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Teacher Training In Inclusive Education In Panama: The Challenge Of Enhancing Mathematical Suitability

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Abstract

In 2017, the National Institute of Statistics and Census (INEC) of Panama, recorded a total of 15, 053 students of inclusive education and 885 teachers who taught courses in that area. These figures contrast with those reported by the Ministry of Education of Panama (MEDUCA), for the years 2015-2019, in which they reported 81,009 students with special needs; data that exemplifies the substantial increase in students with some type of disability.

In Panama there are more than 500 public schools that provide inclusive education; unlike the rest of the schools where there are very few centers that integrate this education. Given this reality, it is recognized the need to develop, integrally, this population with the intervention of teachers trained in strategies, innovation and technology. For these purposes, technological tools are needed to strengthen educational strategies and enhance the didactics of mathematics, both in the regular student and in students of inclusive education. Achieving this objective promotes equitable education and the social integration of citizens with special needs in order to achieve quality education at the initial level. The training of teachers at preschool and primary level, through the strengthening of a technological platform that promotes mathematical suitability in inclusive education, promotes the modification of knowledge and the development of mathematical thinking.

Keywords: inclusion, inclusive education, mathematics, technological platform, mathematical suitability, Social Interpretation Model (SIC)

INTRODUCTION

Teacher training and the educational strategies used by them when developing their lessons are elements that record students' motivation, choices, and expectations (Chowdhury, 2016). This is particularly important because the educator has an important role in the success obtained when developing the practice in inclusive education (Forlin, & Chambers, 2011). Education is the vehicle that schools must channel evolution and social progress. Therefore, it is the institutions of higher education, which are responsible for training teachers who respond to the demands of the external environment; with full awareness that their knowledge, skills, and values are a transformative force that enables mobility, social contribution, quality of life and shared benefit (Bowman et al. 2019).

The skills that educators of the XXI century must have privilege: rigor, communication, work networks and new technologies. This does not exclude social justice, individual growth, and a democratic lifestyle, which interacts with the environment and where there is participation in problem solving. All these factors are guided and receive the direct impact of values and the sense of citizenship. Students involved in civic engagement projects in mathematics develop a sharper sense of how and what the consequences of those problems related to society and everyday life are (Mc Cluskey, 2010). In this way, they contribute to the solution by using their civic expertise. The continuous training of teachers in Panama has been much more evident after this study on the challenges of enhancing mathematical suitability and above all it has been more necessary during and after the COVID-19 pandemic in Panama.

Mathematics responds to a perspective that stimulates logical and complex reasoning and mainly, abstract thinking. Therefore, encouraging their learning increases the possibility of achieving changes in the curriculum, fragmenting situations, and analyzing their components in a systematic way (Livers, Paxton, O'Grady, & Tontillo, 2018). These skills applied to life, turn out to be an added value from the social and dimension. Continuous training is a common practice that is applied to senior and middle managers of successful Panamanian companies and to University Professors and to Researchers and Doctors etc. from Panama. This leads us to the idea that a constant reinvention of the teacher is more necessary today, as evidenced by the PISA and PERCE, SERCE and TERCE tests carried out in Panama in the last years, http://www.unesco.org/new/fileadmin/MULTIMEDIA/FIELD/Santiago/pdf/PANAMA-factores-asociados.pdf hanging life means that teaching tools must be constantly improved. Future professionals will emerge from our K-12 students. The illusion that is transmitted to these students depends on the teachers. This illusion is transmitted with the example of passion of the teacher that he/she demonstrates by applying new didactics in mathematics. This research shows that a greater effort in the skills and talents of the teacher must be applied in conjunction with the knowledge of the content of the curriculum, this alone is not enough in Panama.

By understanding the importance of mathematics and its incalculable applicability to life, the teacher may be inclined to favor citizen positions and values consonant with the inequities and inequities that mathematical training allows to understand and analyze (García Oliveros, Navarrete Serrato & Samboni Trujillo, 2018).

The study of mathematics enhances access to science and technology by imparting methodological rigor and encouraging the exercise of executive functions necessary for personal and professional life (Faragher, Stratford, & Clarke, 2017); Bottge, B. A., Cohen, A. S., & Choi, H. J., 2018). This suggests the need for the student to receive knowledge that supports growth and confidence in their own knowledge and judgment (Morales Maure, García Vazquez & Durán, 2019). In the same way Garcés, Font y Morales-Maure (2021) mentioned that: Several studies on mathematics teaching in engineering degrees have indicated that the high number of students who fail basic science subjects in these degrees is directly related, among other aspects, to the way in which teachers' approach and teach mathematics […] (p. 5)

The didactics of mathematics is a practice that generates concern in the educational and professional field. Many students fail to be successful in this subject, not because of a lack of innate skills, but due to the inadequacy of the pedagogical strategies that were used in their education (Navarro-Mateu, Franco-Ochoa, Valero-Moreno & Prado-Gascó, 2019). According to Štech (2006), mathematics taught in schools is a "highly abstract exercise that serves to classify students as talented or not" and exhibits a lack of strategies that are useful in daily life. This situation contravenes the goal of the school as a socializing agent, since it affects its contribution to the development of mental functions and even more, to the integral education of the learner (García Marimón et al, 2021). On the other hand, several authors in the field of Mathematical Education have consistently reflected on what are the new current perspectives in the teaching of mathematics (Font, 2008; Morales-Maure et al., 2018; Beltrán-Pellicer & Godino, 2020, Seckel & Font, 2020). All elements or resources mentioned so far should be included in the role of the teacher as an academic leader, but it is important to talk about didactics specific to the Didactics of Mathematics that studies the teaching-learning process of mathematics in the classroom.

The process of transformation of mental functions, required in mathematics, warrants an approach to daily life where students observe, discover, and argue. This proximity is fulfilled when there is a teacher with a plan, strategies and a curricular logic that supports their management. Aspects such as: the curricular content, the pedagogical modules, the practices, the academic environment, and the heterogeneity in the university training constitute elements that affect the didactics of the mathematics. In a study carried out by Moscardini (2014) on mathematics at the primary level, the importance of developing in the teacher competences related to the mathematical thinking of children to promote inclusive practices is highlighted.

TEACHER'S ACADEMIC PREPARATION AND MATHEMATICS EDUCATION

The training of teachers in mathematics is the subject of research in many Latin American countries, as its influence on the quality of education provided in the classroom is recognized. It must be considered that the revitalization of an educational system depends, to a large extent, on the degree of commitment of teachers, but also on their permanent updating and the reconceptualization of their roles. Despite the efforts, the government agencies in charge of education often offer training content that does not meet the demands and expectations of teachers and is not linked to the educational situation of students or their daily lives.

Educational systems need to invest in the training of their teachers, which can make up for gaps in their training and in their specialized pedagogical needs, in addition to empowering their ability to face curricular innovations and incorporation into virtual environments such as Information and Communication Technologies (ICT's). To improve the quality of education, profound changes are required in the teaching tasks linked to teacher training. It is therefore necessary to establish indicators that will enable the governing bodies to make the necessary adjustments in the updating process.

Among the topics related to the training of mathematics teachers is their educational practice and the way they structure their discourse in the classroom. It is urgent to understand in what aspects the teacher requires continuous training that leads them to achieve a better mastery of the mathematical contents of the subjects they teach, as well as the didactics inherent in mathematical knowledge, to face the challenges imposed by the learning of their students.

The Ministry of Education of Panama (MEDUCA) annually programs a series of training courses in different subjects. However, judging by the student results in the international exams (PISA Test) and CRECE Test, it is important to evaluate the extent to which the contents offered achieve the objective of teacher training. While it is true that the results of the tests are multicausal, it would be theorized that in the training courses that teachers receive there is almost no existence of specific didactic orientations as is the case of the Didactics of Mathematics. This situation presents a discouraging picture that warrants paying attention to the challenge of managing the cognitive and methodological limitations presented by teachers.

Currently in Panama, a competency-based system is developed that the student must demonstrate. This involves proposing classes that will vary in every way and the implementation of an evaluation system that must require modifications. Therefore, it is not to assimilate foreign educational policies only by innovating, but to use their fundamentals based on the needs of Panama and its educational system.

The use of educational competencies brings with it standardized student tests. Faced with this reality, questions arise that question: What happens to teachers? Will they have the necessary skills to transmit knowledge to their students? In this regard, it is common for training proposals to arise from educational officials at different hierarchical levels who make decisions without sufficient theoretical and methodological support. This situation accentuates the didactic limitations of the teacher and therefore the quality of mathematical learning.

Teacher training is currently a research topic in education, due to the problems it contains and its great complexity since it turns out to be multifactorial and essentially interdisciplinary. Their experience, personal safety, and professional identity are defining factors that define their approach to the special needs student and could characterize their mathematical suitability. This impacts the relationship with other teachers and increases their knowledge in support strategies that enrich the student learning experience and the teacher's reflective process (Mezirow, 2000).

As far as the training of mathematics teachers is concerned, there is still a great deal of research to be done on this subject. The questions are varied: What are your practices like? What was the mathematical training received during your university studies? What elements of mathematical culture does it integrate and use in your classroom how is its culture? Which areas of mathematical didactics should be reinforced? And how beneficial and useful can be the use of Information and Communication Technologies (ICT's) in an area as complex as mathematics and even more so inclusive mathematics?

The training of mathematics teachers not only involves what to teach, but also topics such as: mathematical culture, ways of arguing and how to expose to students the mathematical content. The incorporation of technology in their training enables processes that integrate theoretical and methodological aspects for the design of learning situations, which can allow the teacher to reflect scientifically on their teaching skills. The fact that socio-cultural factors are exerting a strong influence on the pedagogical conception and practice of teaching would partly explain the increase in the number of research studies on the conditioning sciences of education (biological, psychological, social, economic, among others) in recent decades. These sciences are dedicated to the study of the characteristics of educators and their students as well as the conventions, norms, and organization of educational institutions (Pochulu, Font & Rodríguez, 2016; Hummes, Font & Breda, 2019; Godino, Batanero & Font, 2020, Vanegas, Font & Pino-Fan, 2019, Breda et al., 2021, García Marimón et al, 2021, Maure, Font, Gonzalez, & Vasquez, 2021).

Educating in mathematics means ignoring banking education, empirical learning, and fragmented knowledge. In teacher training there is usually a comfort zone characterized by a knowledge of rapid obsolescence that incorporates teaching routines that marginalize contradiction, uncertainty and the unknown; to the detriment of the development of theoretical and reflective thinking (Ibarra & Izquierdo, 2010, cited by Rúa, Bernaza, & Bedoya, 2017). These elements together with a lack

of expertise in inclusive education can make it more difficult to teach inclusive mathematics. The situation becomes more complex when the teacher, with his cognitive and methodological deficiencies in mathematics didactics, must teach the subject to students with a variety of educational needs. According to Cameron & Cook (2007), "general education teachers are not prepared to offer inclusive education" let alone that aimed at teaching mathematics. These researchers identified that a regular teacher receives, in their undergraduate studies, a very low (1.5 courses) versus eleven (11) courses that special education teachers take. As recently as 2017, Gurin, & Maxwell, found that the success of inclusive education depends on the provision of rigorous training, as the regular teacher must assume many of the special education responsibilities without being properly trained. A year later, in an investigation conducted by Butrymowicz & Mader, J. (2018), it was found that the situation remained unchanged.

CHALLENGES FOR TEACHING MATHEMATICAL SUITABILITY

Traditionally, mathematics has been a demonized discipline and it is the same educational process that marginalizes it (Zevenbergen; Mousley & Sullivan 2004; Constantinescu & Samuels, 2016). Faced with the devaluation of mathematical knowledge on the part of teachers, even those who teach it, and together with the limitations in professional training offered by the educational system, the incentive to study the subject and, therefore, to strengthen mental functions decreases, a situation that is exacerbated for those students of inclusive education (Dewsbury, 2017). Therefore, the state of teacher training in terms of mathematics didactics and its inclusive teaching strategies continues to be a repetitive and persistent theme.

The researchers have approached the subject from different perspectives and converge that teacher training is decisive for good didactics of mathematics. Butrymowicz & Mader (2018), argue that the education system has failed students in general and those in inclusive education. Reasons include inadequately trained teachers, insufficient funding to provide support services, a propensity to divert students to alternative short-career programs, precarious future options, and the limited emphasis on teaching skills such as communication, organization, and math operations. (Bottge, Cohen & Choi, 2018)

The research findings align academic success with the opportunity for teachers to receive continuous and rigorous professional training with emphasis on instructional approach to inclusive education students; differentiated instructional strategies; classroom management techniques; knowledge in neuroscience; characterization of different disorders and how they affect student learning (Gurin & Maxwell, 2017).

According to García, Martínez and Carcedo (1993), in students with specific learning difficulties linked to the acquisition of the instrumental contents of the basic areas such as language and mathematics, it will be necessary to adopt educational reinforcement measures by introducing modifications in the sequencing of the contents and in the methodological strategies. In the same

way, those students with generalized learning difficulties derived from an intellectual deficit will require significant adaptations of the curriculum throughout their schooling.

The planning and didactics of mathematics is most effective when there are collaborative links between the regular teacher and the special education teacher. This contributes to "identifying and developing effective intervention techniques that can be used in progress monitoring, evaluation, and remedial instruction." This allows both teachers to make curricular adaptations and implement models that are effective for all students, regardless of the scenario. In the same way, it offers an environment of reciprocal learning in which the mathematical teaching of the professional is strengthened with more limited knowledge and strategies.

The Social Interpretation Complex (SIC) is a model that encourages collaborative work from various disciplines (Meléndez, 2019). The SIC does not admit fragmentation in the interpretation of educational, social, or cultural reality, since it recognizes that human complexity requires the interaction of diverse knowledge to make a more accurate reading. To these ends, the model is appropriate to analyze the elements that converge and shape the development of inclusive mathematics education, by applying a comprehensive analysis that goes from aesthetic judgment to the socio-political and psychological field. Valero & Skovsmose, (2012), converge with the model by pointing out that the study of mathematics is linked to a greater understanding of current social and political practices, which implies the recognition of a multidisciplinary and transdisciplinary approach that involves collaboration as an efficient task (Chao, Lai, Ji, Lo & Sin, 2018).

A meta-analysis conducted by Garderen, Scheuermann, Jackson & Hampton, (2009), found that learning disorders and mathematical disability, at the primary and secondary levels, are the most studied in inclusive education. There is overwhelming evidence from primary level studies (66%) which focus on the didactics of mathematics and its application to special education. However, this is a scientific reality that applies to the North American nation, but not to Latin America, where research at the primary level is literally non-existent and does not provide follow-up to the methodologies implemented, a situation that makes it impossible to carry out measurement and subsequent actions. This poses a fertile context for training in mathematics didactics aimed at children in inclusive education, as it points to a knowledge gap in this area.

Inclusive education should be seen as a permanent process that depends on continuous training that pursues pedagogical development. However, the concept has derived into a multiplicity of visions and perspectives that may be confusing and to some extent, unrealizable. To these ends, Booth & Ainscow (2002) argue that the development of inclusion is improved as schools create, produce, and develop inclusive cultures, policies, and practices. This means that teachers must be trained to implement curricular adaptations, which are usually not part of the training curriculum.

According to Carvalho, Mamcasz-Viginheski & Shimazaki (2018), the didactics of inclusive mathematics occurs "when school knowledge is available to all students, regardless of social, emotional, physical, intellectual and linguistic conditions." It is necessary to recognize and respect the needs of the student, and provide the academic, ecological, and affective conditions for them to appropriate mathematical knowledge (Godino, Giacomone, Batanero & Font, 2017).

Although there is legislation and policies that establish the rights of the population to inclusive education, the initial training of regular teachers continues to be exclusive with regard to this problem (Castro, 2007). The lack of methodological adaptations in the subject, the limited knowledge to identify difficulties in reading, writing or interpretation, the resistance of the teacher and the superficial and scarce continuous training, "motivate feelings of isolation, impotence and incompetence to attend to these students" (Mendes, Almeida and Toyoda cited in Carvalho et. al, 2018). This occurs, simultaneously, with the devaluation of the student's potentialities, where from the beginning he is attributed an inability to learn, which brings with it exclusionary practices and the culmination of primary studies where they do not reach the expected mathematical knowledge, a situation that causes marginalization and a high probability of future poverty. Therefore, it is necessary to strengthen the professional training of the teacher and provide efficient and informed solutions in order to meet specific educational needs through strategies that involve active learning of mathematics and constructivist and sociocultural dimensions.

The professional training of teachers, specifically, in the teaching of mathematics is a national challenge that deserves to be impacted with assertive and relevant strategies. The Ministry of Education aims to strengthen training based on the strategic objective of providing quality education at the initial level (Strategic Plan of the Ministry of Education, 2014-2019). For its operationalization, the Ministry plans to "Provide teachers with innovative strategies for the comprehensive development of children in initial education." The main activity focuses on "Training teachers in innovative strategies for the integral development of initial education", mainly in didactic material. It is expected that "the application of methodological and pedagogical strategies will lead students to develop skills to think, analyze and solve problems", as well as to reduce dropout rates, backwardness, and low academic performance, among other aspects. Therefore, the strategic objective establishes as an indicator, the number of training actions with follow-up in the classroom.

BACKGROUND

In the Characterization Study of Inclusive Schools in Panama, conducted by the National Secretariat of Disability (SENADIS), in 2015, the opinion of teachers regarding their training in inclusive education was collected. 50.3% of the respondents stated that they do not receive professional development in this area. This result was validated through an analysis of the activities of improvement in didactics of mathematics, offered by MEDUCA for the years 2013-2018

(Improvement Unit, Ministry of Education, 2013-2018). This one presented a scarce formation in all the lines, except the year 2015. However, for no period is there follow-up evidence to determine the medium- and long-term effectiveness of the training implemented, nor is there certainty of mathematical training in inclusive education.

SENADIS (National Secretariat for Disability) research emphasized the need to involve the teacher in collaborative planning with other teachers (p.53) and in the mastery of pedagogical methodologies (p.53) that respond to their need for training. Even with how successful this study turns out to be, we note that it does not require school practices or inclusive educational methodology by subject, so it is necessary to identify and strengthen those used in mathematical didactics.

The development of training and the implementation and evaluation of specific actions are not effective when they lack a follow-up that allows to conclude in terms of the cognitive gain of the teacher and the educational transformation of the learner. Nor are they effective when offered sporadically, disjointed from the needs of teachers and without a collaborative and active learning environment. The 2017 statistics provided by INEC indicate that the most predominant special needs problems are located at the primary level followed by pre-medium and medium. However, primary has 50% of all special needs' cases at all levels, including vocational. On the other hand, intellectual disability is the one with the highest percentage (59.2%) with 8,916 students.

Intellectual disability includes the ability to learn, reason, solve problems, and adapt to the environment. In the preschool and primary school environment, this disability can predominate in those areas where abstract knowledge is required, such as mathematics. Therefore, the teacher of general education is the professional, who with few foundations in special needs must face the teaching of a subject traditionally considered difficult and complex. While the special education teacher, even with his specialized knowledge, must reinforce mathematical content.

INEC statistics (2017) indicate that by 2017, there was a ratio of one special education teacher to every ten and seven special education students. Given the increase of 65, 956 in the enrollment of special needs students for the year 2019, the need for teachers with training in special needs, in this case inclusive mathematics, is foreseeable to continue maintaining the same teacher-student ratio.

The teaching that students receive at the pre-school and primary levels determines the preference that students have for the various subjects and develops their curiosity about these disciplines. Therefore, these groups are directly impacted by teachers' practices. The impact is even greater when there are limited teaching skills for teaching mathematics coupled with poor knowledge of inclusive education.

When considering the poor effectiveness of mass and prescriptive activities lacking a diagnosis of the need for teachers, without follow-up and technological innovation it is understandable to understand how little they can contribute to the national goal of educational and economic progress.

We believe that training activities train in fundamentals and pedagogical approaches that provide significant learning, enhance skills for the design and planning curricular design and planning of curriculum) and facilitate the process of reflection in areas such as: educational strategies and evaluation. In the same way, they provide methodological tools and integration of information technologies that motivate and encourage learning. When continuous training based on differentiated education and knowledge and acceptance of diversity is provided, inclusion materializes, and teacher achievement becomes evident.

STATUS IN PANAMA

Data provided by the National Institute of Statistics and Census of the Office of the Comptroller General of the Republic (2012), show a consistently high dropout rate in primary education, with emphasis on the first grade and a trend towards a decrease in enrollment from 2012 (MEDUCA, National Directorate of Educational Planning. Department of Statistics, 1990-2012). This impact is exacerbated as students are recipients of inclusive education.

Statistics issued by MEDUCA (Ministry of Education. Bulletin nº 1. Educational statistics, 2012) point to difficulties in the areas of reading, writing and mathematics. These respond to disabilities of an intellectual nature (72.1%), something that according to the researchers is congruent with the results presented by regular current students (Carvalho, Mamcasz-Viginheski & Shimazaki, 2018). Such difficulties are more notorious "in calculation and multiplication tables; logical reasoning, mastery of fundamental operations, interpretation and concentration". The divergence lies in the individual differences of the students and in the educational methodology used by the teacher to achieve the skill. This fact is based on the results of SENADIS (2015), which establishes the relationship between the type of disability and the academic level of families.

The National Secretariat of Disability found that it is in families with low schooling where the highest number of students with intellectual disabilities is located. This justifies the need for training to bring together pedagogical methodologies that address diversity from a dimension not only behavioral and cognitive, but also sociocultural/ approach diversity not only from a behavioral and cognitive dimension, but also from a sociocultural one. Parents are the scaffolding that guides school education in the family context. To the extent that the teacher is profied in mathematical didactics, he or she is in a better position to support not only the student but also to contribute to the tutoring offered by parents at home/To the extent that the teacher improves in the

didactics of mathematics, he/she will be in a better position to support not only the student, but also to contribute to the tutoring offered by parents at home.

The Pisa test results for Latin America showed that "half of the students could not read or write properly and lacked basic foundations in mathematics"(Organisation for Economic Co-operation and Development - OECD, 2018). This reality prophesies marginalization and a limited employment/job market for those who do not meet the skills, a situation that does not contribute to national progress or to the quality of citizen life, with greater impairment among students of inclusive education. In view of this, UNESCO raises in the 2030 Agenda for Sustainable Development (goal 4), the need to: "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all".

For the month of January 2019, the Faculty of Education Sciences (FCE) of the University of Panama (UP), administered an electronic questionnaire to 70 active teachers, obtaining a response rate of 77%. 88.1% of the participants were primary school teachers, 90.7% had inclusive education students in their classroom and attended between 1-10 of these students daily. We found that the largest population served is students with specific learning disorders (55.9%), followed by physical/mental disability with 16.7%. This is in consonants with national statistics that point to intellectual disability as the priority in pedagogical terms. In this regard, an adequate handling of mathematical didactics turns out to be a very valuable competence, since intellectual disability points to difficulties in some subjects, mainly mathematics.

66.7% of the participants answered that they have not received improvement in inclusive education and when making a self-assessment of their ability, 57.4% answered that they have limited knowledge and proficiency, 31.5% indicated that they have a satisfactory domain and 5.1% indicated that they have no mastery or knowledge. 42.8% indicate that they have a poor preparation to teach mathematics to children of inclusive education, 40.7% indicated that they have a satisfactory preparation and 9.3% indicated that they do not have a preparation to teach mathematics. Regarding the way in which the teacher feels when making curricular adjustments and modifications to teach mathematics to students of inclusive education, 75.9% indicate that they feel that "within their limitations it helps as it can". A 7.4% answered that, in terms of curricular adjustments in mathematics, it depends entirely on the special education teacher, who ultimately does not know the didactics of mathematics. 98.1% of the participants answered in the affirmative when asked about their willingness to participate in inclusive education training to strengthen their mathematics teaching. Finally, respondents indicated that they are interested in reinforcing content and performance standards in the areas of fractional numbers, multiplication concepts, and division.

For the years 2018 to 2019, through a specific Diploma to develop mathematical suitability, a technological platform was structured to train teachers in content, strategies, and mathematical

methodologies. This initiative, which is part of the University of Panama and subsidized by the National Secretariat of Science, Technology, and Innovation (SENACYT), was aimed primarily at primary school teachers in general, without considering the particularities of their students. The results obtained from the external evaluation of the Diploma point to both cognitive and methodological strengthening, while significant progress was recorded even in students with disabilities.

The research carried out by FCE, and the results obtained in the Diploma course reveal the need to contribute to the training of teachers at the preschool and primary level through the current technological strengthening and direct it to promote mathematical suitability in inclusive education (Morales Maure, Garcia Vázquez, & Duran González, 2019). This supports the need to modify the knowledge and skills of preschool and primary school teachers by deepening mathematical suitability to develop mathematical skills and thought processes. There is a tendency to consider more generic elements, in addition to responding to an excessively instrumentalized vision of them (Torres, et al., 2020, p. 296; Castro et al., 2021).

ETHICAL FRAMEWORK

The inclusive education approach is the educational response to the need to foster diversity. It aims for students– whether in school or out of school– to learn together no matter what social, cultural, or functional nature characterizes them. Its purpose is to contribute to strengthening the teaching-learning process while enabling an environment where respect and integral development prevail.

Special educational needs are not exclusive to populations, any child, regardless of his or her social, economic, or cultural origin, may present difficulties of an intellectual cognitive nature. Therefore, the education system must face these challenges through resources and supports that achieve educational integration. Such integration implies enhancing the presence and interaction of the student in open classrooms together with the students of the regular current with the presence of teachers with the appropriate training.

Vygotsky in his Theory of Sociocultural Development highlights the importance of the child learning in contact with their social and cultural environment. Interaction with other children and with adults who act as a guide, serve as a support for the development of their potential. This is consonants with the principles of pragmatic philosophy of John Dewey, who postulated that students could progress in an environment where interaction and experimentation prevail. That active learning that arises from intellectual curiosity and contributes to creativity was considered an essential activity for educational development (Stemhagen, 2016). Therefore, the teacher as the main resource must be consented to the development, implementation, and evaluation of such strategies.

It is necessary to emphasize that inclusive education is not synonymous with assimilation or accommodation of students, since the changes observed in the educational system must be evident (Armstrong, Armstrong & Barton). These changes must be accompanied by individualized strategies that reflect the diversity of disabilities, families, interests, cultures, and forms of learning. Godino (2002) citing Higginson's works aligns with the following topics such as: understanding traditional positions on teaching- learning mathematics; understanding the causes of curriculum changes in the past and forecasting future changes; and the change of conceptions about research and teacher preparation. The results showed significant student achievement, students who attended DSTM schools and classes for four months showed a gain in the assessment of math problem solving with the DMKC model compared to non-exercise participants of the Ministry of Education.

Jack Mezirow's Theory of Transformational Learning (2010) exemplifies the change in teaching attitude towards the strategies and methodologies it employs after going through a process of reflection. emphasizes that adult education should be subject to the establishment of priorities where goals, function and evaluation are aimed at the transformation of learning. As the teacher-in-training progresses in his or her learning and transforms, ~~it~~/he or she shows changes in his or her ability to interpret the world. Such a transformation is mediated by the competencies of the faculty or facilitators who guide you and by the praxis to which you are exposed/ Such transformation is mediated by the competencies of the teacher or facilitators who guide him/her and by the praxis to which he/she is exposed.

The teachers of Panama require a dose of Aristotelian rhetoric (Esbrí, et al, 2021). Ultimately, as stated in a webinar at the Faculty of Education this year in Panama, it is about privileging the formation of being over knowledge, where empathy as sensitivity towards the other and in the conditions of each person. They are the values of empathy, solidarity as emotional tools to connect teacher with student which were observed in this course for teachers.

Within the equation: leadership and practice, the critical reflection that arises from introspection and the examination of his record as a teacher and citizen is inserted. Transformation in learning manifests itself when it occurs in safe environments for critical reflection, in which collaborative inquiry, communication, the ability to listen and new schemes, mental habits and meaningful perspectives are promoted. In this, the didactics of mathematics must bring together the elements that facilitate the internalization of civic competences and values, to generate students, more inclusive and inclined to change. These skills promote openness to new ideas and methods, acceptance of individual differences, curiosity to know and research, encourage creativity and innovation, and empower the valorization of other cultures. This involves the constant examination and re-examination of the teacher's position and the development of critical, creative, and complex thinking.

Teacher training and its capacity for methodological strengthening in the education of inclusive mathematics is linked to the Andragogic Theory of Malcolm Knowles (1974). This theory highlights that the adult is a self-directed human being who is active in solving problems. For these actions, he has an intrinsic motivation guided by his willingness to learn and to assume greater prominence in his social and professional role. According to Knowles, the experience that the adult possesses empowers him with a greater capacity to learn and apply the knowledge acquired more quickly.

The reflection emphasized by Mezirow, as well as the capacity for self-direction driven by Knowles, is essential in the process of metacognition of the teacher because it allows them to meditate on the adequacy of their strategies and methodologies. In this regard, strengthening the didactic means through a technological platform with content and strategies of mathematical suitability in inclusive education, provides for the training and reflection of the teacher on his practice.

ACTIVITIES TO PROMOTE INCLUSIVE EDUCATION THROUGH TECHNOLOGY

Technology, fundamentally, from the forced virtuality imposed by the COVID-19 pandemic, has demonstrated the need to use this medium to impart lessons and offer teacher improvement. Technology platforms are a resource that allows you to reach a greater number of participants synchronously or asynchronously, while including content, teaching activities, readings, activities, and examples.

Strategies such as collaborative learning with peer and peer tutoring, tends to the development of inclusive mathematics didactics competencies when the regular stream teacher has the virtual accompaniment of a teacher specializing in inclusive education (Bottge, Cohen & Choi, 2018). This strategy, together with the technological platform, enhances teacher training. There is agreement that the teacher who teaches the mathematics class must be competent in the observation of tasks, not only to evaluate them by skills but to develop their work properly: "the development of professional skills is activated to a great extent through the reflective learning, which allows understanding the complexity of educational processes" (Alsina, Planas & Calabuig, 2009, p. 256).

The structuring of virtual learning communities is also a resource that can be used in the improvement of methods. The development of creative projects, driven through electronic means and supported by accompaniment, are viable for the strengthening of inclusive mathematical didactics. This strategy provides for the creation of contextualized initiatives that appeal to the interest of teachers to be situations of their known environment (Dare, & Nowicki, 2019, Cranmer, 2020). Because they emanate from a diagnosis of needs, they facilitate the identification of strengths and areas of opportunity in the formation of the teacher and eventually of the children. Their training allows the exchange of ideas on the same subject, offers the opportunity to develop

technological competence and other related means and the availability of access to didactic materials related to inclusive mathematics.

The Universal Design of Learning is also another modality that, through the technological platform, offers the opportunity to prepare materials with emphasis on multisensory and visual stimuli. It may also include the development of auditory and kinesthetic material linked to the didactics of inclusive mathematics.

CONCLUSIONS

The foregoing statement leads us to the fact that for the authors of this research an Observatory with indicators of teacher performance is a need in Panama. This is also demonstrated by the fact that in Panama there is not much research conducted in depth on the needs of teachers, especially the development of their skills. The motivational theme is the starting point to improve the skills of math teachers - and all of them. This observatory should be at the University of Panama, in the Vice-rectory for Research, a place independent from the Ministry of Education of Panama (MEDUCA).

This present research convinced us that the professional career of a mathematics teacher can and should change throughout their professional career. If there is a strategy in the Ministry of Education and in the Teacher Training Centers, a change in the course of the teacher's career can be outlined, their continuous training and specifically in the improvement of their educational leadership skills and talents.

The MEDUCA Improvement Unities an added value of the Panamanian educational system by providing training activities to teachers in the active stage. Through the implementation of these activities, the need to fully develop this population through strategies, methodologies and innovation is recognized. Even with the fiscal and administrative effort that this entails and in the face of the adaptations that the COVID-19 pandemic has forced to make, itis necessary to establish technological tools that strengthen educational strategies and enhance the didactics, in this case, of inclusive mathematics. This measure results in equitable and quality education, as well as strengthening the participation and social integration of citizens with special needs to achieve quality at the initial level.

The strengthening of the current technological platform, with relevant inputs and findings and responsive to inclusive education, will make it possible to diagnose shortcomings and strengths and design innovative strategies for the integral development of preschool and primary school students. In the long term, it is envisaged that the provision of psychoeducational services in schools will be strengthened, and that cognitive, social and affective skills and abilities will be developed from a constructivist and socio-cultural dimension. It also provides to establish a

specific digital platform to deal with crisis situations, such as the one currently experienced at the national level, aimed at meeting the need in terms of mathematical suitability of students for inclusive education.

The establishment of virtual technology training in inclusive mathematics education allows to evaluate and offer follow-up to the participating teachers while providing strategies and accompaniment that help to maintain interest and motivation. This situation feeds national statistics and therefore provides an accurate data of the outcome of the educational intervention.

The global trend is to integrate STEM (Science, Technology, Enginering and Mathematics) into school education because the reciprocal relationship of all these areas of knowledge is recognized. An essential part of inserting oneself in this process is to develop abstract thinking skills and mathematical abilities. This approach requires the integration of preschool and elementary school teachers, including inclusive education students. This integration contributes to the personal and professional growth of these students as it contributes to social mobility and national development.

The adoption and adaptation of strategies that enhance inclusive mathematics education through technological means provide a permanent scenario of training, evaluation, and monitoring. In the same way, it provides a foundation for universities to reevaluate their bachelor's degree curriculum to temper current needs. Although university education provides an opportunity for internships and experiences in inclusive education, inclusive mathematical didactics remains lagging.

To ensure long-term support for teachers, it is necessary to go to the commitment of the educational system to advise and provide continuous professional learning, adequate and aligned to the real needs of content, methodology and inclusive mathematical didactics. It also warrants a collaborative and systematic effort between universities and the education system to ensure an articulated transition from the preparation of pre-school and primary school teachers to become a competent and trained inclusive teacher.

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