Mathematics degrees and the Enade Concept in 2021

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ABSTRACT
In this article, the discussions revolve around the evaluation of undergraduate courses in mathematics about the Enade Concept of the 2021 edition. Thus, the main objective was to position these courses according to the respective Enade Concept obtained in this edition. To this end, a methodology with a mixed approach was used, which encompasses both qualitative and quantitative analysis. In addition, a literature review, a documentary research and a search for data and information made available by the National Institute of Educational Studies and Research – Anísio Teixeira – Inep were carried out. From a quantitative point of view, the value for the Enade Concept ranges from 1 to 5, with 3 being the minimum "acceptable" value. The results showed a relatively low percentage of excellence in mathematics undergraduate courses in the context of the Enade Concept, although the percentage of courses with the acceptable Enade Concept was relatively high. They also pointed out evidence of advances in the qualities of certain courses, as well as needs for improvement in others.

Keywords: Course evaluation, Enade Concept, Teacher training, Quality indicator.

1 INTRODUCTION

In Brazil, there are several moments that can be used to be marked as initial in terms of evaluating the quality of education. For this study, the 1980s and 1990s are propitious because they brought the Federal Constitution of 1988 (CF/88) (Brasil, 1988) and the Law of Guidelines and Basis of Education (LDB) (Brasil, 1996).

According to Dias Sobrinho (2010, p. 195), "evaluation is the main tool for the organization and implementation of educational reforms". Thus, for the author, not only the educational systems would be qualitatively affected by the analysis of the results obtained in the institutional evaluations, but also society as a whole.

Ikuta and Barreyro (2021) associate themselves with Morosini (2009) and understand that, from these two decades onwards, quality began to enter into discussion in the higher education policy agenda: "with the expansion of the evaluating State, quality, as its substrate, acquires strength" (Morosini, 2009, p. 167).

Ikuta and Barreyro (2021), corroborating Rothen and Barreyro (2011), argue that: "both in the more democratic and managerial views, evaluation is understood as a primary mechanism in ensuring the quality of education or at least revealing the ills of Brazilian education" (Rothen; Barreyro, 2011, p. 11).

One of the definitions of the quality of education depends on the values and standards assumed by the actor when pronouncing. According to Ferreira and Amaral (2023), the concept of quality of education is one that promotes the student's personal development. This translates into the power of cultural creation, critical and reflective thinking (Ferreira; Amaral, 2023).

For Lima et al., (2020) the quality of education and the evaluation of the educational system, implemented by the Ministry of Education (MEC) from these two decades mentioned above, established as a duty of the State, the guarantee of the quality standard of education; of the Public Power, the authorization and evaluation of the quality of education provided by the private sector (Brasil, 1988). The evaluation of the quality of higher education, within the scope of students, courses and Higher Education Institutions (HEIs), is carried out by the National System of Evaluation of Higher Education (Sinaes), created by Law No. 10,861, of April 14, 2004 (Brasil, 2004).

Sinaes is characterized as the evaluation policy of Brazilian higher education, in line with the constitutional principle of guaranteeing the quality of higher education (Brasil, 2004). The first paragraph of article 5 of the Law that created Sinaes brought within its scope the link between the National Student Performance Exam (Enade) and this evaluation system. The objective of Enade is to evaluate the trajectory of undergraduate students in relation to the syllabus, skills and competencies acquired in their training (Brasil, 2004).

The evaluation process of this exam consists of four instruments that help in the evaluation of the quality of higher education and in the search for support for improvement policies, namely: the test, the student questionnaire, the test perception questionnaire and the course coordinator questionnaire (Inep, 2023a).

Enade is one of the evaluation processes foreseen for the operationalization of Sinaes, carried out by Inep, to assess the performance of students in relation to knowledge, skills and abilities developed throughout the course. As pointed out, based on the results of Enade and other official data, the quality indicators of higher education are calculated, one of them being the Enade Concept.

It is considered relevant to analyze the use of the results of the Enade Concepts in the orientation of teacher training courses, evaluating them as an instrument to measure efficiency or to propose actions for improvements in undergraduate courses, especially mathematics degrees. For Álvares (2021), it would be important to discuss public educational policies for higher education and the challenges of teacher training courses in Brazilian education, as it would contribute to studies related to policies for evaluating this level of education (Álvares, 2021).

In the last two decades, a range of transformations has occurred in the educational spheres with regard to the requirements for the performance of teachers in basic education. In view of the requirement established in the country's official documents. This documentation was the guideline for the requirement

to train professionals to work in Brazilian education (Oliveira, 2020).

From such requirements, the importance of the National Common Curricular Base (BNCC) and the National Curriculum Parameters (PCNs) are recorded, in which the determinations to be fulfilled for teaching are foreseen. In addition, these two documents are guiding entities that foster the curriculum structuring and planning of Brazilian education professionals (Oliveira, 2020).

In view of the above, this study sought to answer the following questions: how are the undergraduate courses in mathematics positioned in relation to the Enade Concept? In the current scenario of higher education in the country, does this indicator of the quality of higher education actually measure the quality of this course?

To this end, this work was organized as follows: in addition to this introduction, 6 more sections were elaborated, and in the second section the methodological procedures were presented; in the third section, the regimental and regulatory structure of institutional evaluations was dealt with, focusing on the Enade Concept; In the fourth section, the trajectory of mathematics teacher training was presented; in the fifth section, emphasis was placed on the analysis and discussion of the results; In the sixth section, the final considerations were presented, making a synthesis of this work and; Finally, the bibliographic references

2 METHODOLOGICAL PROCEDURES

The methodology used in this study has a mixed approach that encompasses both qualitative and quantitative analysis. The mixed methodology studies of Creswell and Clark (2013) were characterized as a combination of two methodological procedures, without relating them to the philosophical conceptions that underlie this approach. According to Leite et al. (2021) in the studies by Tashakkori and Teddlie (1998), these authors "denoted a broader definition and characterized it as a methodological orientation in which the two methods (qualitative and quantitative) are mixed in all phases of the research, from collection, analysis of results, to philosophical positions" (Leite et al., 2021, p. 4).

Leite et al. (2021), referring to the studies by Tashakkori and Creswell (2007) regarding the combination of qualitative and quantitative methodologies, point out that they comprise "[...] as research in which the investigator collects and analyzes the data, integrates the findings, and draws inferences using qualitative and quantitative approaches or methods in a single study or research program" (Tashakkori; Creswell, 2007, p. 4)

For Galvão, Pluye and Ricarte (2018), the data analysis techniques associated with mixed methods are content analysis, as well as thematic analysis and statistical analyses. Mixed reviews contribute to methodological rigor. The authors argue that:

> Systematic mixed reviews, those that spell out all the elements. Reproducible mixed reviews, those that make explicit enough elements to enable other researchers to retrace their construction path. The

> exploratory sequential mixed review consists of two steps. In step 1, the results of qualitative, quantitative, and mixed-method studies are transformed into qualitative findings using, for example, thematic analysis. In the 2, when there is a common entity among quantitative studies, the quantitative results are tabulated and compared. The interpretation of the findings in stage 1 and stage 2 suggests new hypotheses and may reveal flaws in existing scientific knowledge (Galvão; Pluye; Ricarte, 2018, pp. 13-15).

As the mixed methodology combines quality and quantitative data collection, it organizes and highlights the strengths of both qualitative and quantitative methodology. Therefore, they minimize their weaknesses to provide a comprehensive and integrated understanding of the topic being investigated.

According to Creswell (2012), adopting a mixed methodology requires a series of decisions. One of them refers to the approach that best suits the formulation of the research problem. Other decisions are: "[...] time distribution; the ways of combination and weight that the qualitative and quantitative methods will have in the study; the best visual model; and the strategy and approach that make the researcher more comfortable to employ" (Creswell, 2012, p. 14).

It is noteworthy that, in a research with mixed methodology:

> [...] the researcher collects and analyzes both qualitative and quantitative data in a persuasive and rigorous manner; performs a combination of two forms of data concomitantly, in a sequential manner, making one construct the other or incorporating one into the other; prioritizes one or both forms of data, uses these procedures in a single study, or in multiple phases of a study program; structures these procedures according to philosophical worldviews and theoretical lenses; and combines the procedures into specific research projects that direct the plan for conducting the study. (Creswell; Clark, 2013, p. 22).

Leite et al. (2021), assimilating the study by Sampieri, Collado and Lúcio (2013) about the mixed methodology, point out that these authors argue that "a solid mixed study begins with the formulation of a compelling problem and clearly demands the use and integration of the quantitative and qualitative approaches [...]" (Sampieri; Glued; Lúcio, 2013, p. 557).

2.1 DATABASE EXPLORATION AND SEARCH

In addition to these factors, a collection of government documentation, articles, dissertations, among others, was also prepared. For exploratory purposes, reports from Official Institutions were consulted and interpreted, such as Inep and MEC.

The data used in this study about the Higher Education Quality Indicator, Enade Concept, are secondary with origins in public data available by Inep. These are data corresponding to the Enade 2021 results cycle published in September 2022.

In order to identify relevant reading results related to teacher training, higher education and quality of higher education, a combination of research strategies was used. These included: exploration and research through relevant work bases; verification of the reference list; citation search and; other sources.

Four databases were selected: *Scielo*; journal portal of the Coordination for the Improvement of Higher Education Personnel (Capes); *Elsevier* and *Science Direct*, *Education Resources Information Center* (Eric). Chart 1 shows the criteria for how the articles were selected.

Table 1 – Inclusion and exclusion criteria for selected articles

CRITERION – FOCUS		
Bachelor's Degree in Mathematics	Teacher Training Mathematics	Language
Quality of courses Enade Concept Institutional Evaluation.	Regulation of Training Reformulation of the Dynamic Training of Institutions	English Spanish Portuguese

Source: prepared by the author (2023).

Certain criteria were established that would meet the prerogatives of this study, in order to ensure a certain degree of quality and relevance of the selected articles. The articles were included in the analyses if their focus was: Course Quality, Enade Concepts, Institutional Evaluation. The population of interest were subjects related to Mathematics Teacher Training, such as Training Regulation, Training Reformulation and Institution Dynamics; Articles published in Spanish, English and Portuguese.

The bibliographic and documentary research was carried out between June 2022 and April 2023, comprising articles written between 2012 and 2023, with some publications related to the theme that were outside this period. A total of 104 articles were identified for the screening of titles, which were abstracts and bibliographic information. Based on this, the inclusion/exclusion criteria mentioned above were verified. After the completion of this stage, 38 studies were classified.

At the end of this stage, 06 were excluded, as they did not meet the criteria established for this research. In view of the above, 32 articles were selected for thematic analysis. In addition, the abstracts and titles of 2 books were included in the final review. Official government documents available on portals were analyzed, such as: of the planalto.gov, of the mec.gov, which deal with Laws, Decrees, Resolutions, Norms and Guidelines, Institutional Programs and other normative acts.

3 THE ENADE CONCEPT

According to Moreira, Moreira and Araújo, (2022) indicators have the function of assisting measurement processes that contribute to the interpretation of a given subject or theme. The use of performance indicators in the public sector differs from the private sector, because the purpose of public institutions is society's satisfaction with public services, unlike companies, which focus on profit.

For these authors, Performance indicators are instruments used to quantify the efficiency or effectiveness of decision-making, in order to evaluate how activities are being carried out, including in

comparison with pre-established goals. In terms of results, the use of performance indicators is the most effective and least costly method of evaluating and modifying people's behavior when properly defined (Moreira; Moreira; Araújo, 2022).

In this sense, according to Sousa and Callado (2019), the use of performance indicators has limitations:

> The difficulty of developing performance indicators that convincingly represent long-term projections, the complexity of using an indicator to represent performance, since an isolated indicator is not able to cover the different areas of the organization [...] are some of the aspects that require caution in the use of indicators and in the elaboration of a performance measurement system (Sousa; Callado, 2019, p. 3).

In the case of education, the use of indicators in the measurement of educational structures around the world has been a practice used by several countries through governments and international organizations (Moreira; Moreira; Araújo, 2022). The Higher Education Quality Indicators are important instruments for evaluating Brazilian higher education. Expressed on a continuous scale and in five levels, they are directly related to the Enade evaluation cycle, which determines the areas of evaluation and the courses linked to them (Inep, 2023b).

> The Enade Concept is a quality indicator that evaluates courses through the performance of students in Enade. As a result, "the calculation of the Enade Concept is carried out by undergraduate course, identified by the course code contained in the e-MEC system, according to the framework carried out by the IES in the Enade system" (Inep, 2023b, s.p).

The Enade Concept is positioned as one of the instruments that translates into an indicator that measures the student's performance in the test. From a qualitative point of view, the Enade Concept is defined as a quality indicator that evaluates undergraduate courses based on the results obtained by students in Enade.

It is calculated for each course that is evaluated, identified by the course code registered and defined by the HEI for student enrollment and for the classification of courses in one of Enade's evaluation areas (Inep, 2018). To calculate this Concept, the following information is taken into account: the number of graduating students with valid results, hereinafter referred to as participants; the performance of these participants in the General Training part of the exam and; their performance in the Specific Component part (Inep, 2018).

In the quantitative aspects, the Enade Concept goes through a process of standardization and rescheduling. All the original measurements, referring to the Enade Concept, are standardized and rescaled to assume values from 0 (zero) to 5 (five), in the form of continuous variables. The standardization and rescheduling process goes through two stages: the first consists of calculating the standardized distance from

each undergraduate course, using the means and standard deviations calculated by evaluation area (Inep, 2018).

The second consists of the transformation of standardized leaves into standardized grades that also assume values from 0 (zero) to 5 (five) (Inep, 2018). The initial step for calculating the Enade Concept of a course is to obtain the average performance of the course graduates in General Training and the average performance of the course graduates in the Specific Component (Inep, 2018).

From the obtaining of these values, it is possible to calculate two terms: the standardized grade of the graduates in the General Training and the standardized grade of the graduates in the Specific Component. The Enade Grade of the course is the weighted average of these two terms: (0.25) (0.75) (Inep, 2018).

The part referring to General Training contributes 25% of the final grade, while the part referring to the specific component contributes 75%. The course grade obtained is a continuous variable in the range between 0 (zero) and 5 (five), per construction. To obtain the Enade Concept, the course grade must be rounded to two decimal places according to standard procedure (Inep, 2018).

Courses that did not have any students present in the exam and, therefore, it is not possible to calculate a concept in these cases – these courses are even excluded from the (Inep, 2019). Table 1 shows the Enade Concept linked to the interval corresponding to the final grade.

Table 1 – Parameters for converting the Enade Note into the Enade Concept

Enade Concept (Track)	Final Grades (NC) (Continuous value)
1	$0{,}000 \leq NC < 0{,}945$
2	$0{,}945 \leq NC < 1{,}945$
3	$1{,}945 \leq NC < 2{,}945$
4	$2{,}945 \leq NC < 3{,}945$
5	$3{,}945 \leq NC < 5{,}000$

Source: Inep (2018).

It is important to note that as of 2008, the Enade Concept began to consider in its calculation only the performance of graduating students. Thus, all calculations consider only the graduating students participating in Enade. In this sense, therefore, the discussion around the Enade Concept as a way to try to achieve a better balance in the results of students graduating from HEIs, brought an important innovation to Enade.

However, Griboski (2012, p. 188) points out that the main aspect to be considered in the application of Enade, "much more than the result achieved, is the student's participation in the evaluation process, an aspect that should be a central element to know the quality of the course being offered".

4 MATHEMATICS TEACHER TRAINING

In the second half of the twentieth century, the developmentalist policy promoted a rapid and marked

expansion of basic education in the country. According to Jesus, Santos and Araújo (2023), the movement provided by this policy demanded more mathematics teachers. The legal requirement for a minimum qualification provided for at that time ended up generating a shortage of qualified teachers to meet this demand. The emergence of this imbroglio was only resolved after the government reduced the legal requirements and created short-term degrees (Jesus; Saints; Araújo, 2023).

It was in the first decade of the twenty-first century that the process of standardization of teacher training took place. During this period, the government implemented a series of resolutions and guidelines that established criteria and procedures that should be followed for the organization and reorganization of teacher training courses in the country (Cruz; Bayer, 2017).

Thus, according to LDB/96, undergraduate courses in licensure are those that provide initial training for the performance of teachers in basic education. The average duration of these courses is four years and they are offered in public and private HEIs, both in the face-to-face and distance modalities (Cruz; Bayer, 2017).

Teacher training is regulated by the resolution of the National Council of Education (CNE), Resolution No. 02, of December 20, 2019 (Mec, 2019). According to Uliana et al. (2020), this resolution established changes in the previous resolution, Resolution No. 02 of July 15, 2015 (Mec, 2015). The purpose was to bring teacher training and the BNCC closer together (Uliana et al., 2020).

According to Barichello and Firer (2021), initial teacher training has been much debated in the country due to this legislative apparatus put in place by the government to implement regulations that have a positive impact on this issue. According to these authors, Gatti, Sá Barreto and André (2011) point out, through their studies, that several problems, including the excessive proliferation of distance education courses and the structure of curricular organization with little emphasis on practical aspects of the profession (Barichello; Firer, 2021). As a result, "the theory-practice relationship so emphasized in documents and norms, with the proposed integrated curricular design, is not materialized in the daily life of the different degrees" (Gatti et al, 2011, p. 114).

For Boff and Fabris (2022), analyzing teaching in current times and evaluating the forms of implications in the training of mathematics teachers, is the fact that "seeks to transform theory and practice and the privilege of one dimension over the other in this training" (Boff; Fabris, 2022, p. 2).

With this, they advocate a:

> To look more freely at the teaching of Mathematics and to constitute it as an object of our thought, which enabled us to describe and analyze the productivity of the statements about theory and practice in the processes of education in Contemporaneity. When we look at the training of Mathematics teachers and, specifically, at the teaching in Mathematics that is developed in formative contexts, we pay attention to the studies of Mathematics Education and the meanings of theory and practice put into circulation in this field of training (Boff; Fabris, 2022, p. 3).

For Cruz and Bayer (2017), it is essential that the profile of students applying to undergraduate courses, especially undergraduate courses in mathematics, gather knowledge of the knowledge, skills and expectations of these candidates as students of the teaching profession. This fact allows HEIs to develop their courses according to the profiles of these students entering undergraduate courses (Cruz; Bayer, 2017).

The school experiences acquired over time show the potential of initial teacher training processes. It allows a dynamic of public schools that mobilize teachers to diversify their teaching practices. This fact contributes to the construction of concepts, including mathematical concepts, and, therefore, to the improvement in teaching and student learning (Cruz; Bayer, 2017).

Inserted in the evaluation system, the Enade tests sound like a regulator of student learning, considering that using them as an evaluation in the teaching process would be in accordance with the proposal of defending that they contribute to the improvement of learning (Waideman et al., 2017). In addition, they instruct teachers about the processes in which learning occurs. The items that make up the tests can become a teaching and learning resource in mathematics (Waideman et al., 2017).

It is understood that, in order to teach, especially mathematics contents, the teacher needs an initial training that includes knowledge of this content and didactic knowledge, in relation to the methodology used to teach these different contents (Silva; Viginheski; Shimazaki, 2018).

In addition to these requirements, there is a need to include in the initial training of teachers knowledge that includes the learning processes, taking into account that this occurs in different ways. It is important to consider "[...] that this happens in different ways, in view of the diversity present in the classroom. Among this diversity, there is the issue that some students have special educational needs, such as people with disabilities" (Silva; Viginheski; Shimazaki, 2018, p. 2).

Considering the school's preambles in relation to the teaching of mathematics, it is important to emphasize that "mathematical learning occurs when the student can be allowed to solve problems, investigate and explore the various dynamic situations that bother him" (Silva; Viginheski; Shimazaki, 2018, p. 3). For these authors, it is important that the teacher also "goes through teaching experiences and teaching experiences that go beyond traditional teaching, based on formulas, examples and repetition, based on formulas, examples and repetition" (Silva; Viginheski; Shimazaki, 2018, p. 3).

The relationship between theory and practice is an academic consideration that has been present in the community of mathematics teacher educators for many years. From this perspective, the overcoming between theory and practice is verified, which is a hallmark of the training courses of teachers in Brazil (Gatti et al., 2019). Therefore, it is possible to consider that "[...] teacher training can be seen as a process of induction into a community of practice and discourse that has its own tools, resources, shared ideas and debates" (Ponte, 2002, p. 4).

The discussion about how to approach the relationship between theory and practice is still alive in

mathematics teacher training programs. Interpret this as an indication that the teacher community remains interested in seeking ways to bridge the gap between theory and practice (Aguilar, 2011).

According to Espitia (2016) in teacher training programs,

> [...] The preparation of teachers in terms of mathematical knowledge for practice and research projects can be presented in three axes. The first refers to the consensus that requires more than advanced mathematical knowledge in the preparation of teachers; the second permeates the evolution in the recognition of diverse tools as practical support for the teacher, and the third highlights qualitative research as the main approach for the improvement of practice and collaborative research (Espitia, 2016, p. 100).

In this sense, it can be seen that teacher quality is a multidimensional concept that includes cognitive and non-cognitive factors (Sezer; Çakan, 2022). In addition, it would provide a description of teacher qualifications that would contribute to student performance and provide guidance for effective teacher education programmes and comprehensive planning of teacher education programmes (Sezer; Çakan, 2022).

In the line of understanding the quality of a teacher, what would be the position of the question: what kind of knowledge and skills would a person need to be a "good" mathematics teacher? For Aguilar (2011, p. 135) "there are studies that underline the importance of mathematical knowledge, but there is a recognition that having mathematical knowledge is a necessary but not sufficient condition for being a good mathematics teacher."

With regard to the mathematics degree course, it is known that the knowledge of the subject by teachers and the pedagogical knowledge of the content are significantly correlated with the performance of mathematics students (Sezer; Çakan, 2022).

> Therefore, it considers the importance of specific knowledge and practices in the teaching of mathematics, such as general pedagogy, knowledge of the subject, teaching in space/time and the appropriate use of resources, materials and activities, in view of the needs of students (Sezer; Çakan, 2022).

For all these reasons, it would be important to bring these discussions to be evaluated at a formal level. Enade is characterized as a diagnostic evaluation, in which the results can be used to correct and overcome difficulties. It is considered that the content of the Enade exams can be an important indicator of the skills and contents required in the DCNs of students graduating in undergraduate courses.

The Enade test is a large-scale assessment, and is carried out by graduates of undergraduate courses. The contents are those contained in the DCNs and the competencies are related to General Training and Specific Training. The exams offer quality information for teacher training. In addition, reflections on the contents of the items both in the area of training knowledge and pedagogical aspects (Judensnaider; Figueirôa; Villar, 2021).

According to Waideman et al. (2017), undergraduate courses in mathematics have not obtained satisfactory results in the Enade exams. With

> [...] access to the low average performance rates of Mathematics courses, it is believed that we can use the Enade tests as a regulator of student learning, considering that using assessment in the teaching process is in line with the idea of Hadji (1994, p. 63) who believes that it can "contribute to improving ongoing learning, by informing the teacher about the conditions in which this learning is taking place, and by instructing the learner about his or her own path, successes and difficulties", the test questions can become a teaching and learning resource. (Waideman et al., 2017, p. 6).

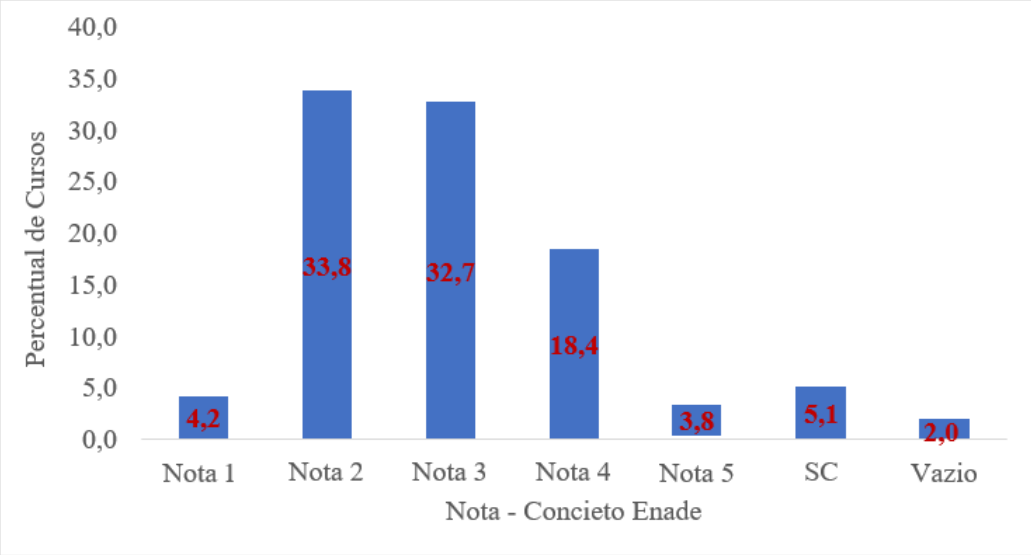
In the context of the Enade test, it could be added that, in this way, the evaluation would be "at the service of learning, providing moments of reflection for both the student and the teacher; to the latter, so that it regulates its teaching process and to intervene, to the former, so that it regulates its own learning process" (Buriasco; Mendes, 2015, p. 471).

5 ANALYSIS AND DISCUSSION OF RESULTS

In 2021 there were 452 undergraduate courses in mathematics in the country, of which 226 (50%) are in Federal Institutions of Higher Education (IFES). Of the undergraduate courses in mathematics offered in these IFES, only 13 (5.8%) obtained the maximum grade referring to the Enade Concept. Of the undergraduate courses in mathematics offered in private HEIs that obtained the Enade Concept with grades 1 and 2, 26 are in private for-profit HEIs and 19 in private non-profit HEIs.

Graph 1 shows the distribution of courses and the grade obtained in the 2021 edition of ENADE.

Graph 1 – Percentage of courses with their grades in the Enade Concept



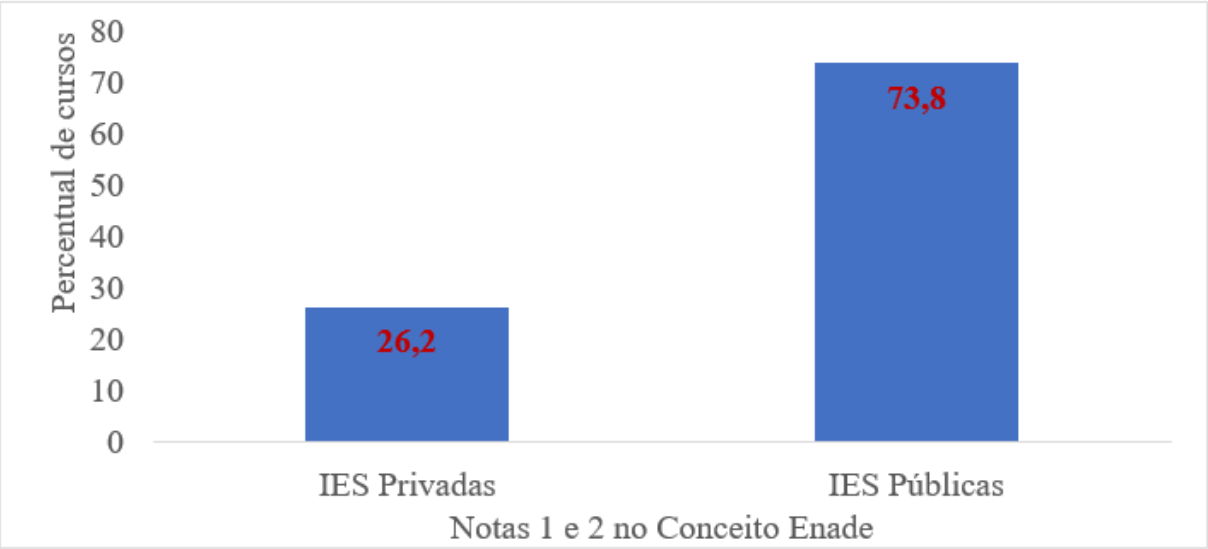
Source: Inep (2023b).

The "Empty Concept" corresponds to the course for which it was not statistically possible to calculate

the indicator (Inep, 2023b). In this case, the Enade Concept is not assigned to the course. In the 2021 edition, this fact occurred for 9 courses, which corresponds to 2.0% of the total courses. On the other hand, only 17 courses obtained Concito Enade 5, whose value is maximum. Of these 17 courses, 13 are offered in IFES, 2 in State Public HEIs and 2 in private HEIs.

In this edition of Enade, 172 undergraduate courses in mathematics obtained grades below average, that is, grades 1 and 2. Graph 2 shows the percentages of these courses by administrative category.

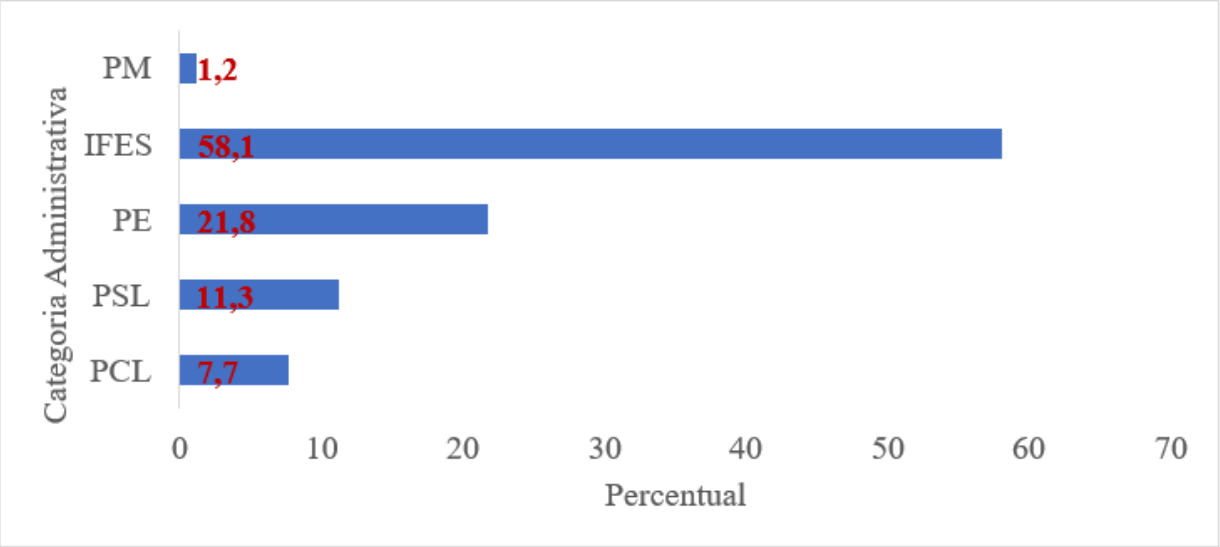
Chart 2 – Percentage of undergraduate courses in mathematics with grades 1 and 2 in the Enade Concept in the 2021 edition



Source: Inep (2023b).

Of the total number of undergraduate courses in mathematics, 248 obtained grades greater than or equal to 3, that is, greater than or equal to the average. These courses are within the expected for the purposes of the Enade Concept. Graph 3 shows the distribution of the percentages of these courses according to the administrative category.

Graph 3 – Percentage of Courses with grades greater than or equal to 3 in the Enade Concept in the 2021 edition



Source: Inep (2023b).

In this graphic, the acronyms PM, stands for municipal public HEIs; IFES, Federal Institutions of Higher Education; PE, state public HEIs; PSL; private non-profit HEIs and; PCL, private for-profit HEIs. It can be seen from the data that, in public HEIs, there is a higher percentage of courses with grades equal to or above the average.

The uninterrupted discussions about the methodological processes in the context of the training of mathematics teachers, associated with the data collection regarding the mathematics degree courses, tend to contribute to improvements both in the teaching and in the learning of this discipline, whose knowledge is universal and essential for the human mind.

6 FINAL THOUGHTS

It is considered that the Higher Education Quality Indicators are, so far, adequate and indicated to measure the quality of higher education. Thus, discussions about the objectives of higher education and the quality of the training process are not recent and are not restricted to the national context.

Several countries are working to improve indicators that can measure the quality of the training offered (Fior; Mercuri, 2018). The interaction between the evaluation institutional indicators and its indicators can serve as interference in the structure and organization of HEIs, pointing out paths to be followed and possible bottleneck solutions in the scope of institutional management and planning (Bernardes, 2019).

For Bernardes (2019), the composition of institutional self-assessment as proposed by Sinaes, is part of a managerial vision, since it proposes to achieve the improvement of higher education quality processes through the indicators indicated. Institutional indicators would be directed towards efficiency, effectiveness

and productivity.

However, from another perspective, it would be directed towards regulation and control and, therefore, the formative characteristics could help in the implementation and maintenance of educational policies, in order to monitor the evolution and point out the flaws that arise in the teaching and learning processes (Bernardes, 2019). Thereby

> The difficulty with the lack of knowledge about the criteria in mathematics teacher training programs to establish didactics in the course progress". The author adds that this fact "could be explained by the great diversity of knowledge necessary for the interconnection of teaching and the interconnection of didactic knowledge with other knowledge". In addition, there is the fact that teachers' knowledge comes from different conceptions and different contexts (Chaves, 2016, p. 112).

All this makes it clear that, in order to study, understand and analyze mathematics teacher training programs, it would be necessary to build a conceptual and methodological system that would allow us to address and understand part of their complexity (Chaves, 2016).

Taking into account these considerations, in the elaboration of this work, the analysis and interpretation of official data made available by INEP enabled a mixed analysis. The evidence pointed to an initial expectation that these data and information actually portray the reality of challenges imposed for discussion around the training of mathematics teachers.

With this, what led to the questions: how do undergraduate courses in mathematics position themselves in relation to the Enade Concept? In the current scenario of higher education in the country, does this indicator of the quality of higher education actually measure the quality of this course? They could be ascertained from the analysis of data made available by Inep and, having as answers that, although the data point to a percentage close to 40% of the courses are below the average, with regard to the Enade Concept, there is a concentration of efforts on the part of educational institutions to propose improvements to the country's teacher training programs.

With regard to the measurement of the quality of the courses, the indicators of the quality of higher education are derived from the evaluation. This assessment is an instrument of legitimation of governments that have played relevant roles in educational systems, especially with regard to educational reforms. These reforms are processes originating from the globalization system and, therefore, have their fingerprints registered in social, economic and political factors (Arantes; Alves; Baptist, 2022)

It is necessary to take into account that this study dealt with only one of the three indicators of quality of higher education and that it is necessary to evaluate other parameters in order to have a more detailed understanding of teacher training programs. Facts that, analyzed together, can demonstrate the needs and challenges posed for the improvement of these programs.

In addition, other factors, such as policies to value teachers' careers, combat violence in schools and

a continuous improvement plan that can attract talent to the teaching area. Within this problem, it was possible to achieve the main objective of this study, which consisted of positioning the undergraduate courses in mathematics according to the respective Enade Concepts obtained in the 2021 edition.

Finally, it is considered that this study presented its contour line in the limits of data presented by the agency responsible for educational data and in the theoretical framework about the subjects addressed in this study. In this sense, difficulties in comparing with other data sources in the pertinent periods, such as the variables analyzed here, which may not have the same connotations, being arbitrarily defined according to the convenience of the study, such as percentage of courses and administrative category.

Thus, future studies could deepen or even give new dimensions of pertinent analyses, such as, for example, examining the Enade Concept for these courses in other editions of Enade; the effective costs of these courses in private HEIs and, thus, extend the understanding of the problem of mathematics teacher training in the country.

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