative and resolution capacity which was not compatible with the end of High School; resolution strategies were presented to elucidate the ongoing conceptualization processes and their meditational needs. A subsequent study was carried out with 91 students from the 3rd year of High School, in the same teaching unit, whose objective was to evaluate the students' change of posture, when they dealt with non-routine questions, outside a test situation and in a collaborative environment. The results revealed that when students are placed in an environment of interaction and dialogue, they present creative responses to non-routine questions and that, depending on how this type of question is presented, the initial results are changed.

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DIFFERENCIAL AND INTEGRAL CALCULUS FOR STUDENTS WITH HIGH SKILLS/GIFTEDNESS

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Abstract: In this paper we present the results obtained during the extension project entitled Differential and Integral Calculus (CDI) for students with High Skills / Giftedness (AH / SD), from GISNO resource room, which currently have 36 elementary and high school students. The students were encouraged to study CDI and its applications, which are part of the curriculum of certain undergraduate courses at the University of Brasília (UnB) in order to promote academic enrichment and stimulating the creative potential of AH / SD of them. Weekly meetings were held with expository theory classes and classes on solving exercises and application exercises. In the application exercises, we addressed some problems that can be solved using the current curriculum of High School and also the curriculum of CDI, providing a link between High School and Higher Education. In the interest of checking whether the proposed objectives were achieved, two questionnaires were carried out, the first, six months after the start of activities and the second at the end of the project. The first questionnaire consisted of a discursive evaluation of the course, that is, a qualification about the interaction of the teacher teachers with the students, as well as a self-evaluation of the performance and participation in the CDI classes previously held. The questions sought to promote the reflection of the students behavior in class and allow a more active participation in the learning process, represented here by a column where they could write suggestions for the second half of the project. The second questionnaire was divided into two parts. The first is a repetition of the previous questionnaire in order to verify whether the suggestions adopted

were positively received and confirm the students impressions about the course. And the second, an evaluative questionnaire with four questions each referring to one of the contents covered. With that in mind we compiled the students answers and analyzed them in order to obtain the results here presented.

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ON THE TEACHING OF PRE-CALCULUS AND ITS IMPACT ON DIFFERENTIAL AND INTEGRAL CALCULUS

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ABSTRACT: It is noticeable that students enter the university with disabilities in learning basic mathematics content. This implies, among other things, important difficulties in learning the content presented in the discipline of Differential and Integral Calculus (CDI), which is usually offered in the first semester of the courses. This difficulty contributes to the increase in dropout and failure rates in CDI. With the aim to reduce these negative impacts, it was offered a course that covered Pre-Calculus content in the two freshman classes, night and day, of the Mathematics course at the University of Brasília (UnB), in the second semester of 2019. This course consisted of weekly meetings during one hour and fifty minutes. In each of them, it was revised the content of high school that would be necessary to understand the theory of CDI to be presented in the following week. Students had weekly assignments that were delivered and corrected by monitors. The tasks were short so that the time of resolution and study did not hinder the activities of the CDI course. The results were measured by comparing the average grades of the CDI exams of these two classes with that of the other classes of CDI at UnB. This was possible by the fact that the CDI course at UnB is unified, so that all 19 classes take the same test. The final approval rate was also purchased, with very good results. A third analysis made was the improvement of students' learning in the basic subjects of high school. For that, evaluative tests were applied at the beginning and at the end of the Pre-Calculus course. In general, all students had an improvement in learning.

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**MATHEMATICAL AND DIDACTIC KNOWLEDGE OF BASIC EDUCATION
TEACHERS CONCERNING PATTERNS AND REGULARITIES: REFLECTIONS
ON CONTINUING EDUCATION BASED ON PRACTICE**

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ABSTRACT: This communication seeks to investigate mathematical and didactic knowledge mobilized by mathematics teacher when preparing, developing and collectively analyzing a class on patterns and regularities in a high school class. For this, we present the context in which the research were developed, a process of training mathematics teachers that aimed mobilize and (re)build teacher's mathematical and didactic knowledge about patterns and regularities. The training process took place through professional learning assignments prepared in a way as to provide collective discussions on the subject in question. The research is qualitative-interpretative and the data was collected by recording audio and video, and through written documents produced by the participants. The results show that the professional learning assignments elaborated around the practice records of a class mistered for high school, as well as the collective discussions experienced by the participants, enabled the development of new professional knowledge in teachers regarding, for example, the collective work of planning classes and conducting collective discussions with their students.

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**CHESS GAME IN THE MATHEMATICS TEACHING AND LEARNING PROCESS:
CREATIVITY, PROBLEM SOLVING AND DEDUCTIVE LOGICAL REASONING.**

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ABSTRACT: This paper exposes the execution of an extension action carried out at UEG - Goiás State University, Campus Formosa. The action provided theoretical and practical studies involving the Chess Game in workshops, championships and olympics, with a view to stimulating deductive logical reasoning, creativity, patience and interaction between those involved (UEG students, high school students and community members). Thus, it is noticeable that schools are the main drivers in the development of skills that can be explored in relationships that arise with the game practice, which occurred in categories and patterns, in view of the manipulation of the chess developed practice, which contributes also for the individual formation. Based on authors such as Becker (2002), Capablanca (2008), Caldeira (2009), Gontijo (2007), Gontijo et. al (2019), Lubart (2007) and others, this action sought a qualified study involving the Mathematics undergraduate students and High School students from a Formosa scholl. The methodology had been organized in three fundamental stages: Theoretical studies (through reflections in workshops and lectures); Literacy of those involved in the game (UEG students, colleges and local community); and, Conducting workshops, theory classes, championships and Olympics of the Chess Game (at UEG and high school). Therefore, it can be stated that the symbolic game exercises the imagination, just as when playing the Chess Game, and it is believed that the use of this game as a teaching strategy, in a dynamic, competitive and pleasant way, promotes, improvements in the teaching and learning process, especially regarding creativity and problem solving in mathematics.

Keywords: Teaching. Learning. Creativity. Logical reasoning. Mathematics.

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CURRICULAR PROGRESSION AND THE TEACHING OF ALGEBRA IN MIDDLE SCHOOL: A ANALYSIS OF THE ABILITIES PROPOSED IN THE NATIONAL CURRICULUM COMMON CORE (BNCC)

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Abstract: This documental research analyzed the abilities presented in the knowledge area of Mathematics, in the thematic unit of Algebra, proposed by the National Curriculum Common Core - BNCC (2017), focusing on investigating the curricular progression during Elementary and Middle School. The National Curriculum Common Core is a the document that regulates which are the essential learning to be worked in Brazilian public and private schools of Elementary, Middle and High School. The analysis was made from three categories: cognitive taxonomy, for which the reviewed Bloom's Taxonomy was chosen; the object of mathematical knowledge, studied from theoretical references such as Canavarro (2007) and Gusmão (2009); and the proposed space of literacy. This work was executed from the necessity presented by the Basic Education teachers, in continuing education, of understanding the perspective of teaching introjected in the BNCC document, from the inclusion of this new thematic unit in Early Years of Elementary School and its alterations proposed in nal years of Middle School.

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MATH TEACHING FOR ADHD STUDENTS

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ABSTRACT: Attention Deficit Hyperactivity Disorder (ADHD) is a developmental disorder that shows characteristics of inattention, hyperactivity and impulsivity, which can accompany the individual throughout his life. Thus, it arises the desire to study and analyze the difficulties faced by students who have this disorder in this course completion paper. Therefore, the guiding question aims to question teachers and students from 6th to 9th grade of elementary school from three public schools in Formosa-GO, seeking to investigate their difficulties about teaching and learning mathematics and if they use appropriate methodologies and resources. The goal of this work seeks to perceive how the teaching-learning process occurs at targeted students with ADHD. And the specific aim to: a) understand the difficulties of teachers and students with ADHD in the mathematics teaching-learning process; b) identify the methodology used by the teachers towards these students; c) recognize the concrete teaching resources that assist in learning and concentration of students with this disorder. For this reason, this paper was unfolded in an exploratory way, with the unfolding of a descriptive research, making a bibliographical review. Afterwards, field research was carried out, where questionnaires were used as an instrument of data collect. Throughout the research, we realized the need to use methodologies that are more interesting from the student with ADHD point of view, applying teaching strategies and didactic resources that make the student concentrate and seek to learn Mathematics, making the process of teaching-learning easier, as this will help teachers have no difficulty in teaching mathematics to these students who will also have an easier time learning the subject.

Keywords: Attention Deficit Hyperactivity Disorder. Teaching. Inclusion. Difficulty. Mathematics.

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MATHEMATICAL EDUCATION AND CITIZENSHIP: REFLEXES FOR A CRITICAL WORK DIRECTION

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Mathematics Education

ABSTRACT: The present work, entitled “Mathematical Education and Citizenship: reflexes for a critical work direction”; as general objective, to raise the presence and the importance of the mathematics teaching in the formation of a citizen. Therefore, it can be highlighted that this work arose from a problem that aims to question what would be the function of this discipline besides using calculations and formulas, that old question raised by the students “Whom will you learn this”? This study seeks answers to the following questions: 1) What is the function of mathematics teaching besides using calculations; formulas; equations...? 2) How can it contribute to the formation of a critical citizen? 3) What is the role of mathematics teaching as an individual’s discipline for society? It is noteworthy that research is exploratory, in which a literature review is used to collect information and field research to obtain data and empirical information, through a sample of ten teachers from the licensing courses in “Pedagogy and Mathematics”. A university located in the vicinity of the Federal District, with the wrong statistics unfolding, both qualitative and quantitative. With this, you can understand how the relationship between Mathematics Teaching and Citizenship, and what is the view of the Teacher-Trainers in relation to it. In this respect, it is concluded that Mathematics Teaching has an important role in the formation of the citizen and that it can and should contribute to the formation of a critical citizen. It is worth noting that they also noticed an alignment of the institution’s teachers with these ideas.

Keywords: Mathematics Teaching. Mathematical education. Critical Citizen. Formation. Citizenship.

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ASSESSMENT FOR LEARNING IN THE CÁLCULO 1 COURSE: THE PERCEPTION OF STUDENTS AT A BRAZILIAN PUBLIC UNIVERSITY

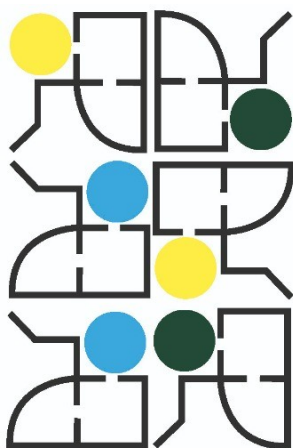
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Mathematics Education Session

Abstract: This research aims to analyze the perception of students about the Calculo 1 course, offered at a Brazilian public University. The research highlights the main aspects of the learning process assessment and was based on the qualitative approach, with a phenomenological focus to analyze the organization of the didactic pedagogical work, the evaluation practice and some factors related with the success/failure of students on this course. A questionnaire was applied to 108 students of the part-time Calculo 1 course, 157 of the full time course of Calculo 2 in 2018 second semester and their answers were analyzed and helped to respond our questions in this study. From the data collects on these questionnaires, it was possible to analyze the closed questions using descriptive statistical elements such as: percentage and graphics. The opened questions were analyzed using the content analysis developed by Bardin, finding 16 categories out of the students. Lastly, from the data collected on questionnaires and the analyze of them, we can affirm that the failures of students on the Calculo 1 course is related to the assessment practices that doesn't favor an effective feedback to the students and by an organization of the didactic pedagogical work that doesn't favor the inner needs of those different courses.

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 **Universidade de Brasília**

XII Summer Workshop in Mathematics

February 10-14, 2020

MATHEMATICS EDUCATION

Posters

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Mathematics Education Session

Abstract: The objective of this project is to promote mathematical knowledge exchanges with an exclusive target on women audience, of all ages, to improve the capacity of learning, enabling progress in school performance, both in mathematics and in other subjects. Encourage the personal growth of each student, giving them tools to improve their self-esteem and professional and academic growth. The classes involve contents of History of Mathematics, Logical reasoning, Problem solving and approach to professions under the eyes of women. The meetings take place weekly on Wednesdays for an hour and a half. Each meeting is divided into three moments: the first, the theme deals with empowerment; in the second, activities involving Mathematics contents are worked on; and finally the theme is about professions. As a stimulus, to the permanence and enjoyment of the meetings, motivational prizes donated by local traders are offered. The evaluation of the results achieved by the project in the participants' school routine is done by consulting the school record.

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AMAZONIAN MATHEMATICS FAIR: GIVING LIFE TO MATHEMATICS IN THE MIDDLE OF THE FOREST

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Mathematics Education Session

Abstract: Over the years of experience with the teaching of Mathematics in Basic Education, it is evident, that for most students of public schools, notice Mathematics present in their daily lives is a great challenge. The teaching practice decontextualized is an important factor to be considered, as it leads to student's lack of interest in the discipline, making it meaningless for everyday life. To the detriment of this lack of interest, early on, the student, in the initial phase of his trajectory in Basic Education, builds a self-image of incapacity in relation to the discipline (PONTE, 1994). This problem present in metropolis schools, such as Manaus, acquires a much larger dimension in schools in the inland of the State of Amazonas and gains more expression in rural communities of these inlands. Giving the above, the objective is to divulge the extension action called Amazonian Mathematics Fair, carried out by the Mathematics Department of the Federal University of Amazonas, in partnership with the Federal Institute of Education, Science and Technology of Amazonas and the University of the State of Amazonas. The Mathematics Fairs have the purpose of giving a new meaning to school activities, transforming them into true laboratories for active experience of scientific learning, co-participated by the community and, thus, deconstructing the elitist vision of the teaching and learning process of Mathematics (ZERMIANI, 2014). It is a summary of the two edition of the Fair, held so, highlighting the challenge of carrying out a pedagogical and didactic action of Mathematics at state level, in the State of Amazonas, with all its social, political and economics peculiarities, not losing sight of its geographical challenges. It will be exposed, in this work, how the movement of Mathematics Fair in Amazonas has instigated new perspectives for teaching of Mathematics and provided new spaces for reflection and action. In the Amazonian Mathematics Fair, as well as in other Mathematics fairs held in the country, everyone is valued and the main driver is socialization and exchange of experiences (FRONZA et al., 2016). In addition, it is written here, how this project has been an instrument of inclusion, by involving students with special needs, inserted in the education of young people and adults, indigenous schools and rural communities, contributing to these students learning of Mathematics, differently from the current and instituted in many Mathematics classes. It was found that the participation of these students in this extension action, has been leading them to a process of increasing their self-esteem, in order to reframe their potentials, giving them the opportunity to express them according to their skills. There was a change and transformation in the lives of the students who, before the participation in the project, did not

envision perspectives for overcoming their challenges in relation to the construction of their own knowledge; after the action they are even aiming to enter university.
Key words: Teaching practice. Knowledge and learning. Mathematics Fair.

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ACTIVE LEARNING METHODOLOGIES AND THEIR CONTRIBUTION TO DIFFERENTIAL AND INTEGRAL CALCULUS TEACHING

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Mathematics Education Session

Abstract: The Differential and Integral Calculus discipline has been, historically, responsible for high rates of failure and evasion, in many degree courses of exact and natural sciences. Among the justification for this fact, the deficient teaching in basic education, the lack of motivation on the part of the student and the unsatisfactory professor-student interaction, are in the studies on this problematic. Other than these, the inadequate teaching methodology is also considered responsible for this situation, since the traditional teaching conception, which permeates the exact sciences degree courses, does not meet the needs of the current social and educational context. In this conception, also called technician, the accumulation of information for later reproduction it is valued, which is understood as insufficient to promote the student's success in this discipline. One of the possibility for teaching, in a different perspective from the technician one, are the active methodologies that can be understand as ways of developing the learning process, used to conduct to the individual's critical formation, favoring their autonomy, wakening the curiosity and stimulating decision making. The present paper presents the doctoral thesis research project, which aims to validate active learning methodologies in Differential and Integral Calculus, in order to promote the student learning. The approach proposed for research is qualitative, with an approximation to the phenomenological method, since our intent is to research the reality through its manifestations, without restricting us to quantifiers. The investigation will take place with students of this discipline, in a public institution of higher education, with the execution of activities planned and conducted by didactic engineering, which is characterized by a scheme based on didactic achievements in the classroom, and on case study records. We believe that active methodologies can contribute to the development of the subject as a whole, provide autonomy, stimulate creativity and prepare them to face new and challenging situations.

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**THE CURRICULA OF MATHEMATICS LICENTIATE DEGREE OF THE
UNIVERSITY OF BRASÍLIA (UNB), SINCE ITS CREATION UNTIL THE
PRESENT DAY**

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Mathematics Education Session

Abstract: This poster aims to present the different curricula of Mathematics Licentiate Degree of the University of Brasilia (UnB), since its creation in the decade of the 60s of the last century until the present day and it is part of the research entitled The History of the Constitution of the Department of Mathematics of the University of Brasilia – MAT/UnB. It was used as research source, official documents that are under custody of the Department of Mathematics of UnB, laws and curricular orientation on teachers training in Brazil. The following questions were raised: How was created the first curriculum of Mathematics Licentiate Degree of the University of Brasilia? Which were the official documents that supported the construction of this curriculum? Which conceptions of education and teachers' training were the basis in the moment of its construction? What transformations have this course suffered over the years? What were the motivation that caused these transformations?

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EFFECTIVE IMPACT OF UNIVERSITY EXTENSION: THE INSTITUTE OF EXACT SCIENCES (IE) DURING THE UNIVERSITY WEEK AT UNIVERSITY OF BRASILIA (UNB)

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Abstract: It is known that one of the great commitments of the university is to constitute itself a space/time for production and dissemination of knowledge as well as social inclusion. Thus, university extension at the Exact Science Institute (IE) of UnB is understood as an interdisciplinary, educational, cultural, scientific and political process. It is argued that it can re-signify the interaction between the university, its students, its professors and the community in general. This way, the IE rebuilt its extension policy based on three pillars: 1/ integrate students and professors from its courses (Mathematics, Computer Science, Computer Engineering, Mechatronics Engineering and Statistics) in the production and promotion of extension actions; 2/ offer these actions regularly to students and teachers from Basic Education (EB) and the community in order to reconstruct negative social representations, still in force in our society, which points the exact sciences as inaccessible to all, especially to girls and women; 3/ evaluate its actions in order to build new knowledge and improve future offers. Therefore, in this paper, it is reported an evaluative process carried out during the XVIII University Week of UnB (SU), in 2018, aiming to understand the impact of university extension on the school and personal life of three groups of participants, namely: EB students and teachers who participated in the offered actions and monitors (IE undergraduate students who helped in offering and organizing IE's participation in the SU). To this end, the three groups were invited to collaborate voluntarily by answering questions, organized in electronic forms, such as: age, gender and education level; previous participation in extension actions; evaluation of the university's functions and responsibilities; evaluation of interest in the different areas of knowledge, in particular, those that compose the IE; evaluation of the activities offered and their impact on future professional choice, among others. Data analysis favored the quantitative and qualitative treatment of the responses provided, seeking to comprehend the impact factor in the participants' understanding. The results show that the EB teachers perceived the SU as a pedagogical tool of excellence to reframe the content already worked in the classroom, as an element of motivation to awaken scientific nature interests among students and teachers. As for the EB students, the data reveal that they perceive the SU

as an opportunity to access information on: areas of knowledge, scientific research, career, labor market, professional remuneration and social ascension. Monitors, on the other hand, perceive the SU differently, according to their area. Licenciante undergraduates from the last semesters, for the most part, assess that the SU presents them with the future professional field by creating opportunities for mediating concepts with the EB students; among the bachelors undergraduates, they perceive the SU as field of professional development due to the access to research, to public policies and to the identification and resolution of problems demanded by the community. The study is configured as an important indicator that will greatly assist the internal of evaluation and management policy in extension of both IE and UnB.

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REFLECTION OF A GRADUATE STUDENT IN MATHEMATICS ON THE IMPACTS OF FOMENTATION PROGRAMS ON TEACHER TRAINING

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Abstract: Educators and specialists from different areas defend the idea of training the “teacher-researcher”, the term deals with the critical and reflective professional, autonomous and active, capable of reflecting on their practices and improve them. In this sense, research has the role of help in academic and professional training, in a liberating way, making the future professor capable of improve his/her teaching work more and more. The arguments in favor of the development of research are strong: a higher level of professional autonomy, increased ability to solve problems in the classroom; motivation for the exercise of teaching; development and improvement of curriculum; production of results communication, among others. “What a teacher has of a researcher is not a quality or a way of being or acting that adds to that of teaching. It is part of the practical nature of the teacher to ask, to seek, to research, what is need is that, in his permanent training, the teacher perceive and assumes himself, because a teacher, as researcher” (FREIRE, 1996, p. 32. Free translation). Stating these values, it is worth mentioning the importance of incentives and financing related to research during the academic training and professional performance of government and institutional programs. Without such incentives, research often becomes a reclusive practice, in which only those with greater capital are able to improve professionally. In this regard, I intend to cite incentive programs in which I participated and participle during my graduation, such as: Institutional Scholarship Program for Initiation in Teaching (PIBID), Institutional Scientific Initiation Scholarship Program (PIBIC), Scientific Technician, Technical Visit, among other. Reporting also, how much they added to my training. Since my second semester of graduation, I have been working in a line of research of inclusive education, with participation in two PIBIC projects I was able to develop methodologies and didactics material for the teaching of mathematics for visually impaired students, through PIBID I was able to have educational experiences in real environment, in order to apply the knowledge acquired and improve it. In calls for Scientific Technician in which I was awarded, I had the opportunity to disseminate the results acquired in others projects, as well as to socialize with other researchers, in the same way Technical Visits provided me work in other institutions, conquering new knowledge that I

can disseminate in the research groups present at Federal Institute of Brasilia (IFB) – Campus Estrutural.

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THE USE OF ACTIVE METHODOLOGIES IN THE DEVELOPMENT OF SKILLS AND COMPETENCIES IN THE TEACHING OF MATHEMATICS

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Mathematics Education Session

Abstract: This work presents the result of the development of a Didactic Sequence of the curricular component of Mathematics applied in classes of the 8th year of the final series. The work was developed in a private educational institution located in Brasília, in the Federal District - Brazil. Our objective here was to demonstrate, through the application of a didactic sequence based on the assumptions of the active methodology, through the use of investigative, experimental, dialogic and object exploration practices, that students become autonomous and protagonists of the teaching learning process, moments that favor the development of mathematical skills and competences. Keywords: Following teaching. Active methodologies. Student protagonism.

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NUMERICAL SETS – DIDACTIC SEQUENCE FOR VISUALLY IMPAIRED STUDENTS

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Abstract: From a bibliographic study and participation in Institutional Scientific Initiation Scholarship Program (PIBIC) and Institutional Scholarship Program for Initiation in Teaching (PIBID) projects, it was requested to elaborate a didactic sequence to visually impaired students, with the main objective the understanding and inclusion of these students in the classroom. At this point, when analyzing one of the papers presented, the idea was to create a pedagogical material inspired by the one presented, but with a different content. It was sought a content in which there were not many didactics materials already created, such as geometry, and that was important for the curriculum of the discipline of mathematics, therefore, it was chosen the content of numerical sets. Initially, in the development process of the sequence, two types of materials were created: Material 1/ common hula hoop and one with string around it that would be used in classes; Material 2/ a hose cut in several circles of different sizes and plates with numbers in Braille. In addition, five classes were elaborate which, according to the materials to be used, were divided in two groups: group A and group B. Group A has the sets as content and uses material 1 for classes 1 and 2. Group B, on the other hand, has the numerical sets as content and uses the material 2 for classes 3, 4 and 5. Group A: In view of the concepts to be present and using two hula hoops, it will be explained to the students the relations between the sets through the method of Venn-Euler diagram, in which the sets will be represented by the hula hoops and the students will be the elements belonging to it. Group B: Using the plates with numbers and the circles with different sizes, the difference between the sets of natural, integers, rationals, irrationals and reals numbers and the need for creating each of them will be presented, as well as the relation between them. After the application of the didactic sequence it was concluded that it is a very effective toll for teaching visually impaired students, as it also facilitates the understanding of the content, makes the students work in

group, interacting with their classmates, thus obtaining inclusion of the student in the classroom.

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