v. 2, n. 21, 2022

International Journal of Human Sciences Research

REFLECTIONS ON THE USE OF SOFTWARE FOR THE TEACHING OF MATHEMATICS IN BASIC EDUCATION BASED ON THE SCIELO DATABASE

Jacks Richard de Paulo
Prof/PPGE/ICHS/UFOP
http://lattes.cnpq.br/6910995649425560

Rômulo Batista da Silva
Doctorate in Education:PPGE/ICHS/UFOP
http://lattes.cnpq.br/3964632014562948

Maria Valdinéia Gonçalves Luiz Dias
Master's in Education:PPGE/ICHS/UFOP
http://lattes.cnpq.br/0968845231156080

Cláudia Geralda de Souza Maia Alves
Research Group Member:
TECNOGEO/ICHS/UFOP
http://lattes.cnpq.br/7982600341843102

Abstract: Recently, numerous researchers have been intensifying their research related to the use of software aimed at the teaching and learning process in different areas of knowledge. In this sense, the aim of this investigation was to promote reflections on the work resulting from research related to the use of educational software for the teaching of Mathematics in High School, published from 2014 to 2020, together with the Scielo database. For the selection of articles, the following descriptors were sought: "Educational Software and Mathematics Teaching" and "High School". It was evidenced through the research analyzed here that the use of educational software can contribute both to the teaching and learning process of Mathematics, mainly, contributing to motivate students and to approach the reality of students by promoting mediation by through technologies in this area of knowledge.
Keywords: Mediation by Technologies; Educational Software; Mathematics Teaching and Learning Process.

INTRODUCTION

Currently, society has been witnessing the expansion of the use of technologies in different sectors. Such expansion has promoted countless transformations and changes, mainly in relation to the ways of communicating, in work and personal relationships, among many other aspects.

In the face of this new context of transformations and changes, in which technologies are increasingly present in our daily relationship, educational institutions both encourage and require that the pedagogical work of teachers begins to contemplate the new demands that emerge from society. contemporary and are related to the multiple ways of using technologies.

In view of the above, several researchers have directed their research on the use of software aimed at the teaching and learning process at different levels and teaching modalities, especially in relation to the teaching of Mathematics in High School (CAZARES, 2014 and SILVA & COSTA, 2019). Therefore, it becomes evident the need to deepen research in order to better understand both the potential and the challenges of educators to promote their pedagogical practices in the face of this new demand that permeates contemporary reality.

According to Fiorentini and Lorenzato (2007), the teaching of Mathematics lasted for a long time from a traditional perspective, that is, discouraging students from this science, mainly because the contents are approached without any relation or meaning to life. of the students. For Azevedo and Maltempi (2020), recently, Mathematics teachers have been experiencing new ways or possibilities in order to expand the possibilities of learning the contents that are being worked through games, games, mainly, through the use of educational software to implement their pedagogical practices.

According to Prieto, Castillo and Márquez (2020), in the current context of the history of human evolution, there is a need to broaden the discussions and debate around successful experiences with the use of software to promote the teaching of Mathematics, mainly, to unveil the new paths or possibilities that are trodden by teachers to promote the process of pedagogical mediation. In addition, to highlight both its potential and its challenges to overcome so that in fact it is possible to better substantiate the teaching pedagogical know-how in favor of student learning.

In view of the above, the main objective of this investigation was to promote reflections on the work resulting from research in relation to the use of educational software for the teaching of Mathematics in High School, published from 2014 to 2020, together with

the Scielo database.

THEORETICAL REFERENCE

From a purely mechanical perspective, one can compare the teachings of Mathematics that lasted for several decades and that are still quite crystallized and rooted in many classrooms across the country (MARTINS, 2012). In this same line of reasoning, Oliveira (2019, p. 80) highlights that "traditional mathematics education can be described as the practice in which the teacher presents some ideas and mathematical techniques and then the students work on solving exercises". Therefore, it can be inferred that, for a long time, the precepts of traditional teaching have permeated the pedagogical work of teachers, mainly on the basis that the learning of contents is necessarily measured by the amount of information that the student can retain in regarding the contents that were being addressed is still a current practice in many classrooms.

According to Souza and Teixeira (2021), Mathematics, like other areas of knowledge, is of fundamental importance for the integral development of students. In this sense, it can be highlighted that there is a need to (re)think the teaching of Mathematics, with a view to expanding the forms or possibilities for the teacher to innovate their practices, because:

> Mathematics has been present in our lives since our birth. Almost everything in our daily lives revolves around numbers, measures, geometric figures and other concepts inherent to this discipline. Even before starting the school period, children already have contact with mathematical notions in their daily lives, learning without even realizing it (...) When the child arrives at school, their development must be respected, providing conditions for interaction between common sense and scientific knowledge in the interrelationship between the experience of home and school (SOUZA and TEIXEIRA, 2021, p. 817).

Recently, new possibilities to promote the teaching of Mathematics have been the subject of research, mainly in relation to the use and contributions of educational software in the pedagogical mediation process to address the concepts (ALMEIDA and ALMEIDA, 2015, BARROS and PACHECO, 2013). For Silva, Ribeiro and Araújo (2018), it is necessary to go beyond the dimension of just thinking about the insertion of software as modern tools within the classroom, but rather, instruments as instruments that are capable of both stimulating and expanding the possibilities for construction of knowledge by students, mainly considering that:

> (...)The computer has become a great ally for the teacher as it offers countless possibilities for approaching content in the classroom, significantly increasing the ability to interpret results through simulations and other resources. On the other hand, the use of computers in the classroom requires good planning in order to favor the construction of knowledge by the student and for the computer to be used as an innovative tool and not as a device that aims to modernize traditional methods. (...) Nowadays, the use of some software must be analyzed and studied, its use must be educational in order to intelligently explore all the resources that the software offers in teaching and learning, and not use it mechanically. and this leads us to the fad, using it because everyone uses it, without any concern as to the result in learning (SILVA, RIBEIRO and ARAÚJO, 2018, p. 2).

From the foregoing considerations, it can be noted that the teacher needs to realize both the need to have a solid domain in relation to the content being addressed and the need for the importance of inserting new methodological possibilities that can better meet significantly the new demands that involve contemporary society. In this sense, it is of paramount importance to highlight below some successful experiences of some research

related to the use of software in mathematics education.

In the work developed by Souza and Passos (2015), the authors studied an online extension course in which the articulation between technology and the teaching of Mathematics was carried out, seeking to identify the receptivity of the course participants to the SuperLogo software and to analyze the way in which they proposed the use of the technological resource. In addition, they argue that they used "the idea of receptivity not in the sense of motivation, but in the sense of the subject who puts himself in motion" (SOUZA and PASSOS, 2015, p. 1029), that is, putting himself in activity to integrate digital technology into teaching.

For the research of the authors in question, the following instruments were used: forum for exploration and clarification of doubts about SuperLogo; forums for planning the sequence of activities; lesson plans and a forum for socializing lesson plans; and a narrative elaborated on the plan in which there was a justification for choosing the objectives of the classes, the learning and the difficulties faced.

Also, according to the aforementioned authors, the proposed activities were: knowing how to identify and describe a location; the exploration of spatial location; and the movement of people and/or objects in space. In addition, observation, comparison and manipulation were present in all proposals.

Souza and Passos (2015) argue that based on the need to design classes using SuperLogo as a didactic resource, it was possible to identify the formulation of strategies and the construction of concepts and ideas about Mathematics and its teaching. It is analyzed that integrating a software to teaching through the verification of its pedagogical functions becomes relevant in Mathematics Education.

The research carried out by Galvão, Souza and Miashiro (2016) aimed to investigate how teaching based on dynamic geometry and concrete materials contributes to the study of trigonometric functions. Thus, they carried out work related to the definition of the Sine function using the software Cabri-Géomètre II.

Four interventions were made in eight meetings with nine students from a Mathematics Degree class. In each intervention, one or two evaluation questions of the knowledge under study concluded the activities, in the last intervention a final test was applied.

According to Galvão, Souza and Miashiro (2016), the interventions made significant contributions to learning possible and suggest that both in teaching and learning Trigonometry, material and computational contexts are combined.

Cazares (2014) developed a research on the statistical reasoning that students develop when analyzing data. Thirty-four students aged between 18 and 19 years old from the Probability and Statistics discipline of the Computer Science course participated in the study.

The research was developed approaching the topics of data analysis covered in the study program (data collection, data representations, central tendency, variability and correlation) through an exploratory approach in a computational environment using the Fathom software. The data files included qualitative variables and quantitative variables.

According to the author above, three activities were developed, in each one a data file with several variables was provided. In the first activity, students were invited to prepare questions and proceed with the respective analysis to answer them. In the following two activities, the questions were provided, since the students had difficulties in elaborating questions.

According to the author in question,

the computational environment in which the students performed the data analysis facilitated the use of various representations, their transformations and the calculation of descriptive measures. However, it indicates that it was perceived that the adequate analysis of a data set in which one can understand its behavior and extract all the statistical information, contrary to what many teachers think, is a complex task that requires a deeper knowledge of statistical concepts. Thus, technology plays an important role in allowing the student to explore variables in a flexible way.

In the work developed by Pantoja Rangel and Ortega Arcega (2016), the authors developed a project for the application of a didactic proposal using the WinPlot software, in which activities were developed in the classroom and outside it, seeking to learn the concepts of limits and continuity with undergraduate students in Mathematics.

According to Pantoja Rangel and Ortega Arcega (2016), the didactic proposal was supported by the following means and materials:

- Exercise book composed of eight learning activities, eight problems and six questionnaires;
- Two DVDs containing 28 digital videos explaining the concept of limits and continuity for students to consult before class to strengthen prior knowledge and enable a richer discussion on the topic in the classroom;
- Activities developed with WinPlot software to stimulate visualization and numerical calculation.

Fourteen students participated in this stage of the study. Then, interviews were carried out with four students so that they could verbally describe the mathematical concepts dealt with in the study in order to explore the cognitive process that each student followed to solve the activities of the first stage, that is, their learning.

Besides, according to the authors highlighted above, the results indicate that including math learning activities with specialized software in the didactic proposal was a wise decision, since WinPlot helped students to visualize the concept of limit and continuity with the graphic and numeric. Regarding the videos, the students liked and felt motivated, but they argued that they did not fully understand them, so they suggested that the teacher check the points of doubts and solve them. Furthermore, in collaborative group work, the socialization of knowledge is promoted.

Silva and Da Costa (2019) carried out a work aimed at providing undergraduate students of a Mathematics Degree course with resources to develop activities using educational software in the teaching of mathematics. Workshops were held using Geogebra, Winplot and Graphmatica software, 17 students participated in the study.

According to the authors, the methodology used was qualitative exploratory research through a Case Study. During the workshops, questionnaires were applied in order to gather opinions about the work carried out, in addition, the researchers resorted to observation to analyze the attitude of the participants in relation to the software used.

According to Silva and Da Costa (2019), the results made it possible to perceive that the participants, undergraduates in Mathematics, understood the mathematical and technological skills presented; that the resources present in the programs allowed exploring graphic and algebraic aspects in the study of exponential, logarithmic and quadratic functions; and that it was possible to promote a learning environment with means of abstracting, creating, questioning and understanding the mathematical knowledge

that the participants had, expanding the ways of teaching.

METHODOLOGY

According to Creswell (2007, p. 23), methodology is the "strategy or action plan that associates methods and results - governs our choice and our use of methods." In this sense, this research was developed under an eminently qualitative and bibliographic.

In order to achieve the proposed objectives, an exploratory research was carried out (GERHARDT and SILVEIRA, 2009). The procedure used was bibliographic research, in which "theoretical references published with the objective of collecting information or prior knowledge" (FONSECA, 2002 apud GERHARDT and SILVEIRA, 2009, p. 37) were sought.

Initially, the research theme was defined: the use of software aimed at Mathematics Education in High School. Then, the data source to be searched (Scielo database) and the search period (2014 to 2020) were determined.

Searches were carried out for articles that dealt with the subject in question, at this stage, the titles and abstracts of the articles were read.

This way, 16 works were selected.

In the second stage, these articles were read diagonally, focusing on the target audience, the software used and the results obtained. 5 works were selected.

In the third stage, these articles were subjected to a more detailed study.

Finally, the results obtained are presented in the next section.

THINKING ABOUT SOME REFLECTIONS

Initially, it can be seen through the research analyzed here that the teaching of Mathematics is changing, mainly in relation to the fact that educational software becomes part of the teaching and learning process of students. In addition, bringing other possibilities to implement the pedagogical practices of teachers, a fact that has aroused more interest in this science in a more recent period.

From the research, it can be seen that three publications were national and two were international (one Venezuelan and one Peruvian). It can also be observed that the use, mainly, of the Modellus, Geogebra, Dynamic Geometry, Scratch and BBC micro:bit boards was highlighted.

In the research carried out by Pastana and Neide (2018), the Modellus software was used, a free computer program, with the purpose of analyzing the integration of Teaching Trigonometric Functions and Simple Harmonic Motion. It can be seen that this program stood out both for allowing students and teachers to carry out conceptual experiments using mathematical models. Still, the authors mention that, through the statements of the students, Mathematics became easier and that they began to better understand the content of both Mathematics and Physics. However, the authors reported that not all students liked the activities and also noticed that some students performed the calculations of the proposed activity, without understanding what the problem required.

In accordance with the previous propositions, Fiorentini and Lorenzato (2007) mention that for the implementation of pedagogical practices, teachers often face some challenges, since the reality of classrooms can be quite heterogeneous. In the same direction of thought, Zeichner (1998) argues that it is pertinent for the teacher to become a researcher on a continuous basis in relation to their practices and to be always (re)thinking about their next practice, seeking to overcome both possible challenges and

challenges. to create opportunities for new ways or possibilities to promote learning in the context of their respective classrooms (ZEICHNER, 1998).

In the research carried out by Azevedo and Maltempi (2020), they developed the research at the Hospital do Velho de Anápolis-GO through an extension project of the Instituto Federal Goiano, with the focus of investigating the issue of the Mathematics Learning Process in the light of Active Methodologies and Computational Thinking. Thus, the project called Mattics uses the constructivist ideas of Seymour Papert, and the objectives were to allow basic education students to build digital games and robotics devices for the treatment of Parkinson's, and that they could develop skills in mathematical concepts and thinking. computation.

According to the authors mentioned above, as the research progressed, new directions and developments emerged in order to expand the contributions of such a proposal. In this sense, of the more than 30 games and 15 robotic devices developed, mainly, the discussion-analysis of the production and use of the Pegar Peixe Game and the robotic device Vara de Pescar stands out, since such creation of this game Pegar Peixe and the device Robotic Fishing Rod, were intended for the treatment of Parkinson's disease. In addition to these, Geogebra and Scratch software and robotics materials such as BBC micro: bit, Makey boards were also used.

Still, in the authors' perception, to develop the games, some concepts of Mathematics, teamwork was carried out through constant mediation by the teacher. Thus, students were encouraged to investigate, formulate hypotheses, find values and collectively build scientific knowledge to assist in the treatment of Parkinson's disease. In accordance with the previous arguments, Fiorentini and Lorenzato (2007) emphasize that it is inexorable to think about a practical route in the classroom, which impels us to realize that in the process of knowledge construction it is necessary to overcome a merely instrumental perspective, based on evidently traditional precepts, which go beyond the dimension of just being modernizing the classes with a contemporary tool, enhancing other forms, new perspectives that can have more effect for learning, mainly, that is meaningful.

The authors, the activities developed by the students in this project brought benefits, such as: the testimony of the speech therapist and project participant that the games developed by the students, in addition to being playful, provided the development of reasoning and attention of patients affected with Parkinson's both in matter of movement and agility as well as balance. For the hospital's physiotherapist and also a member of the Project, it was possible to use the game as a moment of both interaction and encouragement for the patient's upright posture.

Through this project developed by Azevedo and Maltempi (2020), it is confirmed that one of the proposals for the use of games developed at the IF-Goiano is in line with the initiative defended by the World Health Organization (WHO), which aims to encourage the healthy aging of the elderly, bringing contributions to their quality of life. Furthermore, not forgetting that all mathematical knowledge is related to other areas of knowledge, aimed at social well-being and contributing to a better and less unequal society. According to Prieto, Castillo and Márquez (2020), successful experiences must be socialized not as a model to follow, but rather as a possibility of adapting to different contexts or even being completely rejected in the face of each situation. work reality. Furthermore, through critical thinking and in line with the peculiarities and singularities of each context, it is evidently possible to focus on proposals

that are more comprehensive, not as models, but as a path or possibilities that can actually contribute to society.

The work developed by Galvão, Souza and Bastos (2019) sought to introduce projective geometry using software and to present some properties of a Euclidean geometry model. For the authors, the use of 3D Dynamic Geometry software could glimpse the contributions of an interventional proposal for teaching geometry, based on the basic ideas of perspective, to expand the repertoire of plane representations and visualization skills. In addition to diagnosing the participants' perception of the notion of depth and positioning of the elements to draw a parallel between what is seen and what is known and, thus, to verify if the pole of the seen and the known were in harmony.

For the authors in question, it was found that the use of the software can help the participants in terms of both understanding and differentiating the elements of a three-dimensional environment, being able to represent them without disorganization. Still, they highlighted in their research that students do not always absorb learning when working with geometry is restricted to paper and pen, that is, the traditional method of teaching. In accordance with such notes, Fiorentini and Lorenzato (2007) emphasize that the eminently traditional view of teaching needs to be overcome through the new possibilities that emerge in today's society, in which various technological resources can help teaching work, among them, the educational software.

Diaz-Nunja; Rodriguez-Sosa and Lingán (2018) developed a research on the teaching of Geometry using the Geogebra software, separating students into two groups (one using the Geogebra software in the teaching of Geometry and the other using the traditional method, both of which were analyzed and evaluated (before and after the intervention), with tests on the learning of Geometry content.

For the authors mentioned, the results showed that with the Geogebra software, there were positive effects in terms of abilities related to reasoning and demonstration, mathematical communication and problem solving. It must be noted, mainly, that from the view of the teacher participating in the research, it was considered that the program is easy to use by the students, since the software requires little time to become familiar, in addition to helping to understand difficult concepts and facilitating the Learn. In accordance with such evidence, Santos, Silva and Fino (2012) describe that:

> (...) the software and other technologies form the informative and formative technological universe used by the teacher to diversify his pedagogical praxis. In a specific case, such as Mathematics, the available resources can contribute to improving the quality of classes and, therefore, to the development of the teaching-learning process. However, in order to make pedagogical use of this tool, a critical and prior analysis of the material to be worked on is essential, so that competencies, skills and interaction between the subject and the environment are developed, so that the learner seeks new alternatives and strategies to the construction of knowledge (SANTOS, SILVA and FINO, 2012, p. 57).

In the research carried out by Prieto; Castillo and Márquez (2020), a project was developed with the participation of high school students, focusing on different aspects of human collaboration and the elaboration of simulators with Geogebra. For the authors, the intention was to promote, in Club Geogebra, a new community ethic based on qualities such as: responsibility, commitment and care for the other. In this research, work was carried out on the production of a computational model of a robotic arm using Geogebra under the guidance of a mathematics and physics teacher who was responsible for promoting

the club.

For the authors, the Santiago simulator was developed in parts and progressively through weekly work sessions, each lasting two hours. Other students from the same club also participated, interested in cooperating with the Santiago task. According to the authors, Santiago explained to his supervisors, with the help of his colleagues, the techniques for building the geometric objects of the robotic arm with Geogebra.

According to Prieto; Castillo and Márquez (2020), in some situations the students kept their disposition focused more on their own interests and less on the needs of everyone, showing little sensitivity and a lack of ability to recognize the signs of frustration in others. In this sense, it can be emphasized that teamwork, in a collaborative way, in which everyone can have an opinion and play an active role in the knowledge construction process, becomes an essential aspect of being better embodied in the classroom, having It must be noted that such aspects also permeate the new demands of labor relations in our society (OLIVEIRA and ARAÚJO, 2016).

After analyzing the works presented, we realized that the use of software for Mathematics Education proved to be a positive way to enable the visualization of the concepts that the students have and also to allow a better understanding of how the appropriation takes place. of these concepts through mediation by technological resources.

From the works analyzed, it can be seen that the participation and interaction between students, professors and collaborators has great relevance for the dynamism of the research proposals and better contributions in several aspects. Furthermore, it can also be observed that there are inequalities in relation to the development of research between state, private and federal schools. However, even in the face of such differences, it can be seen that there are software, applications and technologies that can make a difference both in the teaching and learning process because they can promote interaction between students and teachers and stimulate learning through collective construction. and significantly.

FINAL CONSIDERATIONS

The objective of this research was to verify how a differentiated methodology could facilitate the learning of Mathematics through software. It is concluded that there are inexorably potentialities in making use of these technologies in terms of the contributions of the programs to promote the teaching process, mainly, presenting different possibilities of use in relation to educational software.

Another point observed is that when reflecting on such potentialities of the use of software for pedagogical purposes, one can broaden the debate and (re)think both about the initial and continuing education of teachers, with a view to contributing to better substantiate the process of Pedagogical mediation when teaching Mathematics in High School in contemporary times.

It was also observed that to develop activities with the use of software, the teacher must know and deepen their knowledge about these technologies and the content they teach.

Another factor that deserves attention is the need to intensify research on exploring the potential of software and promoting greater investments and support for the development of teachers' pedagogical work.

Finally, it can be highlighted that there is both a need and a priority to promote perspectives of continuing teacher education in order to expand the possibilities of enhancing the learning of Mathematics when mediating through software.

REFERENCES

ALMEIDA, Carlos Alberto Santos; ALMEIDA, Rosa Livia Freitas. Fundamentos e análises de software educativo. Ceará: Editora da Universidade Estadual do Ceará, 2015.

AZEVEDO, Greiton Toledo de; MALTEMPI, Marcus Vinicius. Processo de Aprendizagem de Matemática à luz das Metodologias Ativas e do Pensamento Computacional. **Ciência & Educação (Bauru)**. 2020, v. 26. Acesso em 23 de junho de 2021. Disponível em: <https://doi.org/10.1590/1516-731320200061>. ISSN 1980-850X.

BARROS, Janaina V.; PACHECO, José Adson D. O uso de softwares educativos no ensino de matemática. Revista de Estudos Culturais e da Contemporaneidade. n. 8, p. 5-13, 2013.

CAZARES, Santiago Inzunsa. Razonamiento Estadístico de Estudiantes Universitarios sobre el Análisis de Datos en un Ambiente Computacional. **Bolema: Boletim de Educação Matemática**. 2014, v. 28, n. 50, pp. 1262-1286. Acesso em 23 de junho de 2021. Disponível em: <https://doi.org/10.1590/1980-4415v28n50a13>. ISSN 1980-4415.

CRESWELL, John W. **Projeto de Pesquisa: Métodos qualitativo, quantitativo e misto**. 2. ed. Porto Alegre: Artmed, 2007. 248 p.

DIAZ-NUNJA, Luis; RODRÍGUEZ-SOSA, Jorge; LINGÁN, Susana K. Enseñanza de la geometría con el software GeoGebra en estudiantes secundarios de una institución educativa en Lima. **Propósitos y Representaciones**, [S.l.], v. 6, n. 2, p. 217-251, oct. 2018. Acesso em 22 de junho de 2021. Disponível em: <http://revistas.usil.edu.pe/index.php/pyr/article/view/251>. ISSN 2310-4635.

FIORENTINI, D.; LORENZATO, S. Investigação em Etnomatemática – percursos teóricos e metodológicos. 2. ed. Campinas: Autores Associados, 2007.

GALVÃO, Maria Elisa Esteves Lopes; SOUZA, Vera Helena Giusti de; MIASHIRO, Paulo Masanobo. A Transição das Razões para as Funções Trigonométricas. **Bolema: Boletim de Educação Matemática**. 2016, v. 30, n. 56, pp. 1127-1144. Acesso em 22 de junho de 2021. Disponível em: <https://doi.org/10.1590/1980-4415v30n56a15>. ISSN 1980-4415.

GALVÃO, Maria Elisa Esteves Lopes; SOUZA, Vera Helena Giusti de; BASTOS, Lucas Cunha. Contribuições da Geometria Dinâmica na Introdução ao Estudo de Perspectiva para Alunos do Ensino Médio. **Bolema: Boletim de Educação Matemática**. 2019, v. 33, n. 64, pp. 790-810. Acesso em 23 de junho de 2021. Disponível em: <https://doi.org/10.1590/1980-4415v33n64a17>. ISSN 1980-4415.

GERHARDT, Tatiana Engel; SILVEIRA, Denise Tolfo (org.). **Métodos de Pesquisa**. Porto Alegre: Editora da UFRGS, 2009. 120 p.

MARTINS, Ricardo Lisboa. Concepções sobre a matemática e seu ensino na perspectiva de professores que ensinam matemática em licenciaturas de alagoas. Dissertação de Mestrado em Educação Matemática e Tecnológica/PPGEMT/UFPE. 2012. 139 f.

OLIVEIRA, Marcelo de Sousa. Uma reflexão sobre a ideia de superação do ensino tradicional na educação matemática: a dicotomia entre a abordagem clássica e abordagens inovadoras em foco. BoEM, Joinville, v. 7, n. 14, p. 79-93, dez 2019.

OLIVEIRA, Marcos Antonio de. ARAÚJO, Elvira Aparecida Simões de. Desafios da educação e o professor como mediador no processo de ensino-aprendizagem na sociedade da informação. Revista Educação Pública. 2016.

PASTANA, Claudionor de Oliveira; NEIDE, Italo Gabriel. A integração do ensino de funções trigonométricas e movimento harmônico simples por meio do software Modellus. **Revista Brasileira de Ensino de Física**. 2018, v. 40, n. 1. Acesso em 23 de junho de 2021. Disponível em: <https://doi.org/10.1590/1806-9126-RBEF-2017-0095>. ISSN 1806-9126.

PRIETO G., Juan Luis; CASTILLO B., Luis Andrés; MÁRQUEZ T., Maximina. Formas de colaboración humana entre profesores y alumnos durante la elaboración de simuladores con GeoGebra. **Bolema: Boletim de Educação Matemática**. 2020, v. 34, n. 66, pp. 199-224. Acesso em 22 de junho de 2021. Disponível em: <https://doi.org/10.1590/1980-4415v34n66a10>. ISSN 1980-4415.

PANTOJA RANGEL, Rafael; ORTEGA ARCEGA, María Inés. La entrevista clínica: opción para indagar el aprendizaje de límites y continuidad. **Revista de Investigación Educativa**. Xalapa, n. 22, p. 226-238. 2016. Disponível em: <http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1870-53082016000100226&lng=es&nrm=iso>. Acesso em: 29 jun. 2021.

SANTOS, Dilce de Melo. SILVA, Ailton Filgueiras. FINO, Carlos N. O software e sua aplicabilidade como recurso pedagógico na escola. Rios Eletrônica- Revista Científica da FASETE. 2012.

SILVA, João Paulo Martins da. RIBEIRO, Aretha Cristina. SOUZA, ARAÚJO, Tacildo de Souza. O uso de softwares no ensino da matemática: entre o modismo e o uso inteligente. V CONEDU. Congresso Nacional de Educação. 2018.

SILVA, Tales Pessoa de Souza; DA COSTA, Claudiene Gomes. Uma Investigação da Utilização de Softwares Educacionais no Estudo de Funções no Ensino de Matemática. **Boletim Cearense de Educação e História da Matemática**, [S. l.], v. 6, n. 16, p. 91–103, 2019. DOI: 10.30938/bocehm.v6i16.902. Disponível em: <https://revistas.uece.br/index.php/BOCEHM/article/view/902>. Acesso em: 29 jun. 2021.

SOUZA, Ana Paula Gestoso de; PASSOS, Cármen Lúcia Brancaglion. Dialogando sobre e Planejando com o SuperLogo no Ensino de Matemática dos Anos Iniciais. **Bolema: Boletim de Educação Matemática**. 2015, v. 29, n. 53, pp. 1023-1042. Acesso em 23 de junho de 2021. Disponível em: <https://doi.org/10.1590/1980-4415v29n53a12>. ISSN 1980-4415.

SOUZA, Aywkslânia Nogueira de. TEIXEIRA, Verônica Rejane Lima. A Importância da Matemática no Desenvolvimento da Criança na Educação Infantil. Id on Line Rev. Psic. V.15, N. 57, p. 816-827, outubro/2021 - Multidisciplinar. ISSN 1981-1179 Edição eletrônica em http://idonline.emnuvens.com.br/id

ZEICHNER, K. Para além da divisão entre professor-pesquisador e pesquisador acadêmico. In: GERALDI, FIORENTINI & PEREIRA. *Cartografias do trabalho docente.* Campinas: Mercado das Letras/ALB, 1998, p. 207-236.