

International Journal of Human Sciences Research

FORMATIVE ASSESSMENT AND MEANINGFUL LEARNING: A LOOK AT MATHEMATICAL LITERACY

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Abstract: This work, developed in the subject Epistemology of the Assessment Process in Science Teaching, aims to discuss the relevance of formative assessment in the perspective of meaningful student learning from the perspective of mathematical literacy. The work also seeks to emphasize mathematical literacy as of great importance for the understanding and understanding of the student in his development and social insertion. It also seeks to verify how learning becomes meaningful in mathematics and how it contributes to the student's citizenship formation. The research is qualitative, with a bibliographical approach, and does not intend to exhaust the theme, but to contribute to the expansion and refinement of studies related to this area, seeking full school development.

Keywords: Formative Assessment; Meaningful Learning; Mathematical Literacy; Teaching

INTRODUCTION

The school has a great responsibility in the formation of the human being, whose process begins when it receives the children brought by their families to its dependencies, when they reach school age. According to article 205 of the Federal Constitution, "education is the right of all and the duty of the State and the family will be promoted and encouraged with the collaboration of society, aiming at the full development of the person [...]" (BRAZIL, 1988).

In this perspective, the school, together with the family, has a great challenge, which is to form the human being for his full development, taking into account that each person is unique in himself and needs to respect the individuality of each one and prepare the character of that be to participate and contribute to the social, cultural, political and intellectual aspects of a constantly changing society.

With the intention of forming students for life, the school, as an institution that offers a systematized education, needs to have this clear in its social function, since what is prescribed in its intentionality requires a critical and reflective mediation throughout its educational project. (SANTOS; GUTIERREZ, 2019). Focused on its organization and functioning, it is important to highlight that "the school curricula [...] will be mediators of the development process and the constitution of the student as a person and, consequently, as a citizen" (LUCKESI, 2011, p. 35). Research by Domingues (2005) suggests that assessment in general, but especially formative assessment, contributes significantly to improving learning processes, especially those with more difficulties. It is also reported that students who attend classes where formative assessment predominates obtain better results in external exams than those who attend classes where summative assessment predominates.

In this context, for teaching mathematics we rely on mathematical literacy as a bridge to the development of meaningful mathematics in the classroom (MOREIRA, 2012). Teaching based on literacy contributes to the student's development as an active citizen, which can happen when he understands the mathematical concepts learned at school and uses them in his life (D'AMBROSIO, 2012).

As part of the curricular pedagogical actions designed by the school to train the student, the assessment of learning in mathematics is a key element for quality teaching, as "there is no school guidance without assessment" (PERRENOUD, 1999, p. 51). This way, mathematical assessment must also be formative with the intention of assisting in the student's learning process, considering equity as a way of respecting differences and not leaving any student behind in their journey in search of knowledge (D'AMBROSIO, 2012;

AGUILAR JÚNIOR et al., 2022; MENDES et al., 2022). What is obtained with the evaluation “is necessary information for the teacher who is looking for strategies that can help students in the construction of knowledge, therefore, the evaluation must necessarily have a formative intention.” (SANTOS, 2010, p. 13).

In this direction, this work intends to reflect on the formative assessment and how it can contribute to the guarantee of the student’s learning rights, turning its gaze to mathematical literacy in the classroom. It is assumed that, in the educational process, assessment in mathematics must serve to guide pedagogical actions in the training environment and contribute to the full development of the student (FERNANDES, 2008; GOMES, 2020; ORTIGÃO; SANTOS, 2020).

METHODOLOGICAL PATH

The methodological proposal of this research is of an applied nature, regarding the objectives it is descriptive and regarding the procedures it is bibliographical (PRODANOV; FREITAS, 2013). To act on the established problem, we established a basis for discussion based on mathematical literacy, formative assessment and meaningful learning. To carry out this task, a literature review was prepared based on basic texts on these topics. Authors such as Luckesi (2011), Domingues (2005; 2008), D’Ambrosio (1986; 2012), Perrenoud (1999), Moreira and Masini (1982) and Moreira (1999; 2006) were consulted, in addition to seeking support in Brazil (2018) and in recent productions such as the books and journals with themes on assessment in mathematics teaching, including Aguilar Junior et al. (2022), Mendes et al. (2022), Ortigão and Santos (2020), Carvalho and Araújo (2022) and Arruda, Ferreira and Lacerda (2020). The analysis will occur reflecting on the problem considering the

works and publications consulted.

MEANINGFUL MATH LEARNING

School is the second social space where human beings spend more time, arriving when they are still children and leaving in adolescence. In this period that makes up the nine-year Elementary School, the school welcomes students who are “[...] children and adolescents who, throughout this period, undergo a series of changes related to physical, cognitive, affective, social, emotional, among others.” (BRAZIL, 2018, p. 57).

Schools, as educational institutions, actively participate in the formation of the student in all its aspects, it is important that their main objective is to offer a teaching that provides the student with a meaningful learning, welcoming their experiences, their experiences, that is, their life history that it was started long before entering school. For Moreira (1999, p. 153):

[...] Meaningful learning is a process through which new information is related to a specifically relevant aspect of the individual’s knowledge structure, that is, this process involves the interaction of new information with a specific knowledge structure, which Ausubel defines as subsuming concept, or simply subsuming, existing in the individual’s cognitive structure.

In order for teaching to be meaningful, it must start from the student’s prior knowledge, he needs to clearly see the practical reason for learning a certain content, since:

[...] meaningful learning is characterized by the interaction between prior knowledge and new knowledge, and that this interaction is non-literal and non-arbitrary. In this process, new knowledge acquires meaning for the subject and previous knowledge acquires new meanings or greater cognitive stability. (MOREIRA, 2011, p. 14)

Although D’Ambrosio (2012) does not establish the terminology “meaningful” in

the product “learning” through research from the perspective of Ethnomathematics, it is possible to make an approximation:

Access to a greater number of instruments and intellectual techniques gives, when properly contextualized, a much greater ability to face situations and solve new problems, to adequately model a real situation in order, with these instruments, to arrive at a possible solution or course of action. action (p.108).

What D’Ambrosio (2012) describes how learning can be equivalent to meaningful learning:

This is learning par excellence [referring to the product of research in the Ethnomathematics perspective], that is, the ability to explain, to apprehend and understand, to critically face new situations. Learning is not the mere mastery of techniques, skills, nor the memorizing of some explanations and theories. (D’AMBROSIO, 2012) p.109)

One possibility of working mathematics from the students’ prior knowledge would be through a diagnostic assessment to understand what they already know about a certain content, which becomes demanding since the mathematical contents are organized sequentially, being prerequisites for the next. For example, if students already know how to read, write, compare and order natural numbers of up to five orders, the next step could be to introduce them to new knowledge that would be the composition and decomposition of a natural number of up to five orders.

Or the teacher could also use prior knowledge about numbers from the students’ own experience, as a starting point, to introduce new knowledge, always taking care that the student is the center of the teaching and learning process.

It must also be considered that meaningful learning in mathematics cannot lose sight of the role of learning assessment in this process, as “it must be inserted in a context

of meaningful learning in which the social practice of students is a reference for the expansion of knowledge, because it has an investigative characteristic and mediator of new learning by students”. (CURRICULAR DOCUMENT OF THE MARANHENSE TERRITORY, 2019, p. 25). After all, if the student does not find meaning in what was set for him to study, he will not be motivated, and it can be understood as a waste of time and energy that, due to not being well directed, has lost its focus and its intentionality and the result can be grade repetition or school dropout.

This care with the teaching of mathematics is very important since it is a curricular component that still reflects today:

[...] what remained from Greco-Roman antiquity; the picker of the best minds. To the point of being Mathematics, as a school subject, the main responsible for school dropout, for innumerable frustrations and, ultimately, for the maintenance of an unacceptable, or at least unfair, social stratification. But those marginalized by the assessment processes are not, nevertheless, practitioners of mathematics in their day-to-day lives (D’AMBRÓSIO, 1986, p. 42).

When mathematics teaching is very focused on theories and symbologies, very far from the reality of students with no connection with their daily lives, many begin to believe in the myths and beliefs that have been developing around this component, justifying that their understanding is for few, that it is difficult, and that it has no use and therefore, this school mathematical knowledge is useless. As the student does not see its practicality, he loses interest in what is being taught, which can culminate in the disinterest of many, who end up dropping out of studies.

In order to propose a meaningful learning in mathematics, it is important that, in addition to knowing the mathematical contents, “there is a need for the teacher to know its history,

that is: The history of Mathematical Content” (BARONI; NOBRE, 1999, p. 130). When students know the history of mathematical contents, understand that they were built by men and women over the centuries and that it is a process under construction that continues until our days, this humanizes this component that often seems so cold and distant (D’AMBROSIO, 2012).

As provided in the specific competences of mathematics for elementary education, it is also important to consider that mathematics is a “human science, the result of the needs and concerns of different cultures, at different historical moments, and it is a living science that contributes to solving scientific problems and technology [...]”. (BRAZIL, 2018, p. 267).

In this sense, as a human construction, mathematics must have a significant character when applied by the student in different contexts to solve a variety of problem situations, where error, uncertainty, logic, estimation and chance cannot be disregarded.

Teaching as a basis for meaningful learning in mathematics happens when the student is able to think and act mathematically by critically analyzing the intent of a particular statistic in a newspaper article, when he understands the concept of interest when making a bank transaction, or even when you understand the influence of inflation on food prices and how it impacts your finances, just to name a few examples. In this perspective, mathematical literacy contributes to the formation of a student who, by himself, analyzes a situation from his scientifically supported point of view.

With an emphasis on student development and a curricular orientation that leads to a formative assessment with a view to the practicality of teaching mathematics, it is likely that these educational actions will reach their planned objectives, since teaching must contribute to quality education with a focus

on in meaningful learning, hence the need to reflect on how an assessment must be that can consider meaningful mathematical learning aimed at citizenship education.

FORMATIVE ASSESSMENT IN MATHEMATICS TEACHING

Evaluating is a natural human process, we evaluate and are evaluated all the time. According to Luckesi (2006, p. 3) “None of us seeks failure. We diagnose to identify impasses and find solutions, the best possible”, so the evaluation is part of the routine of any individual, and this concept is practiced as we seek to improve, improve our actions.

When we attribute value to something, for example, when we want to buy a certain object, we investigate to see if it is worth the price, when choosing a fruit in the market we check if it is good for consumption, when leaving home we check our appearance in the mirror to correct our mistakes. details, etc. In all these cases, this assessment gives us subsidies to intervene, make decisions and correct things.

For Hadji (2001, p. 9) “It is undeniable that, in the world of education and training, the concept of evaluation has been the object, in the last 30 years, of growing enthusiasm.” What establishes a culture of evaluation according to the author, implying in evaluation a powerful tool for success in educational objectives, especially learning and teaching itself “[...] more precisely, the notion of formative evaluation was proposed by Scriven, in 1967, in relation to curricula, before being extended to students by Bloom in 1971”. Thus, Hadji (2001, p. 10) points out that, since then, the aim is for the teaching activity to be an action in the sense of regulating learning, so that it can “[...] guide the student so that he himself can situate his difficulties, analyze them and discover, or at least operationalize the procedures that allow you to progress”. Not

understanding the meaning and objectives of the assessment impacts on the results with teaching and learning. Commonly, even among active teachers, assessment is confused with tests, exams or similar. For Luckesi (2011, p. 197) “assessment differs from exams because it is diagnostic, moving away from the idea of classifying, ranking, and from that enacting approval or failure. It is only interesting to verify the quality of the situation to, if necessary, proceed with an intervention”, and in this sense, evaluation is established as an important process for both teaching and learning.

Taking it to the school context, evaluation plays a fundamental role in pedagogical actions, as long as its objective is to correct and contribute to the process of meaningful learning. Despite much research and even the LDB (1996) highlighting in its text the importance of learning assessment, a school assessment with a lot of emphasis on the classification and selection of the best student indexes is still very constant, such that:

In our schools, public and private, as well as in our different levels of education, we practice much more school exams than learning assessment. [...] We need to “learn to evaluate”, since we are still more examining than evaluating. Our common sense, in school life, is that of examiners and not evaluators (LUCKESI, 2013, p. 25).

Since learning is a continuous process, assessment as an important part of pedagogical practice must aim to contribute to meaningful learning in mathematics, to assess to improve student performance, to guide pedagogical work and, most importantly, to train with equity and do not wait until the end of the year to deal with student difficulties. The evaluation must serve to indicate an intervention as soon as they appear. From this perspective, it is interesting to consider that:

[...] the human being is a being in the process of formation, in movement, always with the

possibility of achieving a more satisfactory result in the path of life. This means that if he learns, he consequently develops; if he hasn't learned yet, he can learn, if there is investment for him to learn (LUCKESI, 2011, p. 61).

In this training process that occurs with every human being, we become unique people with different particularities, so pedagogical actions must be planned with this focus, taking into account that learning happens in a different process for each student, so one must think in various assessment instruments in mathematics classes and it is up to the teacher to observe how each student learns, after all, the assessment:

[...] it must be a guideline for teachers in conducting their teaching practice and never an instrument to fail or retain students in the construction of their theoretical and practical knowledge schemes. Selecting, classifying, filtering, disapproving and approving individuals for this or that is not an educator's mission. Other sectors of society must take care of this (D'AMBRÓSIO, 2005, p.78).

Since the role of the school must not be to fail, nor to select or classify, but to form the citizen, and considering that students are beings in formation, something that must not be disregarded is the error, which is something natural in the learning process. In mathematics classes they must be “objects of study, as they reveal the nature of the representations or strategies developed by the student” (JORBA; SANMARTÍ, 1993, p. 30).

So that the teacher can know to what extent his student has learned, it is relevant to analyze their mistakes, and this must serve as a starting point for planning pedagogical intervention actions. Unfortunately, students are often punished for making mistakes instead of being helped to proceed from them.

D'Ambrósio (2012, p. 72) naturally relates to his Ethnomathematics, a proposal for

evaluating teaching and learning activities based on instruments and procedures that favor improvements in teaching and learning practice, so that “[. ..] assessment must be a guideline for teachers in conducting their teaching practice and never an instrument to fail or retain students in the construction of their theoretical and practical knowledge schemes.”, which constitutes, according to the author, the mission of the educator or the educator.

When considering the error as an important part of the learning process in formative assessment, it is essential to give less emphasis to the product and more importance to the process, since the error is “an excellent work material for the teacher, which is not simply saying right or wrong., but trying to follow and understand what the student understood that made him reach that result [...]” (VASCONCELLOS, 2003, p. 60). This way, the student becomes the starting and ending point in the teaching and learning process.

We believe that assessment must be an essential part of student training, because “any assessment that helps the student to learn and develop is formative, or rather, that participates in the regulation of learning and development in the sense of an educational project.” (PERRENOUD, 1999, p. 102). Based on this understanding of evaluation, it is up to the teacher who teaches mathematics to think of evaluation instruments that are best suited to their class and in a more particular way to each of their students so that no one is left behind in this process towards meaningful learning in mathematics. then:

when thinking about formative assessment, one must break with this egalitarian scheme. There is no reason to give the same “dose” of formative assessment. Differentiation begins with an investment in the observation and interpretation of processes and knowledge proportionate to the needs of each student.

[...] Like medical diagnosis, formative assessment requires different investments (PERRENOUD, 1999, p. 123).

Let us not be naive in thinking that a differentiated assessment, based on the observation and interpretation of the development process of each student individually, is an easy task, given the reality of the public school education system in the country, with overcrowded classes and exhausted teachers, but seeing no alternative other than “intervening in reality in order to transform. If there is no refocusing of the very intentionality of the evaluation, it will be of little use” (VASCONCELLOS, 2003, p. 44). For Hadji (2001, p. 9) the assessment needs to be formative with a view to “action”, in a constructionist perspective, “to assess [...] is to understand in order to act”, in fact, it is action.

In fact, to change reality and invest in meaningful learning in Mathematics, it is important that assessment be “considered a process that meets the teaching methods used and the proposed curriculum aimed at overcoming the concept of exclusionary, selectivist and punitive assessment for an assessment that favors meaningful student learning” (MARANHÃO, 2019, p. 316).

We agree with Zabala when he considers that formative assessment has different phases. Like this:

[..] you have to observe the different phases of an intervention that must be strategic. That is to say, that allows one to know what the starting situation is, in terms of certain well-defined general objectives (initial assessment); grounded and, at the same time, flexible intervention planning, understood as an intervention hypothesis; a performance in the classroom, in which the activities and tasks and the work contents themselves will constantly adapt (regulatory evaluation) to those that are presented to reach certain results (final evaluation) and an understanding and valuation of the process followed, which allows establishing

new intervention proposals (integrative evaluation) (ZABALA, 1998, p. 201).

In order not to lose sight of the school's role, it must be considered that "formative assessment pursues the following objectives: pedagogical regulation, management of errors and consolidation of successes" (JORBA; SANMARTI, 1993, p. 30). By considering these particularities within the teaching process, it is possible to train people to be autonomous and know how to make decisions that contribute to a better world, equality and justice.

MATHEMATICAL LITERACY AND ASSESSMENT IN MATHEMATICS TEACHING

Human beings, unlike other beings, needed to develop mechanisms to communicate with their peers and also to interact with the environment to which they belong. In this construction process to become a social being, he developed codes (signs) that allowed language and writing, whose processes provided a great advance and contributed to the autonomy of any civilization. The school had the great responsibility, through systematized teaching based on literacy and literacy, to contribute to the student developing the mastery of reading and writing, becoming literate and literate (D'AMBROSIO, 2012).

In this process towards meaningful learning in mathematics, we need to consider that mathematical literacy is also necessary as it contributes to the process of mathematical literacy, and agree with Danyluk, (1998, p. 20), when he states that:

To be literate in mathematics, then, is to understand what you read and write what you understand about the first notions of logic, arithmetic and geometry. Thus, writing and reading the first mathematical ideas can be part of the literacy context.

Thus, considering that mathematical

literacy refers to the actions of learning to read and write mathematical language, it must also be considered that mathematical literacy involves processes of problem solving, investigation, project development and modeling, which are directly involved in strengthening fundamental skills for student learning.

Discussions about mathematical literacy arise from the perspective of writing and its meanings in the learning process, as Machado (2003) points out. Considering what Danyluk, (1998) says about mathematical literacy, it is possible to understand by Machado (2003) that mathematical literacy occurs in terms of mathematical literacy:

[Mathematical literacy is] a process of the subject who arrives at the study of Mathematics, aiming at knowledge and skills about the notational systems of their natural language and Mathematics, conceptual knowledge and operations, adapting to logical-abstractive and deductive reasoning, with the help and through notational practices, how to perceive Mathematics in writing agreed with notability to be studied, understood and built with the aptitude developed for its reading and writing. (MACHADO, 2003, p. 134).

Notably, this concept is linked to the subject as a learning process linked to the ability to communicate, think and relate to mathematics itself, an ability to organize mathematical knowledge to connect thought and mother (natural) language to thought and mathematics. with its ability to represent reality.

Soares (2009, p. 40) understands that:

[...]a literate individual is not necessarily a literate individual; literate is that individual who can read and write; the literate individual, the individual who lives in a state of literacy, is not only the one who knows how to read and write, but the one who uses reading and writing socially, practices reading and writing, responds adequately to

the social demands of reading and writing. of writing (SOARES, 2009, p. 40).

Thus, literacy is directly related to the student's life in its most varied contexts, we can understand from this that mathematical literacy is present in this social context in which the student is inserted.

To understand the concept of mathematical literacy, Carvalho and Araújo (2022) carried out an analysis of this term considering its origin and its insertion in the BNCC elaboration process. They found that in the text of the BNCC, the concept of mathematical literacy is confused as a synonym for skills and abilities.

Under this configuration, the term mathematical literacy becomes frequent in discussions and research on mathematics education from the insertion of the term literacy in the first presentation versions of the BNCC, consolidating mathematical literacy as a fundamental concept for teaching mathematics in basic education in the version end of Brazil (2018).

In this sense, it is important to define what mathematical literacy is in the context of the BNCC, which, to present it, used the definition given by the Pisa Matrix (Programme for International Student Assessment) of 2012. According to Brazil (2018, p. 266; emphasis added):

Elementary Education must be committed to the development of mathematical literacy [Footer - Pisa Matrix], defined as the skills and abilities to reason, represent, communicate and argue mathematically, in order to favor the establishment of conjectures, the formulation and resolution of problems in a variety of contexts, using concepts, procedures, facts and mathematical tools.

According to the presentation, in the Elementary School stage, the teaching of mathematics must prioritize learning with a focus on the development of mathematical literacy as a goal:

It is also mathematical literacy that ensures students recognize that mathematical knowledge is fundamental for understanding and acting in the world and perceive the intellectual game character of mathematics, as an aspect that favors the development of logical and critical reasoning, stimulates investigation and it can be pleasurable (fruition).

The development of these skills is intrinsically related to some forms of organization of mathematical learning, based on the analysis of everyday life situations, other areas of knowledge and Mathematics itself (BRAZIL, 2018, p. 266).

In this sense, mathematical literacy, presented by the BNCC, has an important function in the development of mathematical knowledge and, at the same time, in making it meaningful, as it is applied by students in the labor market, in everyday situations, making it a problem solver subject. problems, problems of their daily lives and the labor market. Considering formative assessment and significant learning for mathematical literacy, it is noted that Hadji's proposal (2001, p.9) contributes to this understanding, namely, it proposes: "1) to trigger behaviors to be observed; 2) interpret the observed behaviors; 3) communicate the results of the analysis; 4) remedy the errors and difficulties analyzed", which demonstrates the weight of the teaching action in student learning.

Based on the assumption that mathematics teaching must be based on literacy and mathematical literacy, it is understood that assessment must also be designed to contribute to this process, in order to become formative. It must be developed in a perspective in which the student has mastery of the mathematical language through reading and writing, and by appropriating the concepts learned, he becomes literate, and thus be able to use these processes to solve his problems and understand the world in which it is inserted. Notably, in

order to evaluate students in mathematics, it is necessary to consider the concept and process of mathematical literacy, a normative concept developed within the scope of schooling, so that one can understand the relationship of these students with the curricular component itself and how it contributes to their development and insertion in their social life (ARRUDA; FERREIRA; LACERDA, 2020).

FINAL CONSIDERATIONS

When analyzing the evaluation system, whether of a network or a school, it is possible to see how it guides the evaluation process and what objective it wants to achieve with this orientation. When the evaluation has a formative character, the student is the center of the teaching and learning process, and must have in its mission the clarity that the objective of the teaching offered by the school must be the integral development of the student, directed to the social aspects, cognitive and affective aspects of the school community.

Formative assessment is clearly intended to sustain and improve performance in teaching and learning processes. This type of evaluation emerges as a process, a conduct, a practice carried out from a pedagogy with attention to the processes of change, attention to the transformations manifested by the learner himself and transformations identified by techniques exercised in teaching. The formative assessment process suggests a distancing from authoritarian, classificatory, standardized and bureaucratic practice. This distance favors teaching actions based on the concept that aim at meaningful learning, oriented towards the integral formation of the student, as described by the BNCC. Mathematical literacy, as a construct of this process, tends to be as faithful as possible to what is established in the document itself.

It is important to consider that in this process of forming the student, as a task

shared by the school, meaningful learning in mathematics plays an important role, since its knowledge can be used to solve problems in the student's social context.

In this process of appropriation of mathematical concepts and to understand the world in which they live, literacy and mathematical literacy are essential for students to understand, interact and transform the social environment in which they live for the better, considering that literacy is related to set of cultural practices, in the written and verbal form of a society.

In order for the assessment to be formative, it is important that all those involved in the teaching and learning process of an education system or even a school, consider that education has as the main objective, to train the student for life beyond the walls school, and be able to take his place in society as a participative and transforming citizen.

REFERENCES

AGUILAR JÚNIOR, C. A.; SILVA, F. O.; MOURAD, A. A. A.; MOTTA, R. G. DE A. Avaliação das aprendizagens e Feedback: uma experiência investigativa em sala de aula remota. *Revista de Educação Matemática*, v. 19, p. e022037, 10 jun. 2022. Disponível em: <https://www.revistasbemsp.com.br/index.php/REMat-SP/article/view/667>. Acesso em 01 jul. 2022.

ARRUDA, F. S. de; FERREIRA, R. dos S.; LACERDA, A. G. LETRAMENTO MATEMÁTICO: Um olhar a partir das competências Matemáticas propostas na Base Nacional Comum Curricular do Ensino Fundamental. *Ensino da Matemática em Debate*, [S. l.], v. 7, n. 2, p. 181–207, 2020. DOI: 10.23925/2358-4122.2020v7i2p156-179. Disponível em: <https://revistas.pucsp.br/index.php/emd/article/view/48745>. Acesso em: 20 jul. 2022.

BARONI, Rosa; NOBRE, Sergio. **A pesquisa em história da matemática** e suas relações com a educação matemática. In: BICUDO, Maria. Aparecida. Viggiani. (Orgs.). *Pesquisa em educação matemática: concepções e perspectivas*. São Paulo: UNESP, 1999.

BORBA, J.; SANMARTÍ, N. A função pedagógica da avaliação. In: BALLESTER, M. et al. *Avaliação como apoio à aprendizagem*. Porto Alegre: Artmed, 2003.

BRAZIL. **Base Nacional Comum Curricular**. Ministério da Educação, Brasília DF: MEC, 2017.

BRAZIL. Constituição da República Federativa do Brasil. Brasília, DF: Centro Gráfico, 1988

BRAZIL. Lei de Diretrizes e Bases da Educação Nacional, **LDB**. 9394/1996. BRAZIL.

BRAZIL. MNISTÉRIO DA EDUCAÇÃO. **Base Nacional Comum Curricular**: Ensino Médio. Brasília: Mec, 2018. 600 p. Disponível em: http://basenacionalcomum.mec.gov.br/wp-content/uploads/2018/12/BNCC_19dez2018_site.pdf. Acesso em: 6 abr. 2019.

CARVALHO, Larissa Ribeiro Viana de; ARAUJO, Elaine Sampaio. Letramento Matemático, um olhar a partir da BNCC. *Revista Cocar*, Belém, v. 16, n. 34, p. 1-19, 29 abr. 2022. Fluxo Contínuo. Disponível em: <https://periodicos.uepa.br/index.php/cocar/article/view/4852>. Acesso em: 06 jul. 2022.

CARVALHO, Larissa Ribeiro Viana de; ARAÚJO, Elaine Sampaio. Letramento Matemático, um olhar a partir da BNCC. *Revista Cocar*, Belém, v. 16, n. 34, p. 1-19, 29 abr. 2022. Disponível em: <https://periodicos.uepa.br/index.php/cocar/article/view/4852>. Acesso em: 29 jun. 2022.

D'AMBROSIO, U. **Educação Matemática**: da teoria à prática. 23.ed. Campinas, SP: Papirus, 2012. 110p.

D'AMBRÓSIO, Ubiratan. **Da realidade à ação**: reflexões sobre educação e matemática. São Paulo: Summus; Campinas: Ed. da Universidade Estadual de Campinas, 1986.

D'AMBRÓSIO, Ubiratan. **Etnomatemática**: elo entre as tradições e a modernidade. 2. ed. Belo Horizonte: Autêntica, 2005.

DANYLUK, Ocsana. **Alfabetização matemática**: as primeiras manifestações de escrita infantil. Sulina, Passo Fundo: Ediupf, 1998.

FERNANDES, D. Para uma teoria da avaliação no domínio das aprendizagens. *Estudos em Avaliação Educacional*, São Paulo, v. 19, n. 41, p. 347–372, 2008. DOI: 10.18222/eae194120082065. Disponível em: <https://publicacoes.fcc.org.br/eae/article/view/2065>. Acesso em: 20 jul. 2022.

GOMES, Amaral Rodrigues. O feedback na avaliação formativa de alunos da educação básica: uma percepção de professores. In: GONTIJO, Cleyton Hércules *et al* (org.). **Avaliação em matemática**: contribuições do feedback para as aprendizagens. Brasília: Editora Universidade de Brasília, 2020. Cap. 8. p. 159-177. Disponível em: <https://livros.unb.br/index.php/portal/catalog/view/61/240/1631>. Acesso em: 02 jul. 2022.

GOULART, C. Letramento e polifonia: um estudo de aspectos discursivos do processo de alfabetização. **Revista Brasileira de Educação**. Rio de Janeiro, nº 18, set-dez 2001.

HADJI, Charles. Avaliação desmistificada. Porto Alegre: ARTMED Editora, 2001. Tradução: Patrícia C. Ramos

JORBA, Jaume; SANMARTI, Neus. A Função pedagógica da avaliação. **Aula de Inovação Educativa**, n. 20, p. 20-30, nov. 1993.

LUCKESI, C. C. Entrevista. Folha Dirigida, edição 1069. Rio de Janeiro, 6 out. 2006. Caderno Aprender. Disponível em: <https://silo.tips/download/entrevista-publicada-na-folha-dirigida-rio-de-janeiro-edicao-n-1069-de-06-10-2006>. Acesso em: 02 jul. 2022.

LUCKESI, Cipriano Carlos. **Avaliação da aprendizagem componente do ato pedagógico**. 1. ed. São Paulo: Cortez, 2011.

LUCKESI, Cipriano Carlos. Avaliação da aprendizagem componente do ato pedagógico. São Paulo: Cortez, 2011

LUCKESI, Cipriano Carlos. **Avaliação da aprendizagem escolar [livro eletrônico]: estudo e proposições**. 1. ed. São Paulo: Cortez, 2013.

MACHADO, Antônio Pádua. **Do Significado da Escrita da Matemática na Prática de Ensinar e no Processo de Aprendizagem a Partir do Discurso de Professores**. 2003. 290 f. Tese (Doutorado) - Curso de Programa de Pós-Graduação em Educação Matemática, Departamento de Matemática, Universidade Estadual Paulista, Rio Claro, 2003. Disponível em: <https://repositorio.unesp.br/handle/11449/102169>. Acesso em: 12 jul. 2022.

MARANHÃO. Documento Curricular do Território Maranhense para a Educação Infantil e o Ensino Fundamental. 1. ed. Rio de Janeiro: FGV Editora, 2019.

MENDES, M. T.; TREVISAN, A. L.; RODRIGUES, R. G. B. R.; WEBER, T. C. Prova em dupla e com consulta em aulas de Cálculo? Agora ficou fácil tirar 10!. *Revista de Educação Matemática*, v. 19, p. e022039, 10 jun. 2022. Disponível em: <https://www.revistasbemsp.com.br/index.php/REMat-SP/article/view/663>. Acesso em: 2 jul. 2022.

MOREIRA, Marco Antônio. *A Teoria da Aprendizagem Significativa e sua implementação em sala de aula: a teoria e textos complementares*. Brasília: Editora da Universidade de Brasília, 2006

MOREIRA, Marco Antônio. *Aprendizagem Significativa: a teoria e textos complementares*. São Paulo: Livraria da Física, 2011

MOREIRA, Marco Antônio. MASINI, Elcie F. Salzano. *Aprendizagem Significativa: a teoria de David Ausubel*. São Paulo: Moraes, 1982

MOREIRA, Marco Antônio. O que é afinal aprendizagem significativa? 2010. **Instituto de Física-UFRGS**. Disponível em: <http://moreira.if.ufrgs.br/oqueefinal.pdf>. Acesso em: 2 jul. 2022.

MOREIRA, Marco Antônio. *Teorias da Aprendizagem*. São Paulo: EPU, 1999

ORTIGÃO, Maria Isabel Ramalho; SANTOS, João Ricardo Viola dos (org.). **AVALIAÇÃO E EDUCAÇÃO MATEMÁTICA: pesquisas e delineamentos**. Brasília: Sbem, 2020. Disponível em: <http://www.sbemBrazil.org.br/sbemBrazil/index.php/publicacoes/colecao-sbem>. Acesso em: 2 jul. 2022.

PRODANOV, C. C.; FREITAS, E. C. DE. **Metodologia do trabalho científico: métodos e técnicas da pesquisa e do trabalho acadêmico**. Novo Hamburgo: Feevale, 2013. Disponível em: <http://www.feevale.br/Comum/midias/8807f05a-14d0-4d5b-b1ad-1538f3aef538/E-book Metodologia do Trabalho Cientifico.pdf>. Acesso em 06 de mar de 2017.

SANTOS, Elisângela Mendes dos; GUTIERREZ, Marcela. Avaliação Formativa: instrumento para aprendizagem significativa na série do 9º ano do ensino fundamental da escola salesiana da colônia - pe / formative assessment. **Id On Line Revista de Psicologia**, [S.L.], v. 13, n. 46, p. 971-991, 29 jul. 2019. *Lepidus Tecnologia*. <http://dx.doi.org/10.14295/idonline.v13i46.1944>. Disponível em: <https://idonline.emnuvens.com.br/id/article/download/1944/2888>. Acesso em: 20 jun. 2022.

SANTOS, Josiane Gonçalves. *Avaliação do Desenvolvimento e da Aprendizagem*. Curitiba: Editora Fael, 2010.

SOARES, Magda. **Letramento**: um tema em três gêneros. 3. ed. Belo Horizonte: Autêntica, 2009.

VASCONCELLOS, Celso dos Santos. **Avaliação da aprendizagem**: Práticas de mudança – por uma práxis transformadora. 5. ed. São Paulo: Libertad, 2003. (Coleção Cadernos Pedagógicos do Libertad; v. 6).

ZABALA, Antoni. **A prática educativa**: como ensinar. Tradução: Ernani F. da F. Rosa. Porto Alegre: Artmed, 1998.