

Importance Of Mathematical Skills In Education

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Abstract

Developing mathematical skills focuses on applying elements of the interpretation and elaboration of information, solving problems from everyday situations and decision-making, and improving knowledge, thinking and reasoning. The research aims to publicize the different studies on the importance of mathematics competence in education. Within the specific objectives, we can specify that they are: to show the studies on mathematical competences in the development of teachers, in the vision of skills, in the value of learning and in education. The bibliographic review method was used, considering 51 final articles which were grouped. Part of the results show that mathematics involves a variety of situations that allow students to develop a meaningful learning experience by connecting knowledge and experience with the realities of their environment.

keywords: Mathematics competence, skills, learning.

Resumen

Desarrollar competencias matemáticas se centra en aplicar elementos de la interpretación y elaboración de la información, resolución de problemas derivados de situaciones cotidianas y toma de decisiones, mejorando el conocimiento, el pensamiento y el razonamiento. El objetivo de la investigación es dar a conocer los diferentes estudios sobre la importancia de la competencia de la matemática en la educación. Dentro de los objetivos específicos podemos precisar que son: evidenciar los estudios sobre las competencias matemáticas en el desarrollo del profesorado, en visión de las habilidades, en el valor de aprendizaje y en la educación. Se utilizó el método revisión bibliográfica, considerando 51 artículos finales los cuales fueron agrupados. Parte de los resultados manifiestan que las matemáticas implican una variedad de situaciones que permiten a los estudiantes desarrollar

una experiencia de aprendizaje significativo al conectar el conocimiento y la experiencia con las realidades de su entorno.

Palabras Clave: Mathematics competence, skills, learning.

Introduction

In recent years, society has been exposed to constant changes, where education and the age of knowledge are developed, taking into account different converging factors and meeting the new needs of this society. The purpose of the education sector is to train critical and creative young people who can assume the responsibility of shaping society. Therefore, achieving this direction requires the formation of different subjects, among which one of the most relevant is mathematics.

When mathematical competencies are mentioned, Bringula et al. (2021) assert that mathematics itself refers to a person's confidence in their ability to learn new numerical subjects, perform, enhance skills, pass assessments and improve performance. For Arrechavala et al. (2021), mathematical ability focuses on the willingness to think mathematically, enjoyment and confidence when engaging in intellectual activities related to mathematical reasoning, strengthening the ability to solve and understand mathematical problems.

While mathematics allows children and young people to develop the ability to think analytically, it encourages and exercises the skills to apply in real daily life. Also, it emphasizes the ability to solve problems that may arise, as well as being one of the main areas of personal development and its application in students' daily lives.

Universally, it can be noted that in the education sector, they are considered the fundamental skills in mathematics and

Language, since they have developed during the process of stages of a student, are transferable skills that are part of the biggest challenges related to low levels of learning, mainly literacy and mathematics, due to the lack of priority in the development of transferable skills; low rates of digital literacy at all stages of life and limited opportunities in market demand (UNICEF, 2020). The different educational systems evaluate and verify their curricular planning processes to contemplate the new educational needs and minimize the low performance of students.

In Latin America, mathematical skills have faced resistance from many students; these problems have been presented by various factors, such as didactic strategy, support with the fulfillment of activities, educational resources, knowledge and teacher management (Unesco, 2021). The teaching method will influence the perception and acceptance of the student field, where mathematics ceases to be only a difficult subject and becomes a course of importance and need for the student, by which it is tried to involve them in an advanced search for knowledge so that they can address more complex problems every day; in this way, from teaching them to learn from their mistakes, corrections can be made.

In Minedu (2019), the educational system evaluates the different pedagogical options to improve the teaching of different resources due to the low grade and acceptance that mathematics has in basic education, involving students to build and understand the concepts of numbers, systems of operations and their properties. According to Choque & Choque (2018), Despite having pedagogical and curricular management documents, part of the teachers

continue to develop mathematical exercises decontextualized to reality, leaving aside the resolution of problems.

In education, situations that promote the development of different skills are made known, where the didactic analysis in the activities is not complex and understandable for the students; this lowers the interest and desires to learn this subject, for which, the enormous challenges of facing and overcoming the levels of difficulty that cross the school trajectory of the students who will complete basic education (Castro & Merino, 2019). Mathematical competences intervene in the development of the student, providing greater knowledge and skills to function in everyday life, for example, problem-solving, responsiveness, and interpretations, among others.

A theoretical approach justifies the article since it is evidenced by the references on mathematical competences in students, allowing theoretical contributions to the registered knowledge. The practical justification evidences the design and combination of didactic strategies used to optimize the development of mathematical competences, better-developing learning. On the other hand, the social justification has been made for the benefit of teachers and institutions on the analysis of pedagogical management, the results it exerts in mathematical learning, and a reference for future research.

Finally, the objective of the research is to publicize the different studies on the importance of the competence of mathematics and education; within the specific objectives is the fact of evidencing the studies on mathematical competences in the development of teachers, in vision of skills, in the value of learning and in education.

I. Methodology

The research uses a methodology of bibliographic review, considering the purpose of generating a complex review of the different theoretical and literary elements aimed at systematizing and analyzing scientific knowledge regarding the importance of mathematical skills in education in the last five years.

The application of bibliographic review aims to analyze the information collected from different sources according to the systematic process. The information collected is aggregated and interpreted according to a classification process (Grijalva et al., 2019). The scientific method focuses on knowledge where the bibliographic search performs relevant processing on the importance of mathematical competence in education.

In the systematic evaluation, the search technique was applied in different databases of scientific journals, considering search engines such as Scopus, Redalyc, Dialnet, Google Scholar, Researchgate and Scielo, the same ones relevant to search for objective information. Several logical operators AND, NOT, OR were considered. In addition, the review used words of inquiry such as: “mathematical skills in education,” and “important mathematical skills.”

The study proceeded with collecting data from selected articles, then a conceptual post-analysis was carried out, followed by the results formulated, discussion and conclusions about the importance of mathematical skills in education. Finally, the information collected was classified into: mathematics in education, value of learning mathematics, skills in vision to mathematics, teacher development in mathematics.

In the search process, 520 initial articles were obtained that gave results from different academic search engines such as Scopus and Dialnet. ; Following the relevance of the topic, 433 articles were chosen. Therefore, as part of the inclusion criteria, the period of 2017-2022, basic education level, research articles, language (English, Spanish-Portuguese); in the exclusion: type of document (monographs, theses, non-academic articles, books) and discarding duplicates; resulting in 71 articles. Finally, 51 articles were chosen from them, due to the significance, timeliness and practicality in reference of mathematical competences in education.

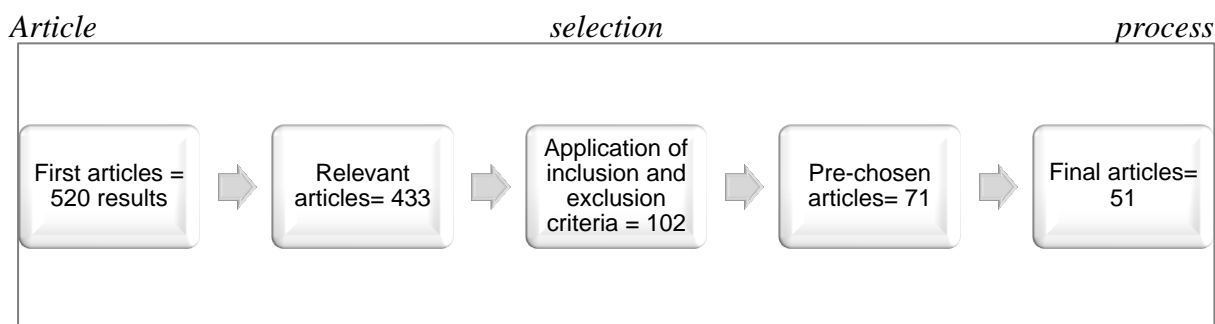


Figure 1
Source: Authors.

III. Results

The study considered 51 articles for the selection, proceeding with creating 4 groups. The first dealt with the value of learning mathematics, the second one with the importance of mathematics in education, and the third on skills in vision of mathematics and teacher development in mathematics.

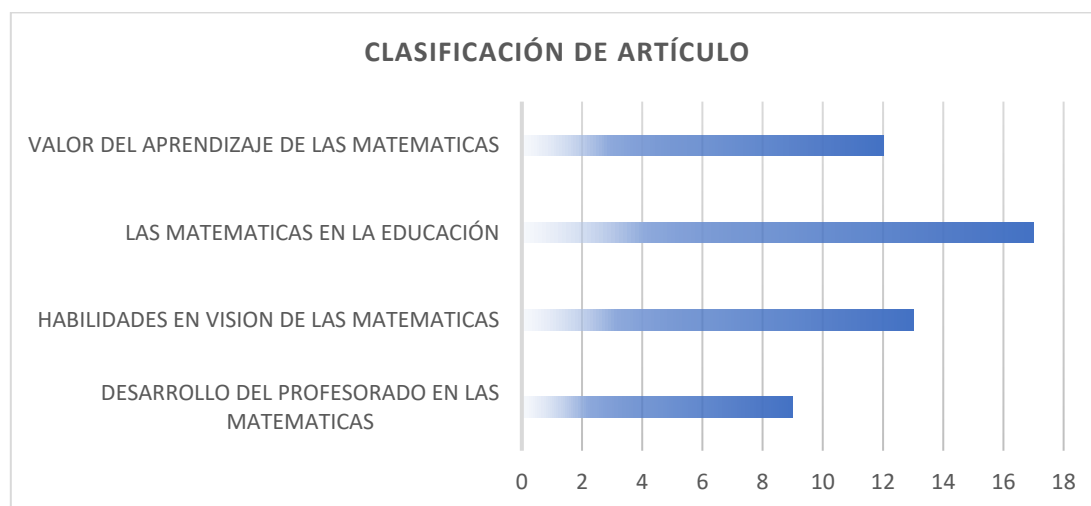


Figure 1 *Classification of articles*

Value of learning mathematics

The learning of mathematics must produce an effective action before a problem, prioritize forms of appropriation and action of the students, managing the conceptual and procedural domain. In addition, the field of mathematics encourages and helps students develop the following skills: Solving problems of quantity, regularity, equivalence and variability, as well as strengthening abilities.

For Gocheva et al. (2021) & Bringula et al. (2021), establishing a unified approach based on learning and mathematics competencies, is an important step towards creating educational and assessment standards. Ramón & Vilchez (2019) due to the execution of the teaching of contextual and interactive mathematics, mediated by the environment and digital resources, generates a strong motivation, power and commitment of the student with learning, being reflected in the efficiency of conceptual construction, modeling and problem solving.

In this way, learning environments allow articulating the development of mathematical competencies in the classroom from real situations of the students didactically. Paez (2017) & Espinales (2018) improves problem-solving and problem-solving skills, improves learning outcomes, and increases student motivation. Miroslav (2018) & Juandi (2021) improving mathematical understanding, problem solving, creative thinking skills and competence.

In this way, students must acquire fundamental skills that allow them to successfully navigate the sea of knowledge and solve problems under any circumstances, thus enabling a process focused on members who develop their own skills and allow them to face any situation easily.

From the perception of the teaching and learning of mathematics, as a social, cultural and historical practice, it establishes increasingly complex processes of theories, methodologies and curricula, and proposes new ways of organizing mathematical knowledge (Alvis, 2019). Therefore, it is relevant to highlight ideas, perspectives, experiences and stories since otherwise mathematics significantly affects people's lives, despite different situations to develop skills that provide them with the essential tools to solve or formulate problems to their reality.

A central objective that builds and restructures knowledge is one of the new challenges that must arise in the complex process of training and developing mathematical skills. Grinshpan & Milligan (2019) classical outcomes and open problems have a motivating effect not only on students but also on educators themselves, therefore active learning should be encouraged at all levels of learning mathematics and appropriately designed practices.

On the other hand, Yeping & Schoenfeld (2019) state that mathematics is the gateway to many fields of science and technology to evaluate the advantages and disadvantages of each option for students. For Pedersen et al. (2021), this skill also includes the ability to reflect and decide which representation to use when solving mathematical tasks or situations.

Mathematics in education

In education, mathematics shapes students' values, as it ensures the solidity of the fundamentals, the security of the approaches and confidence in the results obtained. Moreover, although mathematics is a subject that has been present from our childhood to our daily lives, it has influenced the ability to respond through cognitive learning because it gives us the action to find solutions to problems.

According to Poma et al. (2021), the concepts of mathematics focus on the relationships with the phenomena in which they occur and extend to the learning process to direct their focus during their studies (Espigares et al., 2020 & Chávez et al., 2021). Thus, active learning intervenes in the development of mathematical competencies in students. In the same way, it is necessary to understand the coupling between concepts, theoretical foundations and evaluative practices in the field of mathematics in the approach to social training, to achieve the unification between what has been evaluated and what has been learned.

Meanwhile, Cacha et al. (2021) state that in the basic education sector, students' numerical skills, communication and mathematics are important, they are necessary to solve mathematical and counting problems. Šabíková (2017) & Álvarez (2021) evidence-based social training addresses problems and evaluates them from a new educational perspective, taking into account the reforms and structural changes in several countries to improve the performance of students when facing problems and situations.

According to Zulkardi & Indra (2021) & Segerby (2018), curricular reforms have emphasized reasoning as an essential part of mathematics education. For Riyan & Zanaton (2018), the main difficulty students face in solving verbal problems is to convert the problem into mathematical models, i.e., horizontal mathematics, while the main barrier is related to horizontal mathematics and the construction of mathematical models. (Cabrera & Delgado, 2021) therefore, children and young people cannot be forced to learn mathematical content that is not appropriate for their age and unrelated to previous knowledge, as well as the development of monotonous activities has caused children to lose interest in mathematics.

Institutions have the challenge of satisfying the need to teach how to learn and provide personal and interpersonal tools in developing mathematical thinking and skills in students that allow them to acquire knowledge about use throughout their schooling (Valderrama, 2021). First, Brisson et al. (2017) the ability to compute and represent should be employed, using logical thinking and various forms of representation; the second base to contexts and situations in which mathematical competence can be developed.

Within this framework, Li et al. (2019) & Martínez et al. (2020) foster awareness in mathematics will drive a conceptual shift in mathematical practice to value ideation and design. Lieven et al. (2017) this will help provide a more complete picture of development and stimulate the child's early math skills, thus reinforcing math skills in the school's formation process. Freund et al. (2021) the further development of mathematical competence may take us in another direction, because students use previously learned reading and math skills to continue progressing in mathematics while reading skills may have stabilized during school.

Education is a vitally important factor in overcoming many obstacles, in addition, the leaders and teachers whose job is to find ways to keep students motivated and engaged in learning supported by eclectic teaching strategies, active and collaborative work in the educational community.

Math vision skills

Math skills focus on developing students' cognitive, thinking, decision-making, and problem-solving skills. The construction of solutions is understood as a way to stimulate the student's interpretation of a particular problem to evaluate the conditions for a decisive solution.

It should be noted that the development of skills in mathematics is of considerable importance to enhance both the teaching-learning process and the meaningful learning of students (Macías et al., 2018; García & Falcón, 2018). Furterer et al. (2020) should incorporate expectations to help students understand how math skills relate to applications and knowledge. Conde et al. (2021) urges the need to involve schools due to the lack of motivation in students, so teachers use teaching resources and technology to mediate the execution of teaching and strengthen the skills of the learner.

For its part, Greefrath (2020) & Rebollo et al. (2020), the combination of entertaining techniques and augmented reality in teaching teachers and attractive to students, will satisfactorily improve mathematical skills. Chávez et al. (2020) found that 72% of students achieve exceptional levels of performance, skills and achievement after applying active learning-based teaching. Kahl et al. (2019) & Arrechavala et al. (2021) children's performance in mathematics depends on their mastery: specific skills and general mastery skills. On the other hand, students must be motivated to solve problems and improve tasks with knowledge of their reality and environment.

With the support of virtuality, Quinga et al. (2022), the development of mathematical skills depends significantly on the student's age due to adaptation and understanding. Virtual platforms are used to complement educational programs, contributing to better classroom performance and better learning. Bellini et al. (2019) knowledge may be related to the long-term or short-term development of mathematics and lifelong learning, as the main idea is to engage, learn and understand skills that help growth to a proper education.

In the field of application for its ability to use mathematical knowledge, as learning helps to understand the realities that surround us and contributes to the design of intelligence, fostering the intellectual capacity and skills of students (Lehtinen et al., 2017). It should be mentioned that the conditions, the intellectual knowledge of the parents, the IQ, and the time intervened in the training foster a relationship in the child's education and interest in it (Girard et al., 2021).

The bases of numerical expressions and forms, their power to depend on their effectiveness, adaptability and availability, help to understand the facts that surround us or contribute to intellectual formation, improving the abilities, intellectual abilities of children and young people as a result of their learning. Meanwhile, math skills training in educational settings can be identified as programs and practices that help improve basic skills, but often result in unnecessary skills rather than relying on quantitative knowledge. It is worth mentioning that all students progress at different speeds because some mathematical skills are acquired later than others, some of their skills can improve with their age.

Teacher development in mathematics

Although teachers have acquired the necessary skills and knowledge to teach the subject, there is a need to improve their knowledge of mathematics because students are often fearful, not visual and stressed (Quiroz & Mayor, 2019). Therefore, it is necessary to improve learning, including other mathematical skills.

According to Niss et al. (2017) & Petz & Hoffmann (2017) teacher skills are one of the most important factors in a student's academic performance. Meza & Ruíz (2019) the implementation of the competency-based training approach, especially in the field of evaluation, reaffirms the convenience of integrating knowledge and shows the feasibility of moving from traditional forms of assessment to more integrative and holistic strategies.

According to Anleu (2020), improving school performance, efficiency and integrity means making sure people need teachers, providing a quality education and providing the best possible education, as well as beneficial for all students. Given this, Restrepo (2017) the educational reform has outlined the curriculum for the provision of educational services related to the system of training by skills, which is one of the most influential factors in the assurance of education.

Suárez et al. (2020) along with metacognitive, motivational and personality qualities, teachers self-regulate real and efficient performance in solving everyday problems, understanding the world and making decisions. Prediger & Zindel (2017) beyond these general perspectives, expert diagnostic judgment can be characterized by the richness of the aspects identified by the expert.

Therefore, there is the importance of the application of evaluation methods by the teacher that reinforces knowledge and learning (Santagata et al., 2017). For certain math skills, teaching is an excellent tool for teachers to assess and focus on what they need and should be able to do in their professional field (Meza, 2021).

IV. Discussion

Mathematics involves a variety of situations that allow students to develop a meaningful learning experience by connecting knowledge and experience with the realities of their environment. Mathematics is thus built on the meaning of life and will make it possible.

The development of strategic didactic tools is a complex task that not only involves traditional tests, but seeks to enrich and complement them with other sources of information on student performance, since then, traditional tests will be with us for a long time. If we see to it that students have the right experiences, formal mathematics can serve to organize and systematize those experiences, during which time different perspectives on the nature of mathematics gradually developed.

The value of learning, mathematics is learned from experiences they have developed and in the technical way that has been used, students can incorporate ideas into thought patterns, it is through abstraction techniques; by which it is necessary to establish learning environments in which to build, structure and organize their own experiences. According to Páez (2017) & Alvis (2019) & Juandi (2021), they refer that developing synergies based on learning and mathematical skills is an important step in the development of academic standards and assessments. Therefore, it is relevant that students acquire and strengthen their skills that allow them to complete their knowledge.

In education, innovation and implementation of strategies is a major challenge for teachers and institutions, as didactic and traditional practices reinforce the belief that problem-solving is the key to a problem-solving plan. Cabrera & Delgado (2021) & Valderrama (2021) mention that the development of thinking and mathematical skills in the student allows to acquire knowledge, design of strategies to pose and solve a problem and, of course, apply them in the context of their training. The school should help students understand school knowledge and use it effectively on a day-to-day basis and even in a personal environment.

In terms of skills, students' creativity in working with and solving math problems is an expression of their ability and how this development is called mathematical ability. Math is often related to skills and knowledge, a way to improve by creating and applying didactic events, such as classroom writing, which includes a variety of activities to achieve the goal. Bellini et al. (2019) & Kahl et al. (2019) who substantiate that students' mathematical performance depends on their specific mastery skills and their overall mastery skills they have developed in their educational progress.

In teacher development, the educator must execute new teaching methods to create and produce content as a definition of the strongest and most accessible to students. Given this, the

use of well-designed features and equipment is extremely crucial. Meanwhile, Conde et al. (2021) & Suárez et al. (2020) & Santagata et al. (2017) report that there is a need to engage with new ideas and strategies that inspire students and promote independent learning, allowing them to explore mathematics in a variety.

V. Conclusions

Society is exposed to constant changes, where education and the age of knowledge are developed considering various converging factors; therefore, the development of mathematical skills is based on applying elements of the interpretation and elaboration of information, solving problems derived from everyday situations and decision making, improving knowledge, Thinking and reasoning.

The vision of learning mathematics and learning environments allows to articulate the development of mathematical competencies in the classroom from real situations of the student didactically. For this reason, mathematics is a form of explanation that is learned and applied to the design and implementation experience, allowing students to integrate ideas into challenging patterns and achieve them.

In terms of education, mathematics shapes students' values as it improves core strength, path security and confidence gained in outcomes, responds to problems and assesses them from a new educational perspective, taking into account reforms and structural changes in many countries to improve pupils' performance in solving problems and situations.

In mathematical skills, focus on developing the knowledge, thinking, decision making and skills of students to generate problem-solving, this can be influenced by the age of each student and the preparation capacity they have developed around their educational development.

For the development of mathematics teachers during their academic life, teachers develop and reinforce their knowledge, even more so in teaching a subject; as part of their functions, they involve self-regulating the real and efficient performance in solving everyday problems, understanding the world and making decisions in students. Therefore, teachers should employ strategies and methods through which students can develop critical and cognitive thinking to improve their quality of learning.

References

- Alvarez, Y. (2021). The evaluation of mathematical competences approached from evidence-based socio-formative guidelines. *Bol.redipe* .10(4):144-70. <https://revista.redipe.org/index.php/1/article/view/1257>
- Alvis, J.; Aldana, E. & Solar, H. (2019). Learning environments: An articulator for the development of mathematical competences. *Espacios* Volume 40, Issue 21. <https://bit.ly/3KKvzZi>
- ALVIS, J.; ALDANA, E. & SOLAR, B. (2019). Learning environments: an articulator for the development of mathematical skills. *SPACES*, VOL. 40. (N°21). <https://www.revistaespacios.com/a19v40n21/a19v40n21p08.pdf>
- Arrechavala, I.; López, L. & Chambasis, R. (2021). Level of Development of Mathematical Competences in Second Year Students of the Mathematics Teaching Staff of the Francisco Morazán National Pedagogical University (UPNFM). Level of Development

- of Mathematical Competencies in Second Year Students of the UPNFM Mathematics Teacher's Degree Program. *Journal of Educational Research*. <https://doi.org/10.5377/paradigma.v28i45.11739>
- Anleu, S. (2020). Mathematical competences in the Primary Education Teaching Staff. *International Scientific Review*, 3(1), 153–159. <https://doi.org/10.46734/revcientifica.v3i1.32>
- Bellini, D.; Crescentini, A.; Zanolli, G.; Cubico, S., Giuseppe, F.; Faccincani, L. Piermatteo, A. & Giancesini, G. (2019). Mathematical Competence Scale (MCS) for Primary School: The Psychometric Properties and the Validation of an Instrument to Enhance the Sustainability of Talents Development through the Numeracy Skills Assessment. *Sustainability* 2019, 11, 2569; doi:10.3390/su11092569.
- Brisson, B.; Dicke, A.; Gaspard, H.; Häfner, I.; Flunger, B.; Nagengast, B. & Trautwein, U. (2017). Short Intervention, Sustained Effects: Promoting Students' Math Competence Beliefs, Effort, and Achievement. *American Educational Research Journal*. <https://doi.org/10.3102/0002831217716084>
- Bringula, R.; Reguyal, J.; Dominic, T. & Ulfa, S. (2021). Mathematics self-concept and challenges of learners in an online learning environment during COVID-19 pandemic. *Smart Learning Environments* volume 8, Article number: 22. <https://slejournal.springeropen.com/articles/10.1186/s40561-021-00168-5>
- Cabrera, M. & Delgado, M. (2021). Dteacher commitment to the development of mathematical competences in pre-school education: a systematic review. *Maker*, Vol. 5 No. 1. <https://doi.org/10.26495/rch.v5i1.1619>.
- Cacha, Y., Zuniga, R., Iraola, I. & Gonzales, M. (2021). Analysis of Digital and Mathematical Competences in Elementary School Students. *EDUNINE 2021 - 5th IEEE World Engineering Education Conference: The Future of Engineering Education: Current Challenges and Opportunities*, Proceedings. DOI: 10.1109/EDUNINE51952.2021.9429106. <https://bit.ly/3JpQgtC>
- Castro, O. & Merino, P. (2019). How to develop mathematical competence from the analysis of tasks generated in the classroom. *How to develop mathematical competence from the analysis of tasks generated in the classroom. The teacher's thinking, his practices and elements for his professional training* vol 32, number 1, year 2019. <http://funes.uniandes.edu.co/13951/1/Castro2019Como.pdf>
- Chávez, A.; Moscoso, K. & Cadillo, J. (2021). Active method in the development of mathematical competences in Awajún children, Perú. *Uniciencia Open Access* Volume 35, Issue 1, Pages 55 - 70. DOI: 10.15359/RU.35-1.4. <https://bit.ly/3JhFvte>
- Chávez, A.; Moscoso, K. & Cadillo, J. (2021). Active method in the development of mathematical competences in Awajún children, Perú. *Uniciencia Open Access* Volume 35, Issue 1, Pages 55 - 70. DOI: 10.15359/RU.35-1.4. <https://www.redalyc.org/journal/4759/475965979004/>
- Choque, E. & Choque, P. (2018). Problematic of the development of competences in the area of mathematics at the secondary education level. <https://bit.ly/3iTpWfy>
- Count, R.; Fontalvo, A. & Padilla, I. (2021). The use of technology in the teaching of the limit, for the strengthening of mathematical skills in high school students in times of Pandemic. *Pandemic and Education*. <https://revistas.idep.edu.co/index.php/educacion-y-ciudad/article/view/2496>
- Coordinating reciprocal teaching and systemic functional linguistics to support reasoning in the Swedish context. *Educational Design Research* Volume 2 | Issue 1 | 2018 | Article 12. <https://www.diva-portal.org/smash/get/diva2:1400584/FULLTEXT01.pdf>
- Spikes, M.; Fernández, A. & Oliveras, M. (2020). Instrument to evaluate mathematical and scientific competences of students who start Primary Education, through games.

- Paradigma Magazine (Fortieth Anniversary Edition: 1980-2020), Vol. XLI.
<http://revistaparadigma.online/ojs/index.php/paradigma/article/view/807/793>
- Espinales, A. (2018). Gamification in the development of mathematical competence: Pose and Solve Problems. *Scientist Synapse*, 1(12). DOI: <https://doi.org/10.37117/s.v1i12.136>
<https://revistas.itsup.edu.ec/index.php/sinapsis/article/view/136>
- Freund, M.; Wolter, I.; Lockl, K. & Gnambs, T. (2021). Profiles of competence development in upper secondary education and their predictors. *PLOS ONE* 16(1): e0245884.
<https://doi.org/10.1371/journal.pone.0245884> View registered report protocol
- Furterer, S.; Hein, A.; Whitacre, L. & Gines, S. (2020). Applying lean six sigma to improve engineering technology students' math skills. *Proceedings of the 2020 IISE Annual Conference* Pages 1104 - 1109. <https://bit.ly/3IgaeWg>
- Girard, C.; Bastelica, T.; Léone, J.; Epinat, J.; Longo, L. & Prado J. (2021). The relation between home numeracy practices and a variety of math skills in elementary school children. *PLoS ONE Open Access Volume 16, Issue 9*. DOI: 10.1371/journal.pone.0255400. <https://bit.ly/3KNQGtU>
- García, M., & Falcón, C. (2018). Classification of math problems focused on the development of creativity. *Caribbean Journal of Educational Research (RECIE)*, 2(2), 107-119. <https://doi.org/10.32541/recie.2018.v2i2.pp107-119>
- Gocheva, G.; Kulina, H.; Voynikova, D.; Ivanov, A.; Iliev, A. & Atanasova, P. (2018). Acquiring mathematical competences towards modelling: Example using cluster analysis. *IEEE Global Engineering Education Conference, EDUCON Volume 2018-April, Pages 1469 - 1474*. DOI:10.1109/EDUCON.2018.8363406. <https://bit.ly/3KMqDmQ>
- Greefrath, G. (2020). Mathematical modelling competence: selected current research developments. *Research Advances in Mathematics Education*, 17, pp. 38-51. <http://funes.uniandes.edu.co/23746/>.
- Grijalva, P.; Cornejo, G.; Gomez, R.; Real, K. & Fernández, A. (2019). Collaborative tools for systematic reviews. *Magazines spaces*. Vol. 40 (No. 25) Year 2019. p. 9. <https://www.revistaespacios.com/a19v40n25/a19v40n25p09.pdf>.
- Grinshpan, A. & Milligan, D. (2019). Teaching Mathematics through Concept Motivation and Action Learning. *Research Article Open Access Volume 2019*. <https://doi.org/10.1155/2019/3745406>
- Juandi, D. (2021). Heterogeneity of problem-based learning outcomes for improving mathematical competence: A systematic literature review. *Journal of Physics: Conference Series*. Volume 1722. <https://iopscience.iop.org/article/10.1088/1742-6596/1722/1/012108/meta>
- Kahl, t.; Grob, A.; Segerer, R. & Möhring, W. (2019). Executive Functions and Visual-Spatial Skills Predict Mathematical Achievement: Asymmetrical Associations Across Age. DOI: 10.1007/s00426-019-01249-4. <https://pubmed.ncbi.nlm.nih.gov/31560097/#:~:text=Results%20indicated%20that%20EFs%20and,in%20adolescents%20than%20in%20children>.
- Lehtinen, E.; Hannula, M.; Jake McMullen & Hans Gruber: Minna Hannula-Sormunen, Jake McMullen & Hans Gruber (2017). V Cultivating mathematical skills: from drill-and-practice to deliberate practice, *ZDM Mathematics Education* 49, 625–636 (2). <https://doi.org/10.1007/s11858-017-0856-6>
- Li, Y., Schoenfeld, A. H., diSessa, A. A., Grasser, A. C., Benson, L. C., English, L. D., & Duschl, R. A. (2019). Design and design thinking in STEM education. *Journal for STEM Education Research*, 2(2), 93-104. <https://doi.org/10.1007/s41979-019-00020-z>.

- Lieven, V.; Joke, T. & Bert, S. (2017). Young children's early mathematical competencies: Analysis and stimulation. CERME 10, Feb 2017, Dublin, Ireland. <https://core.ac.uk/download/pdf/195561627.pdf>
- Macías, D., López, A. & González, I. (2018). DEVELOPMENT OF MATHEMATICAL SKILLS IN PRIMARY EDUCATION FROM RECYCLED MATERIAL. *Varela Magazine*, 18(50), 141–154. <http://revistavarela.uclv.edu.cu/index.php/rv/article/view/87>
- Meza & Ruíz (2019). Evaluation of specific mathematical competences in the training of teachers of Media Education in Chile. *Revista Electronica Interuniversitaria de Formacion del Profesorado Open Access Volume 22, Issue 1, Pages 159 - 173*. DOI: 10.6018/reifop.22.1.337261. <https://bit.ly/3MZhv0c>
- Minedu. (2019). What does the “Solve quantity problems” competition mean? <http://curriculonacional.isos.minedu.gob.pe/index.php?action=artikel&cat=4&id=81&artlang=es>
- Miroslav, S. (2018). Should Learning (Mathematics) at School Aim at Knowledge or at Competences? *ORBIS SCHOLAE*, Vol 6 No 2 (2012), 23–39. DOI: <https://doi.org/10.14712/23363177.2015.38>
- Martínez, P., Niebles, W. & Niebles, L. (2020). Mathematical skills as a success factor in the pro test at universities in Barranquilla, Colombia. *Education and Humanism*, 22(38), 1-16. DOI: 10.17081/eduhum.22.38.3590
- Meza, C. (2021). Teaching mathematical problem solving. *Ensino de resolução de problemas de matemática. Pol. Con. (Issue No. 43) Vol. 6, No 11. November 2021, pp. 89-103*. DOI: 10.23857/pc.v6i11.3256
- Niss, M.; Bruder, R.; Planas, N.; Turner R. & Villa, J. (2017). Conceptualisation of the Role of Competencies, Knowing and Knowledge in Mathematics Education Research. In: Kaiser G. (eds) *Proceedings of the 13th International Congress on Mathematical Education. ICME-13 Monographs*. Springer, Cham. https://doi.org/10.1007/978-3-319-62597-3_15
- Paez, S. (2017). Strengthening mathematical competence, problem solving in secondary basic education, through problem-based learning (PBL). *Mathematical Echo*, 8(1), 25–33. <https://revistas.ufps.edu.co/index.php/ecomatematico/article/view/1472>
- Pedersen, M.; Carlsen, C. Maagaard, R.; Heinesen, I.; & Jankvist, T. (2021). Mathematical Representation Competency in Relation to Use of Digital Technology and Task Design—A Literature Review. *Mathematics* 2021, 9(4), 444; <https://doi.org/10.3390/math9040444>.
- Petz, S. & Hoffmann, M. (2017). The development of mathematical competences in hungarian teacher training education. *Annales Mathematicae et Informaticae* Volume 47, Pages 243 - 251. <https://bit.ly/3ifwW65>
- Poma, Y.; Patricio, R.; Acuña, S. & Alanya, J. (2021). Development of mathematical competences in regular basic education Systematic review. *Development of mathematical competencies in regular basic education: Systematic*. South Center Magazine. https://www.researchgate.net/publication/355207587_Desarrollo_de_competencias_matematicas_en_la_educacion_basica_regular_Revision_sistemica
- Prediger, S. & Zindel, C. (2017). Deepening prospective mathematics teachers' diagnostic judgments: Interplay of videos, focus questions, and didactic categories. *EUR J SCI MATH ED*, Volume 5, Issue 3, pp. 222-242. <https://doi.org/10.30935/scimath/9508>
- Quinga, Y.; Pilataxi, N.; Carvajal, V. & Ocaña, M. (2021). Virtual Activities to Strengthen Basic Math Skills in Children. *Lecture Notes in Networks and Systems* Volume 406 LNNS, Pages 173 - 185. DOI: 10.1007/978-3-030-96046-9_13. <https://bit.ly/3qaXBFK>

- Quiroz, A. & Mayor, C. (2019). Evaluation of specific mathematical competences in the training of teachers of Secondary Education in Chile. *Revista Electrónica Interuniversitaria de Formación del Profesorado*, 22(1). <https://doi.org/10.6018/reifop.22.1.337261>
- Ramón, J. & Vilchez, J. (2019). Digital-ethnic technology: Converging didactic resources in the development of mathematical competences in rural area students. *Informacion Tecnologica Open Access* Volume 30, Issue 3, Pages 257 - 268. DOI: 10.4067/S0718-07642019000300257. <https://bit.ly/3D2e8RH>
- Rebollo, C.; Rebollo, I.; Rossano V. & Gasch, C. (2020). Improving math skills using an augmented reality videogame. *CEUR Workshop Proceedings* Volume 2719, Pages 224 - 235. <https://bit.ly/3u0xXEQ>
- Restrepo, J. (2017) Conceptions about mathematical competences in teachers of basic, secondary and higher education. *bol.redipe.6(2):104-18*. <https://revista.redipe.org/index.php/1/article/view/199>
- Riyan, H. & Zanaton, I. (2018). Mathematical Modelling Competency for Indonesian Students in Mathematics Education Programmes. *Creative education* > Vol.9 No.15, November 2018. <https://www.scirp.org/journal/paperinformation.aspx?paperid=88532>
- Šabíková, H. (2017). High school of business pupils' background and mathematical competences. 16th Conference on Applied Mathematics, APLIMAT 2017 - Proceedings Pages 1349 - 1353. <https://bit.ly/3u7T2NH>
- Santagata, R. & Haymore; J. (2017). Preservice Teachers' Mathematics Teaching Competence: Comparing Performance on Two Measures. First Published February 2, 2018. <https://journals.sagepub.com/doi/10.1177/0022487117753575>.
- Segeberby, C. (2018). Primary students' participation in mathematical reasoning. *Educational Design Research*. <http://dx.doi.org/10.15460/eder.2.1.1150>
- Suarez, J.; Duardo C. & Rodríguez, R (2020). THE DEVELOPMENT OF MATHEMATICAL COMPETENCE THROUGH PROBLEMS WITH APPLICATIONS OF FUNCTIONS. THE DEVELOPMENT OF MATHEMATICAL COMPETENCE THROUGH PROBLEMS WITH APPLICATION OF THE FUNCTIONS. *Chakiñan, Journal of Social Sciences and Humanities*, (12), 118–134. <https://doi.org/10.37135/chk.002.12.08>.
- UNESCO. (2021). Mathematics, teaching and research to face the challenges of these times. <https://es.unesco.org/news/matematicas-ensenanza-e-investigacion-enfrentar-desafios-estos-tiempos>
- UNICEF. (2020). Importance of transferable skills development in Latin America and the Caribbean. https://www.unicef.org/lac/sites/unicef.org.lac/files/2020-07/Importancia-Desarrollo-Habilidades-Transferibles-ALC_0.pdf
- Valderrama, D (2021). Mathematical competences: a look from the teaching strategies in distance education. *Gondola, Science Teaching and Learning*, 16(2), 382-398. DOI:<https://doi.org/10.14483/23464712.16167>
- Yeping, L. & Schoenfeld, A. (2019). Problematizing teaching and learning mathematics as “given” in STEM education. *International Journal of STEM Education* volume 6, Article number: 44 (2019). <https://stemeducationjournal.springeropen.com/articles/10.1186/s40594-019-0197-9>
- Zulkardi, Z. & Indra, R. (2021). THE JOURNEY OF JOURNAL ON MATHEMATICS EDUCATION: FROM LOCAL TO GLOBAL. *Journal on Mathematics education* > Vol 12, No 3. <https://ejournal.unsri.ac.id/index.php/jme/article/view/15001>