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Teachers' perceptions of the Brazilian curriculum reform, PISA and mathematics literacy

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Abstract: The present work is the result of a master's research, guided by the following question: what are the perceptions that teachers of Mathematics of Basic Education have about BNCC, about PISA and about what is mathematical literacy proposed in PISA and BNCC? The article has a mixed nature and the data were collected through questionnaires, applied to Mathematics teachers who work in the Public Network of the State of Paraná. Data analysis took place through Content Analysis and Cluster Analysis. We obtained four clusters that allowed us to verify that the teachers knew the BNCC, but many did not read the Mathematics chapter. Regarding PISA, many teachers were not aware of this assessment. We found that teachers do not know if there are relationships between PISA and BNCC, as well as most teachers confused math literacy with math literacy.

Keywords*:* BNCC. Large Scale Assessment. PISA. Mathematical Literacy. Mathematics Teachers.

Percepciones de los profesores sobre la reforma del currículo brasileño, pisa y La alfabetización matemática

Resumen**:** El presente trabajo es el resultado de una investigación de maestría, guiada por La siguiente pregunta: ¿cuáles son las percepciones que tienen los docentes de Matemáticas de Educación Básica sobre la BNCC, sobre PISA y sobre lo que se propone la alfabetización matemática en PISA y BNCC? El artículo tiene carácter mixto y los datos fueron recolectados a través de cuestionarios, aplicados a profesores de Matemáticas que actúanenlaRed Pública del Estado de Paraná. El análisis de datos se llevó a cabo a través de Análisis de Contenido y Análisis de Conglomerados. Obtuvimos cuatro conglomerados que nos permitieron verificar que los docentes conocíanla BNCC, pero muchos no leíanel capítulo de Matemáticas. Encuanto a PISA, muchos docentes no conocían esta evaluación. Encontramos que los docentes no saben si existen relaciones entre PISA y BNCC, así como que lamayoría de los docentes confunden alfabetización matemática com alfabetización.

Palabras clave: BNCC. Evaluación a GranEscala. PISA. Alfabetización Matemática. Profesores de Matemáticas.

Percepções docentes ante a reforma curricular brasileira, PISA e letramento matemático

Resumo: O presente trabalho é resultado de uma pesquisa de mestrado, norteado pela seguinte questão: quais são as percepções que professores de Matemática da Educação Básica possuem sobre a BNCC, sobre o PISA e sobre o que é letramento

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matemático proposto no PISA e na BNCC? O artigo possui natureza mista e os dados foram coletados por meio de questionários, aplicados com professores de Matemática que atuam na Rede Pública do Estado do Paraná. A análise dos dados se deu por meio de Análise de Conteúdo e da Análise de *Clusters.* Obtivemos quatro *clusters* que nos permitiram verificar que os professores conheciam a BNCC, mas muitos não leram o capítulo de Matemática. Com relação ao PISA, muitos professores não conheciam essa avaliação. Verificamos que os professores não sabem se existem relações entre o PISA e a BNCC, bem como, a maioria dos professores confundiram o letramento matemático com alfabetização matemática.

Palavras-chave: BNCC. Avaliação em Larga Escala. PISA. Letramento Matemático. Professores de Matemática.

1 Initial considerations

Brazilian Education in the last years passed through substantial changes, from a curricular reform elaborated based on the new Base Nacional Comum Curricular (BNCC) (BRASIL, 2018). The structuring and implementation of the BNCC evidenced how international organs, as well as regulatory politics, would influence its elaboration. But in what way did they influenced and factually impacted the Brazilian teaching? Do the teachers who work in Basic Education have the knowledge about the received influence for the Brazilian educational reform?

A curricular reform is a large scale change which implies in political options, redefinition of finalities and educative objectives, and structural alterations in the educational system (AFONSO, 2000). For Afonso (2000, p. 56),

> The reforms are not necessarily guided for the problem solving in the educational field, however this can be the presented reason. They have mutch more to do with the economic crises, in national or worldwide level, and/or State legitimation crises.

We agree with Afonso (2000), that, sadly, the reforms are still far from solving the Education problems, mainly when we have in the power neoliberal and far-right governments, in which Education is only part of election speeches. Maués (2009) and Freitas *et al.* (2014) highlight that the reforms in the educational context are related to regulatory politics. In this sense, the “regulatory politics want, in strategic areas, to transfer the regulating power from the State to the market, in a wide process marked by many forms of producing the privatization of the public” (FREITAS *et al.*, 2014, p. 54). It is exactly this the objective of neoliberal governments for Education, with the moto of the minimal State, transferring to the people the responsibility of what is the duty of the State, as it is ruled by our Constitution and the Lei de Diretrizes e Bases da

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Educação Nacional (BRASIL, 1996), in the Art. 2º, that Education is a duty of the family and the State.

Maués (2009) continued explaining, that in Education this regulation reaches the pedagogical processes of the curriculum. But, in parts, the Education has been reaching a main role, in which international organs define as a new educational order and demonstrate huge interest in this area, as the Banco Mundial (BM), the Organização de Cooperação e Desenvolvimento Econômico (OCDE), the Comissão Europeia (CE) and even the Organização Mundial do Comércio (OMC).

These organs see Education as a resource for the transformation, with an adequate transformation of the society and with the generation of economic growth as result. In such manner, the educational system is reached by the changes in educational public politics which adopt the market idea, of globalization.

According to Maués (2011, p. 76), the OCDE sustains that "the Education plays a key-role for the economic and growth and the work. In function of this, stresses the importance of the teacher for the quality of teaching". The OCDE is the organ responsible for the Programa Internacional de Avaliação de Estudantes (PISA). The PISA is an evaluation in international large scale, applied in more than 70 countries, which evaluates students between 15 and 16 years old, who find themselves in the end of Mandatory Education and have as objective,

> Producing indicators which contribute for the discussion of the quality od Education in the participant countries, in a way to subsidize politics of basic education improvement. The evaluation seeks to verify until what point the schools in each participating country are preparing their youth to exercise their role as citizens in the contemporary society (OCDE, 2016, p.1).

For Wilkins (2013, p. 50), the focus of PISA is to analyze and develop the skills and competences of the youth for the real life and "it is aimed the adequacy of goals and objectives of the curriculum itself for what the students are able to do with the knowledge acquired at school". In this way, by means of the PISA it is possible to verify how are the teaching and learning of the students and these can apply the school knowledge in matters of real context, related to the personal, occupational, scientific and social aspects. Aguiar and Ortigão (2012, p. 5) clarify that

> […] the PISA, besides evaluating competences, collects basic information for the elaboration of contextual indicators, which make it possible to relate the performance of the students to their social-demographical characteristics. The

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> results of these studies can be used by managers of the many involved countries, as a tool for the definition or refinement of educational politics.

With this, it is possible to verify that the PISA, as an evaluation in internationally large scale, which evaluates competences and produces indicators about the proficiency of the students, influenced in a manner much more significant in the elaboration of the BNCC. According to Antunes (2017, p.1), “the PISA data work for the construction of public politics in the educational area, searching to sharpen the formation of the youth in consonance with what is expected of them in their productive and social lives”.

In the BNCC, about what treats of Mathematics, it was evident how the PISA was used as basis for its structuring. One of these elements was the mathematical literacy and its competences. The mathematical literacy, in the conception of PISA, also cited in the BNCC, consists on the

> capacity to formulate, employ and interpret the Mathematics as a series of contexts, what includes mathematically reasoning na using mathematical concepts, procedures, facts and tools to describe, explain and predict phenomena. This helps the individuals to recognize the role that Mathematic develops in the world and makes that productive, engaged and reflective citizens are able to make well funded judgments and take the necessary decisions. (OCDE, 2016, p. 138).

The mathematical literacy is structured from the conceptions of Mathematical Modeling, and the study of Jolandek and Kato (2021) shows that the Mathematical Modeling in the context of Mathematical Education can favor the development of Mathematical literacy and its competences. The competences of mathematical literacy are seven: communicating, mathematizing, representing, problem solving, argument and reasoning, using symbolic language, formal and technical and using mathematical tools. And by means of Mathematical Modeling, such competences of mathematical literacy can be developed.

In Brazil, the term literacy is mistaken with the alphabetizing process, because the subject is considered as literate when one has the skills of reading and writing, and, lettered, when the subject uses the writing, is involved in social reading and writing practices, in other words, it is applied in aspects of one’s daily life as the social, psychic, cultural, political, cognitive, linguistic and economic (SOARES, 1999).

It is important to understand that mathematically lettering the student, is a process of long term learning and, it goes beyond the simple exercise of reading and

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writing (OCDE, 2013). But in the view that Brazil improves its indexes, in the PISA tests, the literacy and other elements of the PISA were basis for the structuring of the BNCC (JOLANDEK; PEREIRA; MENDES, 2019). However, for beyond a new implemented document to generate changes in Brazilian Education, it is necessary an investment in initial and continued formation, so the teacher is able to aid the students to develop the competences and skills for the mathematical literacy.

In this context, understanding the BNCC as the mark of the Brazilian curricular reform, in pars it received influence of evaluations in international large scale, such as the PISA; we aim to analyze this work as the result of a masters degree research, about the perceptions the Mathematics teachers in service have about the Brazilian curricular reform, the PISA and the mathematical literacy. In this way, we were guided by the question: *what are the perceptions that the Mathematics teachers' have about the BNCC, about the PISA and about what is the proposed mathematical literacy proposed in the PISA and in the BNCC?* From these teacher's perceptions we searched to articulate the new BNCC, the PISA document and the concept of Mathematical Literacy.

2 Methodology

The present research has a mixed approach, that is, qualitative and quantitative. For Goldenberg (2004, p. 63), "the integration of quantitative and qualitative data may provide a better understanding of the studied problem, [...] and in this perspective they stop being perceived as opposite to be seen as complimentary". In this way, by mean of the mixed approach, we seek to answer: *what are the perceptions that the Mathematics teachers' have about the BNCC, about the PISA and about what is the proposed mathematical literacy proposed in the PISA and in the BNCC?*

In order to do it, the participant subjects of the research were Mathematics teachers who taught in the final years of elementary School, High school and Education of Young and Adults (EJA), during the year of 2019, in the public network of the State of Paraná, Brazil. The data gathering was by means of electronic questionnaires[3], which had open and closed questions, being split in five axis: i) characterization of the teacher's profile; ii) perceptions about evaluation and large scale evaluation; iii)

[3]The questionnaires were applied in the months of March and April os 2019.

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perceptions about the PISA; iv) perceptions about the BNCC; v) perceptions about the mathematical literacy. The questionnaire was sent to the Mathematics teachers, via the Secretaria de Estado de Educação do Paraná (SEED/PR), from where we obtained 106 answers. It was not possible estimating for how many Mathematics teachers the questionnaires were sent, this information was not passed by the SEED/PR. In the sending moment it was asked to the SEED/PR that it sent for all the acting Mathematics teachers in the State network of education of all the Núcleos Regionais de Educação (NRE/PR), being effective teachers or not.

The participant teachers acted in/belonged to 29 of the 32 NRE/PR[4] and most of them taught for more than 10 years. With the objective to preserve the identity of participant teachers of the present research, we identified these professionals as P1, P2, ..., P106.

To treat the gathered data we used two analysis techniques, that is, for the qualitative approach we used the Content Analysis (AC) and for the quantitative approach the Cluster Analysis (ACl). Bardin (2016, p. 37) stresses that

> The content analysis is a group of communication analysis techniques. Is is not about an instrument, but of a fan of tools, or with more rigor, it will be an only instrument, but masked by a great disparity of forms and adaptable to a very wide field of application, the communications.

Therefore, based on the AC proposed by Bardin (2016), we search to follow three stages presented by the author i) pre-analysis of the data; ii) analysis preceded by codification of information; iii) categorization.

The first stage of the AC, pre-analysis, consists on an attentive reading of the data, in the second stage, the analysis preceded by codification, we read again, making a codification of the information as a pre-categorization (text disassembly), which we are going to call *corpus*, with the goal of extracting fragments which could converge (BARDIN, 2016). In this way, in first place, we did a floating reading to understand the context of the *corpus*. Then we disassembled all the *corpus* and extracted fragments and grouped them according to their similarities, where emerged the units of analysis. This process was realized for each question of the questionnaire applied to the teachers and, for each one of the questions of the questionnaire emerged different

[4] The Núcleos Regionais de Educação do Paraná (NRE/PR) are regions with encompass many schools in different cities. In Paraná exist 32 NRE/PR.

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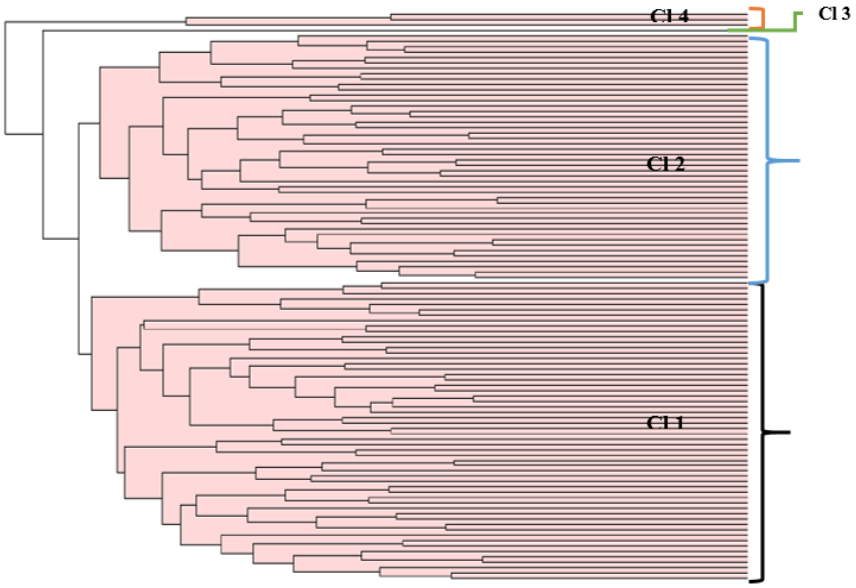
quantities of units of analysis.

The third stage, categorization, was realized with the aid of ACI. The ACI is a statistical procedure, that is, a quantitative tool of data analysis which works to identify homogeneous groups in the data. This kind of technique of analysis allows classifying objects and people based on the observation of their similarities and differences. This method groups the subjects in function of the existing information, in a manner which the individuals of a group are so similar among themselves as possible, or different from other groups. To make this process of "clustering" and to exist similarities among the subjects, it was used the software *Mathematica*®[5] (PEREIRA, COSTA; LUNARDI, 2017).

In order to do so, from the units of analysis processed by means of the ACI, emerged 4(four) *clusters* (*Cl*), which also represent the main categories identified from our data. With the report generated by the Software *Mathematica*®, it is obtained the "hierarchical tree" or "dendrogram", according to Figure 1.

Figure 1: Organization of the Clusters in a hierarchical tree



Source: Own authorship (2020)

The Figure 1 shows the dendrogram of the hierarchical construction of the CI of this investigation, in which all the subjects have similarities in their answers end being grouped in an single CI. Beyond this, from the report processed and generated by the

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software *Mathematica*® it is obtained who are the subjects belonging to each CI.

From the constructed DC, we search to assume the role of author inferred about the results of our investigation, which emerge from the analysis of each of the four CI.

3 Results and discussions

Guided by the question: *what are the perceptions that the Mathematics teachers' have about the BNCC, about the PISA and about what is the proposed mathematical literacy proposed in the PISA and in the BNCC?* We search to realize the analysis of each of the four CI which emerged in our units of analysis and which characterize the perceptions of the Mathematics teachers of Basic Education in the State of Paraná, about the curricular reform (BNCC), about the evaluation in large scale in a general manner and, specifically, the PISA, as well as about the mathematical literacy — conception which appears in the matrix of PISA and BNCC.

3.1 *Cluster* 1 (*CI* 1): Teacher consider the BNCC weak and incomplete, and literacy as knowledge of basic Mathematics

By analyzing the *CI* 1, composed by 56 mathematics teachers, it is possible to evidence the main characteristics identified in the speeches of the teachers about the BNCC, large scale evaluation /PISA and mathematical literacy. In this *CI*, we verified that the largest percentage of teachers knew the BNCC in a general manner, considering it weak and incomplete. They also knew the PISA as na evaluation which compares indexes, but did not know the mathematical literacy, having in sight they consider that an individual is mathematically littered when He/she has the knowledge of basic mathematics. Beyond this, they did not perceive relations between the PISA and the BNCC.

In relation to the BNCC, the results which are stressed are: 32% of the 56 teachers consider it weak and incomplete and 25% point it as a document which will make the teaching uniform. Although most of the teachers point the BNCC as weak, incomplete and regulatory, 53% of the teachers did not participate in the elaboration of the BNCC, when made available the public consultations, as well as 42% did not read the specific chapter of the subject of Mathematics, however stress that it was not discussed in meetings/pedagogical formation in the schools. As we can observe in the examples of the teachers below:

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P28 —They should be reviews, in part, because they still did not get to fully reach the reality of our Educational System.
P40 — In the school I work in it came the study about the BNCC in our pedagogical formation and this process was collective. I did not agree with the BNCC for High School and there are many problems in the subjects from Elementary School
P54 — Too plain and without really listening to what we had to contribute.
P82 — It should be more general, focus on the development of the human being and leaving more in charge of the school which knows its community to define the final pattern. Without casting the process.

For beyond this reading and participation in the structuring of the BNCC, the teachers also highlight inconsistencies in the Mathematics subjects. This context goes in opposition to the conceptions of Aguiar (2018) and Antunes (2017), because the elaboration of the BNCC as a curricular reform is seen as a privatized view, which favored the interests of the marked, that is, business and economic interests, in the sense of a neoliberal view. Being that in Mathematics many of the contents were altered and/or excluded, demanding new understandings by the teachers (PINTO, 2017). This evidences why the BNCC is considered weak and incomplete, as well as regulating by part of the teachers.

About the large scale evaluations, in specific the PISA, most of the teachers had the knowledge about this large scale evaluation, however 73% of the teachers did not have in their initial and/or continued formation a study which approached questions about the PISA and, specifically, the matrix in Mathematics. To do so, the teachers stress that the PISA is an evaluation which aims to verify the performance of the student, compare indexes, improving the teaching/educational politics. As we can see in the examples of speeches below:

P64 — I know by mean of colleagues and internet research. There is a gap in this topic about the teacher training.
P82 — It indicates a cultural settlement between the peoples and forces the governments to think they should base themselves on it.
P94 — It provides a good comparative of how is the teaching in diverse countries, in what relates do Mathematics/problem solving.

In fact, the PISA aims to verify the performance of the student and comparing indexes, according to its matrix,

> the PISA helps to monitor the tendencies of the students to the acquisition of knowledge and skills between countries and in different demographical subgroups inside each country. The test results allow the politics formulators in the entire world to evaluate the knowledge and the skills of students in their own countries and compare to other countries, in a way to establish educational political goals already reached by other educational systems. (OCDE, 2016, p. 5 — our translation).

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In this sense, Maués (2011, p. 84) stresses that the OCDE is a regulating organization and the "concern with the role of the schools, with the subject transmitted by them, gets a centrality in measure in which there is an interest that the Education can answer to the demands of the global market". In the perspective of this author, the evaluations applied by the OCDE and related to PISA are not proposed only to verify indexes to improve Education, but to the global market.

With this, 48% of the teachers from this *CI* pointed that the low performance of Brazil in the PISA, in the area of Mathematics, is due the lack of educational public politics to improve the teaching. And in the search to improve these indexes the teachers applied simulations of the evaluations in the classroom, as well as search to develop methodologies/different planning. This meets the speech of Fernandes (2009), by pointing the teaching inside the classroom may be influenced by large scale evaluations, seeing that it is demanded the students have good results.

By looking at PISA and the BNCC, we questioned the teachers if there is a relation between the large scale evaluations such as PISA and the elaboration of the new Basis. The percentage which are stressed demonstrate most of the teachers, 34%, do not perceive relations between large scale evaluations and the BNCC, others 21% highlight they believe there are relations and 18% indicate the BNCC was elaborated to improve the results from large scale evaluations suck as PISA, as well as other 18% highlight the BNCC is unified with the large scale evaluations. As we can observe in the examples of teachers' speeches below:

> *P19 — [...] the evaluations will have as basis the subjects ranked in the BNCC, that is, the same as the whole country.*
> *P82 — Yes, it seeks focus in the subjects which meet these exams and generate distortions in the results.*

In this context, understanding that, in a certain way, the BNCC was influenced and elaborated based on the PISA, that is, in international large scale evaluations (JOLANDEK; PEREIRA; MENDES, 2019), we question the Mathematics teachers about the mathematical literacy, in view that it is the focus of PISA, for Mathematics, Science and Reading. And now, it is also one of the objectives of BNCC, the development of mathematical literacy in Basic Education. In this manner, we identified few teachers of this *CI* have knowledge about mathematical literacy; 32% point that being mathematically lettered is having the knowledge of Basic Mathematics. But the

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other half of the teachers understand that being mathematically lettered consists in knowing how to apply Mathematics in daily situations (28%), as well as consists in knowing how to read, interpret, understand and solve problems (27%). Let us see some examples of speech below:

> *P66 — It is having the arithmetic and algebraic knowledge.*
> *P110 — It is knowing the concepts, meanings, symbology, and understanding and contextualizing the mathematical problems.*
> *P111 — The capacity of identifying and understanding the role of Mathematics in the society with the objective of meeting the needs of the individual in the accomplishment of the role as a conscious, critical and constructive citizen.*

The literacy, many times, is seen in a mistaken manner, as already described in the previous chapters. Lettering a student is more than just alphabetizing and teaching basic concepts. Lettering mathematically consists in forming a student in order to him/her knows how to apply what was learn in Mathematics to daily situations, knowing how to formulate the problem, interpreting it and employing mathematical tools so he/she can get to a conclusion for this problem (OCDE, 2016).

The 32% of the teachers who do not understand mathematical literacy allow us inferring that, possibly, these teachers did not have training with subjects which treated mathematical literacy, objective of the BNCC, and, consequently, of PISA. In this manner, 94% of the teachers from this *Cl* pointed as necessary an initial and/or continued formation about mathematical literacy and its competences, so the same can be developed in Basic Education.

3.2 *Cluster* 2 (*Cl* 2): Teachers who know the chapter about Mathematics in the BNCC understand that the low performance in PISA is due to students' lack of interest

Cl 2 is the second biggest, composed by 46 teachers who characterize with similar answers. In this *Cl,* we found the Mathematics teachers know the new BNCC, considering it innovative, necessary and what will make education uniform. They do not know the PISA and the structure of the test, only pointing it as being a diagnosis evaluation. They do not perceive the relations between PISA and the BNCC and consider mathematical literacy as the knowledge of basic Mathematics, as well as in *Cl* 1.

For this, in relation to the BNCC, beyond the teachers considering it innovative

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(30% of the 46 teachers), other 26% see it as an instrument to make education uniform. Even the answers diverging between some teachers in this *CI*, 71% answered they took part in the public consultation in relation to elaborating the BNCC, by mean of discussions and debates in pedagogical meetings in the school. This shows that most of the teachers studied the BNCC, with the Mathematics chapter (52%).

> *P25 —They are subjects to be worked in the entire Brazil, so everyone learn the same way.*
> *P30 — The BNCC is a necessary "reform". It has many positive and negative points. Many studies and discussions were done about the documents, with the intention of knowing the BNCC. It was not an easy study, because in the moment there was a huge setback around the document, what ends up making it difficult to understand. It was not a study with impartiality. Many personal opinions are put in the study, this is why there was not an objective study.*
> *P85 — Yes, the BNCC comes to aid us giving a new vision to the classroom practices by directing determined necessary subjects each year, but it presents fragility by establishing subjects which in my point of view are not relevant to the students.*

Some teachers affirmed that, during the meetings done in the schools, the study of the BNCC was not easy to understand and, in the end, it did happen with neutrality between the study and the contributions were not used, as pointed by the teachers' speeches. We noticed these ideas meet what Aguiar (2018) discusses, by pointing its elaboration was verticalized. To the teachers who read the Mathematics chapter, many found difficulty in putting into practice what it has been presenting. Because of this, we understand that there is a need of improvement in teacher training, because it is not enough implementing a Base Nacional Comum if there is not an adequate formation to the teachers.

When questioning the teachers about the large scale evaluation, specifically the PISA, we verified that half the teachers from this second *CI* do not know how to describe what it means, and almost 60% of the teacher do not know the PISA. This reflects in the answer the teachers gave about the low performance of the students at Mathematics in the PISA, being that 46% understand this as lack of interest from the students, as well as for not understanding the Mathematics subjects which were taught in the classroom. However, other teachers also understand this is a reflex of the lack of public educational politics in Brazil turned to improve education. Besides this, we verified that due to the teachers not knowing the PISA, they do not search to develop equivalent questions in the classroom (85%). As we can observe in the examples of speech from the teachers below:

> *P3 — Lack of interest by the governors, overcrowded classrooms and lack of training.*
> *P14 — No. But after starting this research, it came to me the idea of taking it to the classroom.*

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[Questions equivalent to those of the PISA].
P18 — No, what influences it is the lack of will from the students which demotivate any professional.
P61 — Our country does not see in Education a conditional of social changing.

According to Sassaki *et al.* (2018, p. 2), the low performance in PISA,

> Is specially owed to the fact that a great part of respondents do not manage to reach the end of the test, what can be related to the delay to understand the enunciation of the question and to develop the reasoning about the answer. In this way, the decay seems to be more related to the cognitive skills.

This also reflects on the level of competences of mathematical literacy in students, that is, the Mathematics proficiency (OCDE, 2016).

By analyzing the BNCC and the PISA, from the speeches of the teachers, we question about the possible influence/relation between the BNCC and the large scale evaluations, 44% do not know if there are relations. We verify that the teachers are not able to claim the relations between the large scale evaluations and the implementation of the BNCC in Brazil, the answers show that they do not have certainty about such situation. Let us observe the examples in the speeches of the teachers below:

P24 — I believe yeas, but I do not know hot so mention it clearly.
P30 — I am not sure, but yes, I believe so.
P62 — I cannot opine, because I do not know.

There are diverse researches who investigate and point to the relations of large scale evaluations, with the curricular changes and educational politics (MAUÉS, 2005). However, the lack of knowledge the teachers present about the existing relations is due to the lack of formation, because it is expected that in the initial an continued formation is where it should be taught this important view of reality, of national Education.

We infer this reflected in the understanding about what is mathematical literacy. In this way, 46% of the 46 teachers understood that it is having knowledge over basic Mathematics, and only 26% understand is as knowing to read, interpret, understand and solve problems. According to what we can observe in the examples of speech from the teachers below:

P11 — Being able to know and apply the basic calculations.
P23 — Dominate the mathematical operations, properties and logical reasoning.
P83 — In my opinion it is who knows how to operate with at least the 4 operations, who have geometric notions, have an idea of percentage and can interpret charts and graphics.

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P100 — It is knowing to read, solve and interpret the obtained results.

In fact, we found out that few teachers have knowledge about the mathematical literacy, proposed by the PISA and the BNCC. Most mistook literacy with alphabetizing. In this manner, we understand as necessary a formation to the teachers so they can develop mathematical literacy with the student. Thus, by asking if it was necessary an initial or continued formation to teach at Basic Education the mathematical literacy processes, 95.6% answered yes.

3.3 *Cluster* 3 (*Cl* 3): Teacher critiques the BNCC elaboration and the form which PISA is applied

Cl 3 is characterized with the answers of only one teacher (P8). This teacher has teaching experience, because he works for more than 10 years in Basic Education with the final years of Elementary School and High School. As there is only one subject in this *Cl*, every percentage will be 100%, which are not going to He highlighted along the description of this *Cl*. In this third *Cl*, we identified the teacher knows the BNCC, but points that more discussions are missing to its elaboration, also stresses the suggestions given by teachers in general were not heard. The teacher does not know the PISA with the end of saying definitions about the evaluation, but critiques its form of application. It also was not evidenced He could not describe if there are relations between the PISA and the BNCC. In relation to the mathematical literacy, his conception converges with *Cl* 1 and 2, pointing that it is having the knowledge of Basic Mathematics.

When we asked about the BNCC, the teacher P8 indicated he took part in the public consultation for the BNCC elaboration by mean of pedagogical meetings, and stresses it was little discussed with the teachers and the schools in general. In this manner it is possible to perceive that, even taking part in the pedagogical meetings at school, the teacher felt the need of more discussions about the new Base, including the Mathematics part, of which he did not read entirely, as we can observe in his speech below:

P8 — I see it was a proposal was little discussed in the basis, that is, with the schools and the professionals of Education. We accessed the MEC website and posted contributions of what subjects should be worked in Elementary School and High School. It occurred in a very fast form, without time for a good discussion. It is unfortunate that subjects so important did not receive, at the time, a more careful look in relation to the dynamics and necessary time to the debate and discussion of the proposal.

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About the Mathematics chapter in the BNCC, the teacher affirms that He did not read it entirely, however, he made a remarkable speech about the implications of the BNCC in the teaching and learning processes in Mathematics, saying that, “certainly it will bring [implications], and I worry with these results. Because, as already previously punctuated, once again it seem to be a proposal elaborated by a small group”. Soon, we are going to see that the speech of teacher P8 meets what is pointed by Aguiar (2018), when he highlights the methodology utilized for elaborating the BNCC.

Aguiar (2018) mentions that the methodology to elaborate the BNCC was verticalized, that is, it was denominated as participative. Otherwise, it is put that the Base was elaborated with immediatist measures, unlinked from a planning and references. The author still demonstrates that after the teachers’ participation, who mostly participated individually and not agued in groups, it is questioned in relation to the choices of public contributions, “what is the Mark of reference which served as parameter for MEC’s choices?” (AGUIAR, 2018, p. 15). In fact, who participated giving contributions to the BNCC knows that they were not put in practice in the document, justifying the teacher’s speech when seeing that it lacked more discussions about the BNCC, because the methodology used by it was centralizing, not considering time for the discussion among educators.

In relation to the large scale evaluation and the PISA, the teacher only heard about it, he does not have deep knowledge on PISA and its matrix. However, he considers PISA as an evaluation used to compare indexes — generating rankings. He stresses that PISA, “besides being more of a diagnosis, evaluates only the degree of learning of them, ranking these results, without considering, maybe, other facots which may interfere in it”. By the fact of not knowing deeply the PISA, the teacher does not develop questions from PISA and its process in his classes — “never accessed this evaluation”, pointed the teacher.

Even only hearing about the PISA, the teacher P8 highlights that the low performance of the Brazilian students at Mathematics in PISA, is due to the economic and social diversities in Brazil, different from other countries in which the test is also applied, according to what he stresses below:

> *P8 — As I already stressed, it is a punctual evaluation which ranks countries, including from different economic classes. This aspect and other diversities and peculiar specificities of each country, probably is not taken into consideration. This evaluation applied in a general scope, does not seem to me as having as basis a teaching proposal which applies integrally to every*

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> *participating country. There is too much economic, social, cultural diversity which imply in the level of learning from our students. If we already observe this inside the classroom, certainly in a major degree, it occurs in comparison between a country and another.*

Besides the economic and social diversity of Brazil, the evaluation might be considered as valid, even being applied in different countries with different contexts, seeing that in Mathematics, for instance, the problems are analyzed and adapted, if necessary, according to the Brazilian reality by the Instituto Nacional de Estudos e Pesquisa Anísio Teixeira (INEP), thus the enunciations of the questions may vary from one country to another. Furthermore, the mathematical subjects approached in the PISA evaluation have similarities with the Brazilian curriculum, in addition we can consider the mathematical concepts as universal (LIAO; MOTTA; FERNANDES, 2021). However, it is still necessary to verify the equity of the evaluation.

The PISA test does not take into consideration some social aspects, although it applies social-economical questionnaires for the students, parents and teachers. Fernandes (2009) discusses about the equity question in large scale evaluations, presenting that its lack occurs in the educational systems influencing the results from this large scale evaluations, favoring or disfavoring certain groups of students. The equity is a complex subject, not only in large scale evaluations as the PISA, but in the entire educational system.

In this context, of PISA and the BNCC, we questioned about the possible relations between these two documents and the teacher did not know if there are relations. Because, as seen, the teacher has knowledge of the BNCC in a general manner, but he does not know the Mathematics part, as well as he does not have any deeper knowledge about the PISA.

Thus, his perceptions about the mathematical literacy meet the other *CI*. “I believe it is having the domain over a minimum knowledge, here, meeting a parameter of some organ linked to Education and learning evaluating systems” (P8). However, the teacher also considers important approaching the mathematical literacy during the initial and continued formation — “Certainly yes. A formation which, including, bring new teaching proposals, which emphasizes and prioritizes subjects which in fact are relevant to the students, but that, above all, give them the intellectual capability to advance in the knowledge and reading of the world”. Even with the teacher not knowing the conception of mathematical literacy, he approaches the need of a formation which provides a world reading, which meets the mathematical literacy and its competences.

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We verify that, even not knowing in a deeper manner the BNCC and the PISA, the teacher P8 is able to Express his opinions about both the documents, and about the need of approaching them in teacher training.

3.4 *Cluster* 4 (*Cl* 4): Teachers have a superficial knowledge about the BNCC, do not know the PISA, but understand mathematical literacy.

This last *Cl* is formed by only 3 teachers. In it, some answers between the teachers converge in 100%, and others diverge. In this *Cl*, we can observe that the teachers know the BNCC, being it a document to make education uniform. However, they do not know the PISA, but most of them say the BNCC and PISA are unified. About the conception about mathematical literacy, on the other hand, this was this *Cl* the closest to the conceptions of PISA and BNCC, describing that it is having knowledge to interpret, understand and solve problems, as well as understanding Mathematics as a language. About the BNCC we see that the teachers see it as a document which will make education uniform (66.6%), according to what we can observe in the speech examples below:

> *P15 — The Base Nacional is a tool which aims to guide the elaboration of the specific curriculum of each school, without disregarding the methodological, social and regional particularities of each one.*
> *P108 — Yes, the subject imposed by the Federal Government, owed to all the institutions, public or private, to include in their PTD (Plano de Trabalho Docente).*

Besides the teachers commenting about the imposed subjects, and about it being a regulatory document, 100% of them did not participate in the elaboration of the BNCC, in the public consultation. However, two of the teachers did not read the Mathematics chapter and only one of them read it and pointed as being within expected, not expressing conceptions about the read chapter. Furthermore, the teachers do not consider the BNCC will bring impacts for the Mathematics teaching. Their perceptions end being neutral about the BNCC.

The same occurs with the large scale evaluations and the PISA, all the teachers do not know it. In this way, they did not develop questions presented in the PISA exams in their classes and pointed that the low performance of the Brazilian students at Mathematics in the PISA is given, in a general way, due to the lack of educational politics for improvement of education — P108: “It lacks a better structuring to develop effective learning techniques”.

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About the relations between PISA and the BNCC, only one teachers pointed these two documents are unified and the other two teachers do not know if there is a relation. This reflects in their conceptions about the PISA, which they do not know, and about the BNCC which are neutral.

This way, about the mathematical literacy each teacher expresses a different perception. One of the teachers do not know and did not describe the perception. Other teacher understands that being mathematically lettered means reading, interpreting, understanding and solving problems, and for the other teacher it would be understanding Mathematics as a language. Let us see their speeches below:

> *P15 — Lettered is the one who knows how to read and write, but who answers fittingly to the social demands of reading and writing.*
> *P73 — Knowing and developing.*

Although they have demonstrated not having knowledge about the PISA, as well as about the BNCC, they get close to the conception of mathematical literacy proposed in these two documents. Even though they have previous conceptions about the mathematical literacy one of the teachers do now know if there is need to approach this subject in the initial and continued formation, on the other hand the other two teachers consider this formation necessary.

4 Final considerations

For the present work we searched to articulate the curricular reform — BNCC, with the PISA and the mathematical literacy, by means of the Mathematics teachers' perceptions. In order to do it, we were guided by the following question: *what are the perceptions that the Mathematics teachers' have about the BNCC, about the PISA and about what is the proposed mathematical literacy proposed in the PISA and in the BNCC?* By means of the AC and the ACI, we found four *CI* which characterized the perceptions of the teachers who participated in the present study.

Between them, we can highlight the lack of knowledge of the Mathematics teachers from Basic Education, about the large scale evaluations, PISA, BNCC and the mathematical literacy.

In this context, by analyzing the *CI*, we verified that the teachers, in most part, know the BNCC in a general manner, but not all of them know the large scale evaluations with specificity in the PISA. By not knowing the PISA, we verify they did

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not perceive the existing relations between the PISA and the BNCC, and in this way they do not know the concept of mathematical literacy in the conception of PISA and BNCC. Most of them mistook mathematical literacy for mathematical alphabetizing. Beyond this, we verified most of the teachers pointed they did not have in their initial or continued formation the teaching about large scale evaluations, as well as about public politics of curriculum and evaluation. The teachers. Still highlight the need of a formation for mathematical literacy.

In this manner, we verified a distancing between what the curricular and evaluation educational politics present and the teachers' perceptions. If the large scale evaluations, such as the PISA, influence a curricular reform in Brazil, which is the BNCC, it would be necessary, before implementing it, preparing the teachers that are on the classroom floors in Basic Education and, in the same way, professors who train teachers, that is, professionals who act in universities and graduation courses, which train the teachers to act in Basic Education.

The teachers also reported they missed more discussions about eh BNCC and the area of Mathematics proposed in it. A curricular reform may have as consequence a resistance to the change and this reform will only show if it is positive or negative for Education after a certain time when it is totally implemented in Basic Education. The curricular reform will demand changes in the process of teaching and learning of Mathematics, one of them is the mathematical literacy. But, how to put in practice mathematical literacy if most of the teachers do not understand it and mistake it with alphabetizing? How to develop in the classroom the mathematical literacy if the teachers feel the need of a formation which guides them? When will it be done a formation about the BNCC and the mathematical literacy, in order to them to feel secure and prepared for such changes?

There is still the need of changes in Education, but which meet the reality of the true Brazilian Education, and which considers our social, cultural and economic diversities. It is indisputable the importance of curricular reforms, in the same way it is important that these are democratic and consider the real protagonists of this context, that is, that they listen to what the educators have to say about the demands, impacts, challenges and insufficiencies of Education, as well as of the relation with the students, our greatest objective in Education. If the objective is to improve indexes to obtain better economy in the country, a possible way would be to look at the reality and the

diversity of Brazil as a whole, and not only base on a minority which does not have interest in the student, in the teacher and in the function of Education. However this is the subject of a following article!

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