

ARTICLE

APPROPRIATE ASSESSMENT TO THE CURRICULUM?
WHAT IS EXPRESSED BY THE CONTENTS REQUIRED IN THE NATIONAL
EXAMS OF BIOLOGY IN PORTUGAL AND BRAZIL

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ABSTRACT: The objective of this research was to analyze the correspondence between the guiding principles of the Biology curriculum and the National Examination in Portugal and the National High School Examination (ENEM) in Brazil. To this end, an empirical documentary study was developed to analyze the questions of the Biology of the above-mentioned examinations. It was found that both Exams have a reduced number of Biology questions to test the various contents indicated by the official documents, as well as favoring certain contents. When testing scientific knowledge, Portugal surpasses Brazil, as it presents essay questions in the structure of the Examination. National Examinations may standardize, in terms of knowledge, what will be taught by requiring more questions on a given topic.

Keywords: National Examination. Evaluation. Curriculum.

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AVALIAÇÃO ADEQUADA AO CURRÍCULO? O QUE DIZEM OS
CONTEÚDOS SOLICITADOS NAS PROVAS DE BIOLOGIA DOS
EXAMES NACIONAIS EM PORTUGAL E NO BRASIL

RESUMO: Analisar a correspondência entre os princípios orientadores do currículo da disciplina de Biologia e o Exame Nacional em Portugal e do Exame Nacional do Ensino Médio (ENEM) no Brasil foi o objetivo desta pesquisa. Para tanto se desenvolveu um estudo empírico documental de análise das questões das provas de

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Biologia dos Exames supracitados. Constatou-se que ambos os Exames têm um número reduzido de questões de Biologia para testar os diversos conteúdos indicados pelos documentos oficiais, bem como privilegiaram determinados conteúdos. Em se tratando de testar os saberes científicos, Portugal supera o Brasil, pois, apresenta na estrutura de seu Exame questões dissertativas. Os Exames Nacionais podem vir a padronizar, em termos de conhecimento, o que será ensinado ao exigirem mais questões relativas a determinado tema.

Palavras-chave: Exame Nacional. Avaliação. Currículo.

¿EVALUACIÓN ADECUADA AL PLAN DE ESTUDIOS? LOS CONTENIDOS SOLICITADOS EN LAS PRUEBAS DE BIOLOGÍA DE EXÁMENES NACIONALES EN PORTUGAL Y BRASIL

RESUMEN: El objetivo de esta investigación fue analizar la correspondencia entre los principios rectores del plan de estudios de Biología y el Examen Nacional en Portugal y el Examen Nacional de Enseñanza Media (ENEM) en Brasil. Con este fin, se desarrolló un estudio documental empírico para analizar las preguntas de los exámenes de Biología mencionados anteriormente. Se constató que ambos exámenes tienen un número reducido de preguntas de Biología para probar los diversos contenidos indicados en los documentos oficiales, así como tienen contenidos privilegiados. Cuando se trata de probar el conocimiento científico, Portugal supera a Brasil, ya que presenta preguntas desarrollo en la estructura de su examen. Los exámenes nacionales pueden estandarizar, en términos de conocimiento, lo que se enseñará al requerir más preguntas relacionadas con un tema dado.

Palabras clave: Examen Nacional. Evaluación. Plan de estudios.

INTRODUCTION

The evaluation of learning has been confused with the evaluation of the education system. Assessing learning means using a variety of tools to diagnose how much learners have learned (or have not learned) and thus make corrections to the direction of the teaching-learning process, if necessary. In turn, evaluating the education system is much more than analyzing students' grades at a certain level of education. Evaluation must be systemic and take into account factors such as school infrastructure (teaching support equipment, laboratories, libraries and their collections, etc.), the opportunities for continuing education offered to teachers, and the socio-economic and cultural characteristics of students.

According to Santos, "it is increasingly essential to know how to use and analyze data from external evaluation in order to obtain credible information that allows us to improve the curriculum, assessment and didactics, taking into account all the specificities and diversities that characterize our educational system" (SANTOS, 2014, p.151). The intervention of the Ministries of Education of the countries is necessary to ensure the implementation of educational policies as a whole. Therefore, understanding the concepts of evaluation from the perspective of the school and the educational system present in official documents is fundamental.

Those who think that education and the economy are completely separate, detached, are being eluded. The importance of education for the economy is so evident that its relationship is explicit in different official documents from different countries and bodies.

According to Marcon (2015), various multilateral organizations such as the World Bank (BW), the International Monetary Fund (IMF), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the Organization for Economic Cooperation and Development (OECD), the Inter-American Development Bank (IDB) and the International Bank for Reconstruction and Development (IBRD), created since the end of the Second World War with political and economic objectives, began to act systematically in the field of education, in the broadest sense and, in educational policies, in particular. In addition to these actions, there has been a growing spread of an ideology that strongly links education and economic development of countries.

This brings us to the present day, where the phenomenon of globalization has taken shape and imposes on future employees the need to master Information and Communication Technologies (ICT), to know how to speak a second language, without leaving aside the mastery of the mother tongue (reading and writing), mathematics and sciences.

All this without forgetting the acquisition of transversal competences - increasingly well-informed professionals, with emphasis on group work, peer interaction and group performance assessment, capable of performing multiple tasks with multidisciplinary knowledge. (SILVA, 2009).

In the Biology discipline, the development of scientific literacy (competence) is directly related to the student's ability to "explain scientific phenomena and draw informed conclusions on issues related to science". (PINTO-FERREIRA, SERRÃO e PADINHA, 2006, p.6).

At this point, we arrive at two basic questions – How do we achieve the standardization of competencies? How does decision-making about what to teach occur? The answer to both questions is interlinked, because it is easy to see that through the reformulation of curricula, standardization is achieved, with those influenced by public policies in the educational area. Two examples of standardization of curricula to achieve such propagated competencies and thus obtain the so dreamed economic development and improve competitiveness, were implemented in Portugal: Bologna Process (1999); reorganization of the National Curriculum of Basic Education – Core Competencies (2001) and in Brazil – National Curriculum Parameters - PCN and PCN+.

The interrelationship between Public Policies and Curricula brings us back to the context of the economy *versus* education, where the conduct of these policies is the product of articulations at a global level, as can be seen on the European Commission's Education page, through the description of the “Role of the EU in the field of education and training”:

[...] European Union policy aims to support national action and contribute to solving common problems such as ageing societies, skills gaps in the workforce, technological change and global competition. (EUROPEAN UNION [s.d.]).

You can also find it on this page:

While education and training systems are the responsibility of Member States, the European Union plays a key role in supporting and complementing efforts to improve and modernize national education systems. (EUROPEAN UNION [s.d.]).

UNESCO itself, in the preface to its 2015 Education for All (EFA) Global Monitoring Report, mentions that “EFA Global Monitoring reports have played a prominent role in the journey to 2015 in supporting countries, providing robust assessments and analysis to underpin new policy development”. (UNESCO, 2015 p.4)

These reports are presented in a configuration that involves the evaluation of student learning associated with the quality of educational systems and have as assumptions “to diagnose to correct deviations, realigning local educational agendas according to the adjustments proposed by the agencies that sponsor them, and present legitimations that reaffirm their propositions, not only as being the best, but also the fairest”. (CAMPOS, 2005 p.2).

The question then arises: how is it diagnosed and legitimated to intervene? In education it's been, in part, through exams. We came to a huge amount of Benchmarking tests (internally promoted by schools), National Examinations (eg. ENEM) and international (eg. TIMSS and PISA).

NATIONAL EXAMINATIONS AND THEIR IMPLICATIONS FOR THE EDUCATIONAL SYSTEM

At first, National Large-Scale *Assessment* examinations were introduced in many countries with the aim of diagnosing and improving the education system.

Anderson (2005), mentions that countries such as China, France, Hong Kong and Japan have begun to employ national assessments to measure student performance and consequently make decisions about student progress. However, as already mentioned at the beginning of this article, education policy makers around the world have used Exams in an accountability approach. This accountability, in turn, has had a major impact on schools, i.e. on managers, teachers and students.

Authors such as Looney (2011), Nichols e Berliner (2007), report that when the evaluation system places an importance, a very great weight on external evaluations, teachers and principals perceive these, as a threat.

Klieger (2016) conducted a survey in Israel, which found that only 6 principals (out of 30) and 13 teachers (out of 92) saw the large-scale National and International Exams as a working tool. Scherer and Cruz (2015) point out that large-scale evaluation policies, in addition to marking/labeling some students and/or schools, hold the actors involved in the learning process (parents, teachers and the students themselves) accountable, without necessary reflection on the causes of these results. Others, such as Gesser and DiBello (2016), refer to the privilege of areas and Ventura (2014), to disciplines in detriment of others, as we see in the texts below:

[...] Therefore, in schools, and in particular in disciplinary groups, there is a great concern for the management of the curriculum of the subjects of the years with National Examinations, which does not always happen with those of the remaining years of schooling. (VENTURA, 2014, p. 90).

[...] The level of alignment and standardization that we perceive impact the school curriculum in terms of what should be taught and with which materials (books, ideologies, logic, and other resources) the students will be taught. In addition, it will affect the practice of teachers in terms of how to teach and why to teach certain subjects to the detriment of others available and other ways of learning and knowing. (GESSER e DIBELLO, 2016, p.89).

The direct relationship between National Exams and curriculum content is recurrent in many articles Ventura (2014); Caria and Oliveira (2015); Gesser and DiBello (2016). Similarly, the transmission of content remains a recurring concern of teachers.

It can be seen that there are many approaches that can be analyzed when referring to the subject. In this research, the focus was on the test instrument and what is requested there to the student, in order to contribute in some way to its elaboration in order to produce the desired effects upon its application.

METHODOLOGY

Purpose and type of study

In order to analyze the correspondence between the guiding principles of the Biology curriculum and the National Examination in Portugal and the National High School Examination (ENEM) in Brazil, an empirical study of

a documentary nature was developed. The analysis focused on the issues of Biology evidence from both countries in order to: 1) to characterize the tests of the National Examinations of Portugal with focus on Biology; 2) to characterize the tests of ENEM in Brazil with focus on Biology; 3) to analyze the contents of the Program and Curriculum Goals of the discipline of Biology-Geology of the Scientific-Humanistic Course of Sciences and Technologies (DECREE-LAW N° 139/2012) present in the questions of the National Examinations and 4) to analyze the contents of the National Curriculum Parameters for Secondary Education (PCN+) of the Biology discipline present in the questions of ENEM.

Documentary bases

The documentary bases considered in this research were the questions of the Biology examinations of the National Examination of Portugal, the 10th and 11th years of secondary schooling, in the period from 2010 to 2016, the 1st and 2nd phases, and also, in the case of Brazil, the questions of the tests of the same period of time, the subject Biology, which falls within the area of Nature Sciences and its Technologies.

The evidence from Portugal was obtained through the book published by the Editorial Office of the Ministry of Education of Portugal, called EME, which contains questions and resolutions of Exams. The access to the 2016 test was made through the official database of the Institute of Educational Assessment (IAVE.I.P 2013). In the book “Biology and Geology, 10th and 11th years: National Examinations, 2010-2015: 1st phase, 2nd phase and special periods” the questions of the National Examinations are classified by teaching unit, degree of difficulty and need for experimental knowledge for their resolution. These criteria were established by the teachers of the Association of Teachers of Biology and Geology - APPBG since the book is the result of a partnership between APPBG and the publisher of the Ministry of Education and Science. The book also contains complete and commented resolutions for both the construction items (essays) and the selection items (multiple choice) included in the exams.

In addition to the National Examinations, on the *website* of the General Directorate of Education (DGE) of the Ministry of Education (MEC), the Biology Program for the 10th and 11th years was obtained. These documents were extremely important, as they constituted the reference framework for the competences to be developed in students and the contents taught in the subject, as well as their respective lesson hours.

Information was also obtained through the reports of the Institute for Educational Evaluation, I.P. (IAVE), as well as the Contemporary Portugal Database (PORDATA), organized and developed by the Francisco Manuel dos Santos Foundation. Besides the InfoEscola portal of the Ministry of Education.

In Brazil, the ENEM tests were obtained from the *website* of the National Institute for Educational Studies and Research Anísio Teixeira (Inep). The National Curriculum Parameters for Secondary Education (PCN+) were used as a reference for contents to be developed in students. In relation to complementary information regarding Brazil, the websites of Inep (the institution responsible for ENEM) and the Ministry of Education (MEC) were consulted.

Exploratory analysis of examination evidence

In order to identify, record and analyze the characteristics, factors or variables that are related to the study in question, it was considered logical to know *a priori* the main characteristics of the Brazilian and Portuguese National Examinations. For this purpose, only the Biology questions of the National Examinations of Portugal were selected and tables were prepared in which the presence/absence of the content was recorded, by phase of application of the test, in the respective year of the test, thus obtaining the frequency with which each content appeared in the tests of the period analyzed in this research. In these tables, the questions were identified with the group to which they belong (GII or GIV) and the question number. It should be noted that this analysis was carried out taking into account that, in Portugal, the test can be taken in more than one phase and that the Biology subject is biannual, that is, it is offered in two of the three years of secondary education. Thus, the tests of phase 1 and 2 of the Exams for the years 2010 to 2016 were analyzed.

After this procedure, the number of times that each content was requested in the tests was added and the percentiles were calculated. Based on these results, graphs and tables were prepared to synthesize the data obtained.

In relation to ENEM, the first process was to select, among the 45 questions of Nature Sciences and its Technologies, those exclusively of Biology. This process is possible through the classification of questions by skills, made by Inep himself and made available in the database (microdata in csv format) on the institution's website, associated with the content of the questions. After this selection, the questions were identified by content. To this end, we used as a reference the contents charged in the test, described in a specific ENEM notice that is called "Knowledge objects associated with the Reference Matrices". From this first analysis, the advisors analyzed the classification made to reduce possible biases. The questions were identified with the letter "Q" and the number of the question in the test. It should be noted that all the questions analyzed refer to the "yellow notebook" of tests from 2010 to 2016.

RESULTS

Structure of the national examination of biology-geology - Portugal

Understanding the structure of the National Examination Biology-Geology exam in Portugal is the first step to analyze the other results obtained in relation to this exam. In this context, the 702-numbered test is based on the Biology and Geology Program of the 10th and 11th years of schooling and is structured in four groups: I and III for Geology issues and II and IV for Biology issues. Both disciplines (i.e. Biology and Geology) have the same weighting (value of 100 points for each subject). Each group is preceded by a support (text, tables, schemes, graphs, pictures, maps). The test is composed of questions of selection items (multiple choice, ordering or association) and construction items (short answer or restricted answer – discursive). The test lasts 120 minutes, with 30 minutes of tolerance.

Table 1 shows the distribution of the questions among the two disciplinary areas (Biology and Geology) over the years evaluated. It can be seen that Biology and Geology issues were distributed irregularly, with the number of Biology issues exceeding those of Geology in 2010 by 51.72%, in 2011 by 55% and in 2013 by 51.61%. From the year 2014, the questions of Biology and Geology were in equal quantity.

Table 1. Biology and Geology number questions by phase, in the tests of the time series under study

Year	Biology			Geology			% Biology number
	Total number Phase 1	Total Questions Phase 2	Total Questions	Total number Phase 1	Total Questions Phase 2	Total Questions	
2010	15	15	30	14	14	28	51,72
2011	16	17	33	15	14	29	55,00
2012	16	15	31	16	15	31	50,00
2013	16	16	32	16	15	31	51,61
2014	15	15	30	15	15	30	50,00
2015	16	16	32	16	16	32	50,00
2016	17	17	34	17	17	34	50,00
Total	111	111	222	109	106	215	-

Source: Prepared by the authors, 2019.

In a second moment, the analysis focused on the characterization of the type of item in the National Biology Examinations. Table 2 shows that the selection items are predominant in all years of application of the National Examinations. It is also possible to verify that 2011 was the year with the lowest number of questions related to construction items (short answer or restricted answer – discursive).

Table 2. Biology issues, by type of item, in the tests of the time series under study

Year	Total questions	Types of Questions and their Percentages			
		Selection items	%	essay Items	%
2010	30	26	86,7	4	13,33
2011	33	29	87,9	3	9,09
2012	31	27	87,1	4	12,90
2013	31	26	83,9	5	16,13
2014	30	26	86,7	4	13,33
2015	32	28	87,5	4	12,50
2016	34	28	82,4	6	17,65

Source: Prepared by the authors, 2019.

Structure of ENEM – Brazil

In the ENEM there is no specific Biology test. This discipline is included in the Nature Sciences and its Technologies exam associated with Chemistry and Physics. All questions (also called items) have as standard three constitutive parts: base text (statement), enunciation (command given to the student) and (alternatives). Usually the basic text brings a problem situation and the items are contextualized with hypothetical or real subjects and themes of the participants' daily lives. The test is of multiple choice; applied in two days, and on the day of application of the Science of Nature and its Technologies test is also applied the Mathematics test and the duration of the test is five hours.

Table 3 shows the quantification of the questions that require students to know Biology over the years evaluated. It should be noted that Biology issues are very representative, especially in 2011 and 2012. Over the 7 years evaluated, 114 questions demanded knowledge of Biology.

Table 3. Issues that demand knowledge of Biology from students in the ENEM tests of the time series under study

Year	Total number	Biology number	% Biology
2010	45	17	37,7%
2011	45	20	44,4%
2012	45	18	40%
2013	45	14	31,1%
2014	45	14	31,1%
2015	45	16	35,5%
2016	45	15	33,3%
Total		114	

Source: Prepared by the authors, 2019.

Finally, an overview of the Exams applied in Brazil and Portugal is presented in Table 1. The most striking difference between the two Exams is in the fact that the National Examination of Portugal is compulsory, since the exam score contributes to the final score of the respective subject (the assessments make up 30% of the students' final marks).

Frame 1. Characteristics of National Examinations in Brazil and Portugal

Characteristics		Brazil - ENEM	Portugal - National Exam
Obligation		No	Yes
Free		No	No
Questions	Average number	15	15
	Type	Multiple Choice	Multiple Choice and essay question
Themes		Content of three years of secondary education	Reference to the 10th and 11th year Biology Program

Source: Prepared by the authors, 2019.

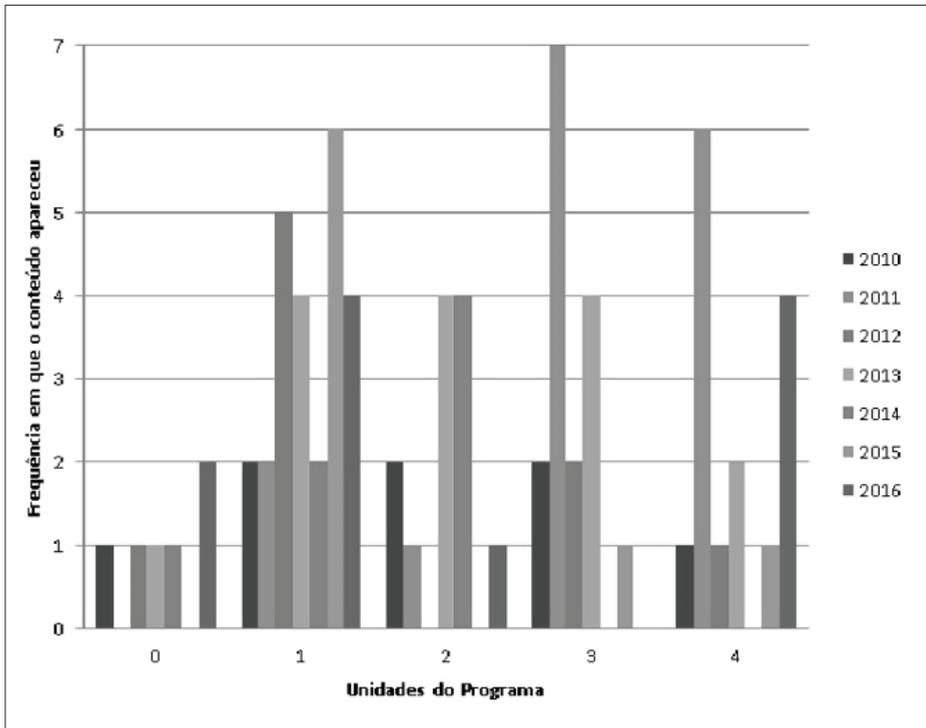
The ENEM application fee waiver is valid for all students in the public network and for participants who claim to be low-income family members or to be in a situation of socioeconomic vulnerability.

In relation to the National Examinations of Portugal, registration and the tests of equivalence to attendance by self-proposed students¹ is compulsory in any of the two phases of the Examinations or tests, being subject to payment of €3 (three euros) per subject, in each phase. Internal pupils and self-proposals enrolling in national Final Examinations or tests of equivalence to attendance to improve their marks are subject to a payment of €10 (ten euros) per subject at each stage and the payment referred to in the previous paragraph does not apply.

CONTENTS PRESENT IN THE QUESTIONS OF BIOLOGY OF THE NATIONAL EXAM - PORTUGAL

The results related to the programmatic contents of Biology, present in the questions of the National Examination, are presented in figures 1, 2 and 3.

Figure 1. 10th grade biology contents, by teaching unit, present in the National Examination questions (2010-2016)



Source: Prepared by the authors, 2019.

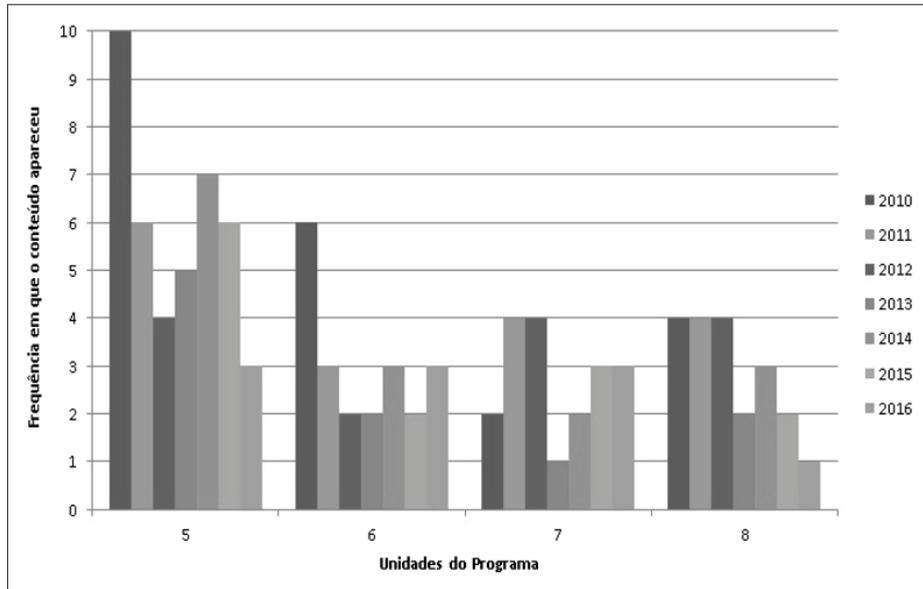
As can be seen in the graph in figure 1 of the structural themes of the Biology Program, unit 1 – obtaining matter by heterotrophic beings in the processes of auto and heterotrophy in beings with different degrees of complexity occupies the first place quantitatively in all editions of the Examinations with 25 questions (sum of the editions evaluated), followed by unit 3 – processes of energy transformation, namely in the use of the aerobic and anaerobic pathways by living beings, with 16 questions. Unit 4 – aspects related to the maintenance of the conditions of the internal environment of organisms in the face of the fluctuations of the external environment, through the study of the cases of thermoregulation and osmoregulation in animals and phytohormony in plants come soon after, with 14 questions. Among the topics that have least appeared in the National Examinations are units 2, which focuses on the distribution of matter and its obtaining by beings with different levels of organization, with 12 questions and unit 0, which refers to the conception of the Biosphere (its diversity, organization, extinction and conservation) and the cell as a structural and functional unit (the degree of complexity of organisms), with only 6 questions over the last 7 years.

With regard to the subjects considered in the National Examinations, in addition to their numerical difference, it was found that in certain years some subjects did not even appear, namely: those related to unit 0 in 2010 and 2015,

to unit 2 in 2012 and 2015, to unit 3 in 2016 and to unit 4 in 2014. Thus, taking into account the data on the contents of the 10th year, it can be seen that their distribution in the Exams is not uniform, both in relation to the units of the Program and throughout the years of application of the National Exams.

The data for the 11th grade contents (Figure 2) show that there is greater uniformity in the appearance of questions concerning the different teaching units - contents from all units appear in the National Examinations of all the years considered.

Figure 2. 11th grade biology content, by teaching unit, present in National Examination questions (2010-2016)

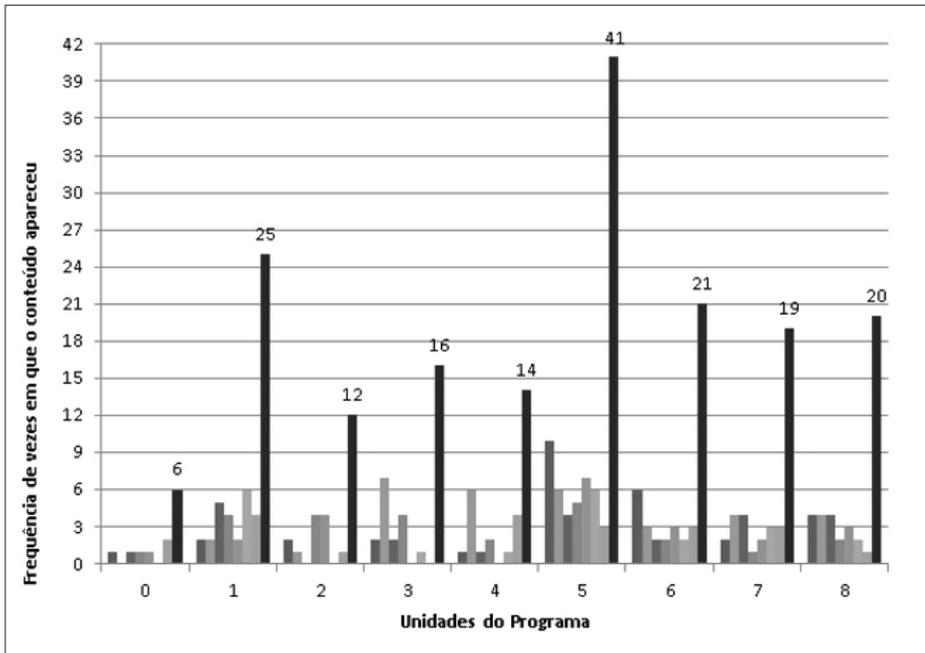


Source: Prepared by the authors, 2019.

Among the units with the greatest number of questions, unit 5 – cell renewal and growth – explaining the role of mitosis, DNA and protein synthesis is, without a doubt, the most requested with 41 questions over the last 7 years of application of the National Examinations. This is followed by unit 6, which deals with reproduction, understood as a process of information transfer, with 21 questions. On the other hand, unit 8 – levels of biological organization, which addresses the systematics of living beings, was requested in 20 questions. Finally, there was unit 7 – which explains biological evolution, with 19 questions.

When the data on the total programmatic content of the National Examinations are analyzed (Figure 3), it can be seen that the contents of the 10th year appear less often than the contents of the 11th year. In relation to the contents, there are also discrepancies within the contents of the 10th grade of schooling. It is also observed that units 1 (10th grade) and 5 (11th grade) were the most demanded in the 7 years of National Examinations analyzed, which suggests privileging contents that make up the educational curriculum.

Figure 3. Total contents of Biology of the 10th and 11th grades, by teaching unit, present in the questions of the National Exam (2010-2016).



Source: Prepared by the authors, 2019.

Analyzing the workload – the number of 45-minute classes suggested by the Program – it was observed that some contents with an expected allocation of workload higher or equivalent to others, were not included in many editions of the exam. A good example is the unit 0 of the 10th year with 8 suggested lessons: in the editions of the National Exams of 2011 and 2015 there was no question on the subject. On the other hand, unit 1 of the same year, which appears first, quantitatively, in all editions of the Exams with 25 questions (sum of the editions evaluated), is suggested to be taught in 9 classes. In the case of the 11th year of schooling, although there is greater uniformity in the appearance of issues related to the different teaching units, and a greater number of classes foreseen in the subject Program, there is also a greater number of classes foreseen in the subject Program for less requested content. An example is the 13 lessons foreseen for unit 6, which presented 21 questions, while unit 5 has as a suggestion to be taught in 10 lessons, but its content was required in 41 questions over the 7 years of application of the National Exam.

Given these results, it should be noted that, over the years analyzed, the suggested time to teach the various teaching units, and eventually of cognitive deepening of the topics, is not similar, with a discrepancy between what is suggested in the number of teaching units by the Programs of the subject and the proportion of issues that correspond to them in the National Examinations. Corroborating with these results, studies conducted by Ventura (2014) showed that there is a great concern in the management of the curriculum of the subjects

of the years with National Exams, which does not always happen with those of the remaining years of schooling.

The difficulty in testing the various contents indicated in the Biology-Geology Program (Scientific-Humanistic Course in Science and Technology) for the 10th and 11th years of schooling in Portugal, may be related to the number of questions – only 30 questions on average. There is therefore an impediment to requiring a large number of contents from students on a small number of issues. It is therefore an unrepresentative sample of the contents.

Corroborating this hypothesis, it is possible to find in the report of the National Exams of Secondary Education (period 2010-2016), prepared by the Institute of Educational Evaluation, I.P. (IAVE) the statement that [...] “In all the tests, the contents of all the binding themes, but not of all the themes/units of the program, shall be evaluated”. The same report makes the following reference:

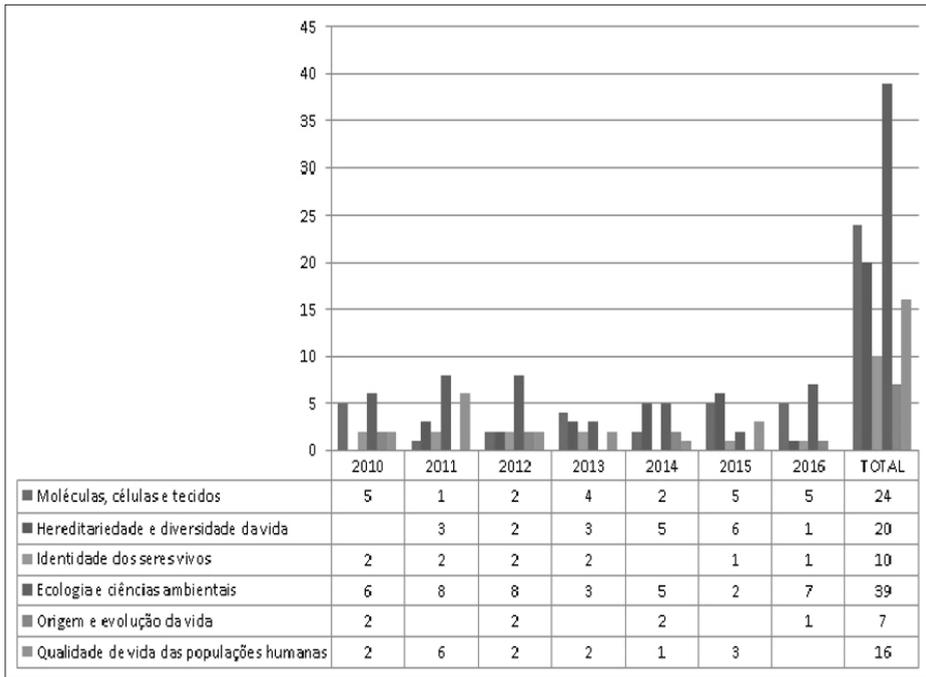
Under the Biology component, the initial module (Unit Zero), Diversity in the Biosphere, was explicitly assessed only in 2010 and 2015. This unit is successively revisited in the teaching and evaluation of the remaining units. In turn, Unit 5, Cell Growth and Renewal, was explicitly evaluated in all the years under review. (IAVE, 2017, p.51)

CONTENTS PRESENT IN THE QUESTIONS OF BIOLOGY OF THE ENEM – BRAZIL

In contrast to Portugal, the contents present in Biology issues in ENEM are not distributed by teaching unit, but by “contents and themes normally addressed in the whole Basic Education” (BRASIL/INEP, 2015, p.62).

When the data in figure 4 are analyzed, it can be seen that the questions associated with the structuring theme “ecology and environmental sciences” were the most requested in the ENEM in the period studied, with 39 questions. Then, with 24 questions, there are questions about the structuring theme “molecules, cells and tissues”. With 20 questions, we find the structuring theme “heredity and diversity of life” and, among the most requested are also the “quality of life of human populations” with 16 questions. “Origin and evolution of life” was the least requested structuring theme, with a total of 7 questions distributed in 2010, 2012, 2014 and 2016.

Figure 4. Biology structuring themes present in ENEM (2010-2016)



Source: Prepared by the authors, 2019.

The greater number of questions associated with the structuring theme “ecology and environmental sciences” over the analyzed period may be associated with the fact that this theme is more easily inserted into problem situations and contextualized in terms of social and economic relevance. Thus, there is an ease in the construction of the statements of the questions (items) and approach to the student’s daily life.

The theme “Molecules, cells and tissues”, second most addressed in the years evaluated, brings important contents, based on the scientific concept of Biology. Thus, it is expected that a representative number of questions from these contents will be elaborated, since the correct answer indicates the appropriation of scientific concepts by the student (one of the competences recommended in the ENEM and in the PCNEM).

“Hereditry and diversity of life” is a structuring theme considered controversial (it involves ethical, political, economic and social debates), because they address issues focused on genetic improvement, transgenic, Human Genome Project, treatment of neurodegenerative diseases, among others. Thus, there is also a facility to approach the theme in a contextualized manner and through problem situations. This is also the probable cause of the relatively high number of issues involving the theme “quality of life of human populations”, since it refers to numerous social issues such as vaccination, sanitation, water resources, etc.

Despite being a very important content, “a theme of central importance in the teaching of Biology” and that should “constitute a guideline for the discussions of all other themes” according to the PCNEM (BRAZIL/MEC, 2006, p. 22), the

structuring theme “Origin and evolution of life” was very little addressed in the ENEM tests: only seven questions during the six years of analysis. One likely reason for this finding is that the theme is controversial because it involves religion and science (many students already have a preconceived idea about the subject, which has been infused into their homes and churches). Associated with this fact, in the document “Guide for preparation and review of items” of the Inep there is the recommendation “Avoid approaches to controversial topics” (BRASIL/INEP, 2010) Thus, the different positions of the official documents are evident (that of the preparation of the ENEM exam and the Curriculum Parameter).

The results referring to the frequency of appearance of structuring themes over the years analyzed are presented in table 4. It should be noted that, both in absolute and in percentage terms, four structuring themes dominate “Ecology and environmental sciences”, “Molecules, cells and tissues”, “Heredity and diversity of life” and “Quality of life of human populations”.

Table 4. Percentage of questions by ENEM structuring theme

ENEM Structuring Theme	2010	2011	2012	2013	2014	2015	2016	% questions per structuring theme
Molecules, cells and tissues	5	1	2	4	2	5	5	20,7%
Heredity and diversity of life		3	2	3	5	6	1	17,2%
Identity of living beings	2	2	2	2		1	1	8,6%
Ecology and environmental sciences	6	8	8	3	5	2	7	33,6%
Origin and evolution of life	2		2		2		1	6,0%
Quality of life of human populations	2	6	2	2	1	3		13,8%
Total questions per year	17	20	18	14	15	17	15	

Source: Prepared by the authors, 2019.

A temporal analysis of the data in Table 4 reveals that some themes are favored with a large number of questions (items) per exam, while others are relegated to a secondary role or are not even requested from students. This reveals that in the period the examination prioritized the contents related to Cell Biology, Ecology and Heredity.

END REMARKS

Several authors such as Stecher (2002), Koretz (2008), Gesser and DiBello (2016), Cária and Oliveira (2015) mention the interference of National Examinations in curricula. It is through the curriculum that we establish what will be taught in schools. Thus, defining what will be taught in schools also defines the profile of the citizen that the school is forming.

The curriculum is also an instrument that guides pedagogical practice when defining what to teach, when to teach, how to teach and how to evaluate. All this is conditioned to the knowledge that the curriculum privileges or secondary.

In relation to the teaching of science, Krasilchik, still in 1988, already mentioned two existing strands in relation to its objectives. One of them aimed at training scientists to meet the need for scientific and technological dominance of nations; the other considered the need to train citizens capable of acquiring, understanding and obtaining scientific information and with the ability to opine about them.

This polarization ends up creating expectations about the teaching and learning of science. There are those who mention that “The process of research in science deserves special attention in its approach to education, because it is the process of building science itself”. (MAIA and JUSTI, 2008, p. 432).

In this perspective, it is important to mention that issues related to the research processes have an important role in the Exams, because it is one of the means to ascertain if the student has acquired scientific knowledge, which understands how and why scientific claims are validate, explaining and rationalizing with models. Developing questions to test specific knowledge and criteria of scientific knowledge is a major challenge.

Concurrently with the concern for scientific formation, the role of science education in the formation of the citizen was also postulated. Kolstoe (2000) mentions the need to promote science for citizenship and, in this context, the capacity of the teacher to develop in future citizens the dimension of attitude is a crucial point.

In turn, the interrelationships between science, technology and society have been highlighted in science education. On this subject, Magalhães and Tenreiro-Vicira, (2006, p. 86) point out that “Effectively, it is now widely defended a science teaching with a CTS orientation with the purpose of teaching about the phenomena in a way that connects Science with the technological and social world of the student”. With regard to the pedagogical practices that promote the aforementioned assumptions, the same authors mention “the performance of teachers in the classroom tends not to contemplate, at least intentionally and systematically, activities/strategies of a CTS/PC nature”.

Covering all these perspectives, i.e. providing students with solid knowledge for citizen science education and a CTS-based approach, enabling them to pursue a career in science if they so wish, is the school’s duty.

When it comes to assessment, in practice, the role of assessment is to support and encourage student learning. Thus, the type of assessment has to be in line with the way the teacher teaches and the degree of assessment must respect the depth with which the content was addressed in class. There is also an urgent need to link the school’s curriculum with the assessment matrices of education systems.

With these understandings, when resuming the objectives of this study, it was possible to ascertain, through the characterization of the tests, that both (National Examination of Portugal and ENEM in Brazil) have a reduced number of Biology questions to test the various contents indicated by the official reference documents of each country. Objective issues hamper the purpose of testing scientific knowledge. In this situation, the National Examination in Portugal surpasses the ENEM, because it presents in its structure essay questions, while the ENEM presents exclusively objective questions.

In terms of content, in addition to restricting the knowledge tested, both the ENEM and the National Examination tests focused on certain contents. In such circumstances, it became clear that in both countries, National Examinations may standardize, in terms of knowledge, what students have to learn by demanding more questions on a given topic.

Taking into account the information obtained in this research and taking into consideration the question raised by this article – Is the external evaluation adequate to the curriculum proposed in Portugal and Brazil? A discrepancy was found between the Biology-Geology Programs in Portugal, as well as the PCN's in Brazil and the National Exams of both countries.

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NOTES

1 Student who proposes to take the exam.

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