

READING MEDIATION ACTIVITIES IN CHEMISTRY CLASSES ON HEALTHY EATING AND THE PERIODIC TABLE

ATIVIDADES DE MEDIAÇÃO DE LEITURA EM AULAS DE QUÍMICA SOBRE ALIMENTAÇÃO SAÚDAVEL E TABELA PERIÓDICA

ACTIVIDADES DE MEDIACIÓN DE LECTURA EN CLASES DE QUÍMICA SOBRE ALIMENTACIÓN SALUDABLE Y LA TABLA PERIÓDICA



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Hélio Nascimento da Paixão Júnior¹, Josineide Pantoja da Costa², Wilton Rabelo Pessoa³

ABSTRACT

The study of Chemistry can broaden the students' view of their universe of experiences, while considering such contexts can facilitate the understanding of this science. However, we realize that there is still resistance to its study by students, especially when faced with a teaching that privileges nomenclatures and calculations. Such teaching makes the student perceive chemistry from a stereotyped view, or in his words, as 'an even more complicated version of mathematics'. The present work proposes to present and discuss contributions of the interaction between reading mediation and chemistry teaching, since the use of scientific texts as a didactic resource can be considered as a means of facilitating. We start from the idea that, arousing curiosity in the search for new information, motivates the student to get involved in their learning, so it is important to promote their enculturation from elementary school, with the use of scientific language in the teaching and learning process of Chemistry. This research aims to propose reading mediation as a didactic resource in the teaching of Chemistry, through scientific literature, with the use of scientific articles - AC or scientific popularization texts - TDC, in order to promote and improve the construction of knowledge in the classroom. AC or TDC reading mediation are used as learning vehicles for students in the first year of high school, in a School of the Public Teaching Network of Ilha de Mosqueiro/PA and, above all, as a way to help students to think and to position itself critically before society. The preliminary results of this research suggest that reading mediation, associated with writing and discussion activities are relevant factors in the acquisition of chemical knowledge, contributing to the formation of a conscious and critical student about social problems. In summary, this interaction established between reader and scientific text can contribute to making learning more effective.

Keywords: Chemistry Teaching. Science Popularization Texts. Methodological Resource. Scientific Literacy. Enculturation.

¹ E-mail: Hélio_nascimentop.junior@yahoo.com.br

² E-mail: pjosineide@yahoo.com.br

³ E-mail: wiltonrabelo@yahoo.com.br

RESUMO

O estudo da Química pode ampliar a visão dos estudantes sobre seu universo de vivências, ao mesmo tempo em que considerar tais contextos pode facilitar a compreensão desta ciência. No entanto, percebemos que ainda existe uma resistência ao seu estudo por parte dos alunos, principalmente ao deparar-se com um ensino que privilegia nomenclaturas, fórmulas e cálculos. Tal ensino faz o aluno perceber a Química a partir de uma visão estereotipada, ou em suas palavras, como 'uma versão ainda mais complicada da matemática'. O presente trabalho propõe apresentar e discutir contribuições da interação entre mediação de leitura e ensino de química, já que a utilização dos textos científicos como recurso didático pode ser considerada como um meio facilitador da aprendizagem. Partimos da ideia que, despertar a curiosidade pela busca de novas informações, motiva o aluno a se envolver em sua aprendizagem, por isso, é importante promover sua enculturação desde o ensino básico, com o uso da linguagem científica no processo de ensino e aprendizagem da Química. Tal pesquisa tem como objetivo propor a mediação de leitura como recurso didático no ensino da Química, por meio da literatura científica, com o uso de artigos científicos – AC ou textos de divulgação científica – TDC, com intuito de promover e melhorar a construção do conhecimento científico em sala de aula. A mediação de leitura de AC ou TDC foi empregada como veículos de aprendizagem aos estudantes do primeiro ano do ensino médio, de uma Escola da Rede Pública de Ensino da Ilha de Mosqueiro/PA e, sobretudo, como forma de auxiliar os estudantes a pensar e se posicionar criticamente diante da sociedade. Os resultados desta pesquisa sugerem que a mediação de leitura, associada a atividades de escrita e discussão são fatores relevantes na aquisição de conhecimentos químicos, contribuindo para a formação de um aluno consciente e crítico sobre os problemas sociais. Em síntese, essa interação estabelecida entre leitor e texto científico pode contribuir para tornar a aprendizagem mais efetiva.

Palavras-chave: Ensino de Química. Textos de Divulgação Científica. Recurso Metodológico. Letramento Científico. Enculturação.

RESUMEN

El estudio de la Química puede ampliar la perspectiva de los estudiantes sobre sus experiencias vividas, mientras que considerar estos contextos puede facilitar su comprensión de esta ciencia. Sin embargo, observamos que aún existe resistencia a su estudio por parte de los estudiantes, especialmente cuando se enfrentan a métodos de enseñanza que priorizan la nomenclatura, las fórmulas y los cálculos. Este tipo de enseñanza lleva a los estudiantes a percibir la Química desde una perspectiva estereotipada, o en sus palabras, como "una versión aún más compleja de las matemáticas". Este trabajo propone presentar y discutir las contribuciones de la interacción entre la mediación lectora y la enseñanza de la Química, ya que el uso de textos científicos como recurso didáctico puede considerarse un medio para facilitar el aprendizaje. Partimos de la idea de que despertar la curiosidad en la búsqueda de nueva información motiva a los estudiantes a involucrarse en su aprendizaje; por lo tanto, es importante promover su inculturación desde la educación básica en adelante, utilizando el lenguaje científico en el proceso de enseñanza y aprendizaje de la Química. Esta investigación tiene como objetivo proponer la mediación lectora como recurso didáctico en la enseñanza de la química, a través de la literatura científica, utilizando artículos científicos (AE) o textos de divulgación científica (EDC), con el fin de promover y mejorar la construcción del conocimiento científico en el aula. La mediación lectora de AE o EDC se empleó como herramienta de aprendizaje para estudiantes de primer año de secundaria en una escuela pública de la Isla de Mosqueiro/PA y, sobre todo, como una forma de ayudar a los estudiantes a pensar críticamente y a posicionarse en la sociedad. Los resultados de esta investigación sugieren que la mediación lectora, asociada a actividades de escritura y debate, es un factor relevante en la adquisición de conocimientos químicos, contribuyendo a la formación de un estudiante consciente y crítico ante los problemas sociales. En resumen,



esta interacción establecida entre el lector y el texto científico puede contribuir a un aprendizaje más efectivo.

Palabras clave: Enseñanza de la Química. Textos de Divulgación Científica. Recurso Metodológico. Alfabetización Científica. Enculturación.

1 INTRODUCTION

The teacher has the task of awakening in the student a critical attitude towards the reality in which he is inserted, preparing him to "read the world": at first his world, from then on, and gradually, all possible worlds".
Koch, 2000.

To a large extent, we can say that learning Chemistry means appropriating the language of science, with its codes, concepts, equations, that is, as a specific way of reading and interpreting reality. At the same time that discussions about Science circulate in the media and raise questions, the teaching and learning of Science in school has often encountered difficulties, configuring a crisis, according to Fourez (2003). Such a crisis is related to a distant and unattractive teaching, contributing to the lack of interest on the part of students.

This can be evidenced, among other aspects, in the performance of Brazilian students in PISA⁴ (Program for International Student Assessment) in 2018, whose exam is carried out by the Organization for Economic Cooperation and Development – OECD, in which Brazil occupies the 66th position among 78 participating nations, still below Latin American countries such as Chile, Uruguay, Mexico, Costa Rica and Colombia. These results indicate that Brazil, despite having improved its performance in reading, mathematics and science in the latest assessments, still has a rate significantly below the OECD average. The score of Brazilian students was 404, and the average in this category is 489, with the maximum score being 590, recorded in Singapore. This performance gives the Brazilian student level 2 of learning, on a scale ranging from 1 to 6. This means that students can understand only a limited part of the text and are only able to make low-level inferences (PISA, 2018). Although the results of this evaluation can be questioned, one of the consequences is the stagnation in science teaching in Brazil, observed by the lack of interest in the discipline and the scientific careers associated with it.

There are different initiatives to improve the teaching of Chemistry in Brazil. Research such as that of Martins, Nascimento and Abreu (2001), for example, proposes the use of didactic strategies that value the relationship of students with different types of scientific texts that express a variety of forms of argumentation and different points of view. Such texts can bring certain benefits, among which are: access to a greater diversity of information; development of reading skills and mastery of concepts, forms of argumentation and elements of scientific terminology (MARTINS et al., 2001). From this perspective, knowing a variety of

⁴ PISA (Programme for International Student Assessment). Information available on the website: ocde.org/pisa/

types of scientific texts, from media reports to scientific originals, helps students to incorporate elements of scientific culture.

The need to focus on reading, writing and text interpretation is related not only to the appropriation of the mother tongue, but also of scientific language, to strengthen the teaching of science, especially the teaching of Chemistry. As Martins et al., (2004) point out in their works, scientific dissemination texts can function as motivating or structuring elements in the classroom.

Therefore, I understand that no matter what the school subjects are, they can all contribute to the development of activities that enable students to gradually increase their ability to understand the materials read, and thus accentuate the taste for reading. For this to occur, it is of fundamental importance that teachers promote the insertion of various texts, such as Scientific Articles (CA) and Scientific Dissemination Texts (TDC), with language appropriate to the student's learning level as a resource to enhance the teaching and learning process in the teaching of Chemistry.

Tonindandel (2008) comments that in science teaching it is necessary to promote conditions and stimulus for an approximation of the student to scientific processes, which by understanding their rules, processes and forms of language, can enable students' access to scientific culture. Two competencies of the ENEM reference matrix, found in the Cognitive Axis (Mastering Languages – DL and Building Argumentations – CA), should be stimulated in high school students are: "master the cultured norm of the Portuguese language and make use of the mathematical, artistic and scientific languages and the Spanish and English languages" (p. 1) and "Relate information represented in different forms, and knowledge available in concrete situations, to ensure consistent argumentation" (BRASIL, 2020, p. 101). Therefore, the need to value scientific culture in basic education is evident.

In my view, it is somewhat challenging to consider reading as a learning space in Chemistry classes, so I sought to investigate my own practice, having as a guiding question:

- In what terms can reading mediation activities contribute to learning in Chemistry classes at the high school level?

In this sense, we seek a simple proposal, but one that can be significant, which leads us to reflect on our postures in the face of the work carried out in Chemistry classes. With the pedagogical intervention method, we used the insertion of CA and TDC in Chemistry classes in the 1st year of high school, with the general objective:

- Investigate reading mediation activities of scientific articles and texts of scientific dissemination in the context of Chemistry classes and their possible contributions to the Scientific Literacy of students.

In view of this general objective, the study also seeks as specific objectives:

- Identify reading habits of students in the 1st year of high school and correlate them with the learning of Chemistry.
- Analyze reading mediation activities and their possible contributions to the learning of Chemistry.
- Develop an educational product with reading mediation strategies in Chemistry classes.

2 BRIEF ACCOUNT OF ACADEMIC AND PROFESSIONAL LIFE

The path of this research is the result of my academic and mainly professional trajectory, which converged to the search for a didactic resource, which prioritizes solving learning difficulties encountered by my students in the teaching of science, especially with Chemistry subjects in basic education. To understand this choice and the path taken so far, I must refer to my academic path, which began in 2003, in the Full Degree course in Natural Sciences – Chemical Qualification – at the State University of Pará – UEPA, Regional University Nucleus of Baixo Tocantins, Moju and to my teaching essays as a teacher of CFB (Physical and Biological Sciences) in the Municipal Network and Chemistry in the State Network.

My journey as a student in Basic Education was in public education, marked by negative factors since due to the difficulties faced in my path I was labeled early as a student with little interest in studies, with learning and cognition deficits, factors that resulted in retention in literacy and weaknesses in the areas of Portuguese language and mathematics.

From average student to hardworking student, my educational deficiencies accumulated and I needed more time than other students in my age group to enter university. At the time when the preparation for admission to universities was carried out by area of knowledge, I fell in love with the old CB – area of Biological Sciences – which had as its main focus of studies the disciplines of Chemistry, Physics and Biology. It was during this period that I chose my degree and sought a degree by affinity, with an emphasis on Chemistry and Biology, as my future and profession, as they have always been my favorite subjects.

I studied at UEPA in the period 2003 – 2006 at the Regional University Center of Baixo Tocantins - NURBAT, in the municipality of Moju, where we had several structural and pedagogical problems that hindered the teaching and learning process. We were the second class of a newly opened campus, so the tripod of higher education – Teaching, Research and Extension – was not consolidated, thus leaving a gap in my academic training.

Now graduated in Natural Sciences with a qualification in Chemistry, I sought a second degree, Degree in Biology from the Federal University of Pará, it was offered in the distance learning modality in the city of Capanema/PA, with face-to-face meetings on Saturdays, only with monitoring of doubts, evaluations and experimentation. The course maintained the same profile as the university centers in the interior of the State of Pará, with structural and pedagogical problems and, associated with this and other personal factors, I was unable to complete this degree.

Such experiences in graduation produced a professional who was still unfinished, so I sought in specialization courses new perspectives on my definitions, seeking to answer many questions: how do I see myself as a teacher? How can I improve my practices? What is my role in basic education as a teacher of Natural Sciences?

To answer these questions, I participated in the courses Methodology of the Teaching of Natural Sciences, with qualification in Chemistry, by the Center for Social Sciences and Education - CCSE of the State University of Pará - UEPA and then Methodology in the Teaching of Chemistry, by the Faculdade Integrada Jacarepaguá - FIJ, through the Virtual Learning Environment, distance learning model of teaching, both very theoretical and not very interesting, So the questions and the search for answers continued to surround me. I wanted ready-made answers that would give me a direction, show me how to become a better and more complete person and professional. So far I have not found them, because today I know that this process is long and indeterminate, as it is a human construction.

I consider that in my beginning in teaching I sought to reproduce the pedagogical practice of the teachers I had in high school, plastered to the mechanical and traditional teaching format to which I was subjected and which was not questioned or problematized at the University. Paulo Freire (2006, P. 61) characterizes the educator-student relationship as "fundamentally narrative" and excessively theoretical, in which the teacher, considered as the bearer of knowledge, transmits ready-made and finished information to students, without integrating them into the process of knowledge formation or giving space for questioning. This type of education empties students of subjectivity, reflection and criticality.

The experiences as a student in basic education, in which I built ideas about the teaching and learning processes and the role of teacher and students, are referred to in research as environmental or incidental training (CARVALHO AND GIL-PÉREZ, 2001). This draws attention to the fact that teacher training does not begin in undergraduate courses and goes beyond them, being a permanent process that needs to be considered so that simplistic ideas about teaching are not perpetuated, to the detriment of the development of the teacher's professional knowledge.

As an education professional, I came across several realities and understood that difference, before being a problem, is inherent to the classroom. In public school, I lived with students from different social classes, with different levels of learning and each one with their own time to learn. I experienced violence in schools and structural precariousness, but what drew the most attention during this period was the negligence of managers with public education.

I could be one more, wait for the salaries at the end of each month, but all this bothered me, because I was a "child" of the public school and I know that even in its decadent face it can transform lives, just as it transformed mine. Working since the second semester of college was not easy, because in addition to being very young and inexperienced, I was at the beginning of my academic training, without theoretical and methodological foundations, but with the sparkle in my eyes and the enthusiasm to do my best.

In these seventeen years as a teacher, I taught in the municipalities of Moju, Igarapé-Miri and Belém, but always with the intention of transforming lives and changing realities. I love my profession and that's why I dedicate myself to doing what I understand to be the best for the students. I try to use several different resources and methods seeking to prioritize quality teaching, focused on student learning.

One of the most relevant factors of my teaching journey in basic education was the participation as an advisor of research projects in science fairs and as a coordinator of fairs. Science fairs appeared in my professional life in 2008 and changed the way I view my teaching practice. I became an advisor for Junior Scientific Initiation projects – ICJr and coordinator of science fairs at the Manoel Antônio de Castro school - MAC and later director of the Coordination of Support and Incentive to Scientific Initiation - CAIC, by the Municipal Department of Education - SEMED of Igarapé-Miri, where I learned that research and scientific investigation in basic education are very important for the formation of the student.

Thus, I started to bet on the production of research in elementary and high school, with child and youth engagement from the early years, and I realized that it was possible for young people from public elementary and high schools to get involved with research. That was how my teaching practice started to make sense, so I sought, in the Junior Scientific Initiation, to give meaning to my teaching practice.

I was looking for an instrument in scientific initiation that would concretely help the teaching of Chemistry and Sciences, using research actions to teach, in which the appropriation of knowledge occurred through reading and immersion in the scientific world. There were years of work and participation in several local, regional, state, national and

international scientific events. Unique experiences with learning that changed my story as a person and professional.

It was from my practice as a project advisor and organizer of scientific events that I was able to realize the importance of reading and the appropriation of scientific language as one of the elements for citizenship formation, considering that it enables other ways of understanding reality by the student. Reading habits can be encouraged from the beginning of the literacy process, as we know that science and scientific culture play a fundamental role in contemporary society, in addition to contributing to expanding students' reading of the world.

I continue to seek the best of myself and try to subsidize teaching with differentiated activities, with playfulness, problematization and research. I seek to involve students in the teaching and learning process, as I believe that we can, albeit indirectly, transform the lives of our students through education.

3 ACADEMIC PRODUCTIONS ON THE TEACHING OF CHEMISTRY AND READING AS A METHODOLOGICAL RESOURCE IN THE AREA OF CHEMISTRY TEACHING

In this section, a mapping of academic productions on the theme "reading in the teaching of Chemistry" is presented, especially in high school, which is the focus of this research. The investigation was made around knowing some research on the teaching of Chemistry in the Brazilian territory, focusing on reading in classes of the referred curricular component.

For this, a survey was carried out in works published at the National Meeting of Chemistry Teaching – ENEQ, corresponding to the years 2008 to 2018. The ENEQ was chosen for its representativeness among teachers in the area of Chemistry Teaching, in Basic Education and at the higher level, which meets the focus of the present study. The studies were selected taking the following elements of analysis: theme, keywords, reading of abstracts. In some cases in which these elements were not sufficient to classify the study, methodology and results were evaluated. A total of 32 studies were identified with a focus on Reading as a didactic resource, as illustrated in the following table:

Table 1

Academic works published at the National Meeting on Chemistry Teaching – ENEQ, from 2008 to 2018, focusing on reading in the teaching of Chemistry

YEAR OF THE ENEQ	NUMBER OF PUBLICATIONS	AREA IN ENEQ	ACRONYM
2008	2	Experimentation	EX

		Environmental Education	EA
		Language and Cognition	LC
2010	6	Teaching Learning	EAP
		Teacher Training	FP
		Not specified	XXXXXXXXXXXX
2012	6	Language and Cognition	LC
		Language and Cognition	LC
		Curriculum and Assessment	CA
2014	10	Environmental Education	EA
		Teaching and Learning	EAP
		Experimentation	EX
		Education in Non-Formal Spaces and Scientific Dissemination	EFD
2016	4	Science, Technology and Society	CTS
		Language and Cognition	LC
		Not specified	XXXXXXXXXXXX
2018	4	Teaching Learning	EAP
		Education in non-formal spaces and Scientific Dissemination	EPF
		Language and Cognition	LC
		Inclusion and Educational Policies	IPE

Source: Author 2021

In the period corresponding to 2008-2018, 4,557 works were published⁵ within the thematic lines of table 1, and from these studies a demonstration of only 32 works that came close to the object of study of this research was selected, based on the criteria already mentioned. The analysis of the table reveals that there was a greater number of studies focused on the focus of this research in 2014 with 10 studies, followed by 2010 and 2012 with 6 studies each. In the subsequent years, 2016 and 2018, there was a drop in the publication of these works, with only 04 and 04 studies presented respectively in each of these two editions of the event. A more detailed investigation was carried out in order to elucidate issues such as "types of reading" that have been addressed in the research, "levels of education" to which the research is directed and "thematic areas" involved in the published studies. These data are shown in Table 1 below:

⁵ Quantitative data obtained from the Brazilian Society of Chemistry Teaching (SBENQ) that publishes the works published in the National Meetings of Chemistry Teaching (ENEQs) through the website: <https://sbenq.org.br/eneqs/>. Accessed in January 2019.

The tables with the demonstrations of the number of papers published in each Edition of ENEQ in the period 2008-2018 as well as the respective thematic areas are found in Annex I of this research, the data were accounted for and organized by the proponent of the research since the page does not have the systematization of data in the way it is being demonstrated in this study.

Table 2

Academic works published at the National Meeting of Chemistry Teaching – ENEQ, between the years 2008 and 2018, with a focus on language and writing in the teaching of the discipline of Chemistry

No.	ENEQ'S	TITLE	EDUCATION LEVEL	FOCUS	THEMATIC AREA
1	XIV ENEQ 2008	Reading labels as a contextualizing instrument for the teaching of Chemistry.	Medium	Reading and interpreting labels	EX
2	XIV ENEQ 2008	Reading the World: Using Written and Spoken Language to Awaken Scientific Interest in Chemistry.	High School/Prep School	Use of newspapers, magazines and films in problem situations.	EA
3	XV ENEQ 2010	Analysis of Questions and Questions and Answers Prepared by Chemistry Undergraduates in Reading Activities	Graduation	Reading texts about experimentation	LC
4	XV ENEQ 2010	Emphasizing the relationship between the ability to read texts and the learning of Chemical contents*	Graduation	Use of scientific articles for reading	EAP
5	XV ENEQ 2010	Reading experiences in the Amazon: the case of PIBID Chemistry at the Federal University of Rondônia	Graduation	Readings of articles.	FP
6	XV ENEQ 2010	Investigating rhetorical strategies in the writing of researchers in the field of chemistry: subsidies for understanding the language of science*.	Postgraduate	Reading of 10 articles and the present rhetoric.	LC
7	XV ENEQ 2010	Medicine Leaflets, Drug Production and Biopiracy: An Experience Involving Reading, Educational Video and Playful Activities in the Classroom.	Medium	Reading of medicine leaflets and biopiracy.	Not specified
8	XV ENEQ 2010	Possibilities for the construction of the written language of science in chemistry classrooms	Medium	Reading of textbook text.	LC
9	XVI ENEQ 2012	The reading of scientific texts as a possibility of analyzing the improvement of discourse genres*.	Graduation	Reading of scientific texts.	LC
10	XVI ENEQ 2012	Reading strategies in initial training in chemistry: an analysis of two cases based on the use of scientific literature*	Graduation	Readings of scientific texts.	LC
11	XVI ENEQ 2012	The mediation of the reading of didactic texts and the process of understanding the chemical contents	Fundamental	Mediation of readings in didactic texts.	LC
12	XVI ENEQ 2012	(Dis)paths of research on reading and formation of readers in chemistry classes in high school	Postgraduate	Literature review.	LC

13	XVI ENEQ 2012	Reading and textual interpretation in Chemistry classes in schools in the municipality of Juiz de Fora*.	Medium	Reading of a text for scientific dissemination.	LC
14	XVI ENEQ 2012	The development of argumentation and scientific language by undergraduate students in chemistry through textual production*.	Graduation	Reading scientific texts learning.	LC
15	XVI ENEQ 2014	An evaluation of the teaching of argumentation to chemists	Graduation	Creation of a reading and writing discipline.	CA
16	XVI ENEQ 2014	The use of poems as a didactic proposal in the teaching of Chemistry.	Medium	Reading and Analysis of poems	EAP
17	XVI ENEQ 2014	Reading scientific articles in high school: proposal of a methodology for teaching chemistry*.	Medium	Reading articles, books and writing.	EAP
18	XVI ENEQ 2014	The Teaching of Atomic Models Mediated by Reading	Medium	Reading cybertexts and textbooks	EAP
19	XVI ENEQ 2014	Scientific language in the school context: the acquisition of oxygen by Lavoisier as a motivating theme.	Fundamental	Paradidactic book "Elementary Chemistry Treatise"	EX
20	XVI ENEQ 2014	Mediation of scientific knowledge articulated by the teacher during a class on Chemical Transformations for deaf students	Fundamental	Mediation of experimentation with the use of LIBRAS.	IPE
21	XVI ENEQ 2014	Written activity based on a text of scientific dissemination in high school chemistry: production of meanings*	Medium	Reading of a text for scientific dissemination. "Green energy".	LC
22	XVI ENEQ 2014	Scientific and everyday language: how students explain an environmental phenomenon.	Medium	Thematic classes using everyday or scientific language.	LC
23	XVI ENEQ 2014	Use of a popular science text in chemistry classes in high school*	Medium	Use of texts from the magazine Ciência Hoje.	EFD
24	XVI ENEQ 2014	The written language of chemical reactions: perceptions of chemistry undergraduates.	Graduation	Chemical language used in reactions.	LC
25	XVI ENEQ 2016	Language and the other in the process of understanding chemical conceptual contents	Other	Central role of language and discursive interactions	LC
26	XVI ENEQ 2016	Dissemination of Science in Elementary Education – classroom reports*.	Fundamental	Readings of popular science texts	Not specified
27	XVI ENEQ 2016	Reading from a Freirean perspective and assumptions of the STS approach:	Other	Reading of literary texts.	CTS

		approximations and implications to the teaching of chemistry			
28	XVI ENEQ 2016	Contributions of reading scientific texts to scientific literacy in Higher Education*	Graduation	Reading and interpretation of scientific texts.	LC
29	XVI ENEQ 2018	Retextualization of original research articles in science education: overview of the works published in the JCE and JCST (2007-2014)*.	Graduation	Reading articles for Retextualization.	LC
30	XVI ENEQ 2018	Investigation of Reading Habits in Chemistry Classes of High School Students*	Medium	Application of a questionnaire on reading habits.	EAP
31	XVI ENEQ 2018	Scientific dissemination in Chemistry: contributions to formal education	Graduation	Use of a laboratory for scientific dissemination. Experimentation for the appropriation of scientific terms.	EFD
32	XVI ENEQ 2018	The use of Scientific Dissemination Texts for the teaching of Chemistry at PROEJA.*	Medium/Technical	To analyze the effectiveness of BDT with an approach in general chemistry, seeking to facilitate its understanding and importance for citizenship formation.	EFD

Source: Author 2021

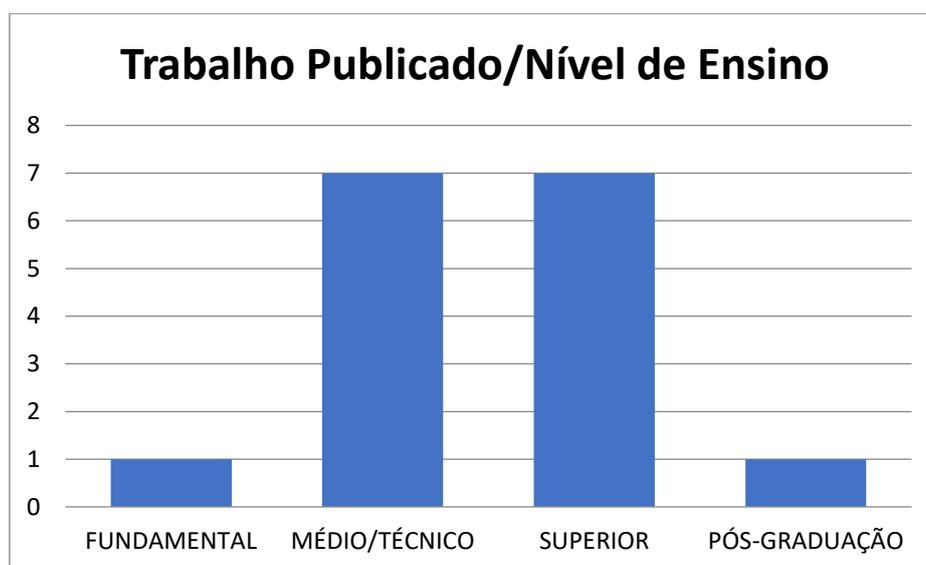
The data in Table 1 indicate that 46.875% of the studies are focused on higher education, including undergraduate and graduate studies, and 53.125% of the studies are directed to basic education, including elementary and high school. Another piece of data observed in Table 1 is related to the "type of reading used" in the studies investigated. It was observed that 40.625% of the readings used in the classroom correspond to scientific articles (identified in the box with an asterisk) and most of the readings used, which correspond to 59.375%, refer to other textual genres such as "product labels", "medicine recipes", "textbooks" and others.

Furthermore, it is important to emphasize that of the studies that made use of Scientific Articles and TDC's, 50% were used in higher education and the other 50% in basic education. This shows a parity in productions, but still limited, hence the need to discuss articles of scientific dissemination within the reach of basic education students, which in part may justify

possible difficulties that these students have in discussing themes involving scientific themes, ratifying the need for other studies in this line. Of the 32 studies found in the mentioned period, 48% are in the area of Language and Cognition (CL), denoting its importance for studies focused on Reading. For an analysis of the Teaching Level of the 32 works published in ENEQ with a focus on Reading as a contribution to the teaching of Chemistry, Figure 1 shows in more detail how this distribution took place.

Figure 1

Distribution of publications by level of education



Source: Author 2020

In addition, an analysis was carried out with regard to the teaching and research institutions in which the studies are linked, as well as the major Brazilian regions, so that we could have an overview of the distribution in our country and in particular in the North region, the state of Pará that is the location of the present study. This survey showed disparity in the distribution of these studies in the major Brazilian regions, because as can be seen in Figure 2, there is a greater number of publications in the Southeast region, which totals 15 studies published in the ENEQ, followed by the North region with 06, the South and Northeast regions with 04 and the Midwest with only 02 studies. It is important to mention that although the North region shows an academic production with 06 publications, considering its vast territory this number becomes low compared to the other Brazilian regions, in addition to the fact that the state of Pará does not have any of the publications in this region.

Figure 2

Regional Quantitative of Academic Productions on "Reading" published in ENEQ in the period from 2008 to 2018.

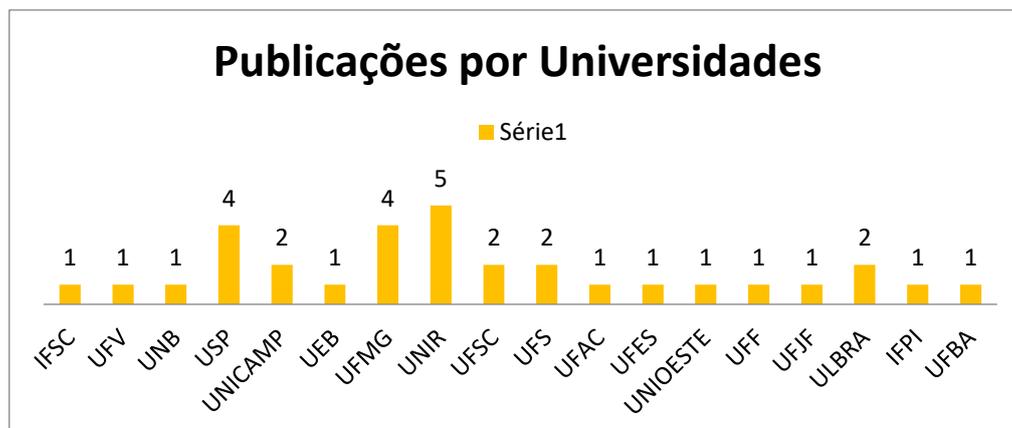


Source: Author 2021

Figure 3 shows the institutional distribution of these studies, where there is a predominance of studies produced by the Federal University of Rondônia (UNIR) with 5 studies, the Federal University of Minas Gerais (UFMG) and the University of São Paulo (USP) with 4 studies, each institution. In the other institutions shown in the Figure, between 1 and 2 studies were identified. It is relevant to emphasize that in the North region, UNIR concentrates productions involving reading in the teaching of Chemistry. On the other hand, there is a greater number of teaching and research institutions in the Southeast region producing this study profile, which expresses the predominance of this region in academic productions of the theme in focus.

Figure 3

Teaching and research institutions that are proponents of studies focused on reading and writing in the teaching of Chemistry in Brazil



Source: Author, 2020

These data demonstrate the need to continue to develop research and promote pedagogical actions aimed at strengthening the theme of reading, considered essential for the teaching of Chemistry based on reading, interpretation and writing.

In this regard, Espinoza (2010) discusses the importance of didactic resources for the appropriation of knowledge through reading:

The interpretation of a science text is always difficult for a student who reads to learn new knowledge, so in order for him to be able to make a correct interpretation, there must be didactic conditions that facilitate this appropriation ESPINOZA (2010, p. 164).

We know that reading and writing are fundamental in all disciplines, including Chemistry, because we use them to prepare from a simple experimentation report to the dissemination of academic works and research, as stated by Francisco Junior and Garcia Junior (2010) in their research on reading and writing in pre-university preparatory courses.

Reading and writing are skills to be worked on in science classes, since students are often unable to interpret questions in physics, chemistry, mathematics, etc., due to deficiencies in reading ability, which implies, therefore, the scientific learning difficulties of the majority of the population. (FRANCISCO JÚNIOR; GARCIA JÚNIOR, 2010, p. 192).

The actions aimed at the development of this theme in the teaching of Chemistry are still timid, in relation to the other areas. Reading and writing are important skills for learning Science, especially the teaching of Chemistry, considering that it is a specific language. In addition, the relevance of reading and writing lies in the very formation of student readers,

who have contact with various texts, such as scientific articles, scientific dissemination texts, song lyrics, poetry, comics, cartoons, literary narratives, among others, associating chemical knowledge with different registers and languages. Such texts can enhance the use of more common pedagogical materials, such as textbooks and, thus, subsidize pedagogical practices in order to contribute to a more critical and contextualized teaching.

According to Silva et al. (2012, p.1), in order for the student to see meaning in the Chemistry contents addressed in basic education, it is essential to discuss its importance "in several areas of their life, such as: hygiene, food, beverages, medicines, cosmetics, among other areas that are part of the daily routine of the human being". Carvalho et al. (2007) found that in addition to the difficulty in relating Chemistry to their social reality, 70% of the students associated chemistry with weapons (chemical and nuclear), drugs and pesticides, denoting a negative interpretation of the discipline and corroborating the idea of disconnection with everyday life. In addition, there is difficulty among teachers to relate the knowledge of Chemistry with the student's daily life, since reproductions of knowledge with memorization of definitions and formulas are prioritized (Pontes et al. 2008).

In this context, in his studies Flôr (2009) mentions the importance of correlating everyday knowledge with the teaching of Chemistry, in order to assist in the formation of citizenship:

In today's world, where science and technology are increasingly present in our daily lives, contact with scientific knowledge and the understanding of its contents become important instruments in favor of citizenship. And the teaching of chemistry does not escape this responsibility and importance. Present in our daily lives from the occurrence of natural phenomena such as respiration and decomposition to the manufacture of the bread we eat every day, through soaps and detergents that we use in cleaning and covering paints, varnishes, fuels and the most varied materials possible, chemical knowledge permeates our most ordinary actions. Alcohol or gasoline, which is the most efficient fuel? What is the best economically and environmentally speaking? In addition, it is part of important discussions about global warming, production and disposal of polluting materials, among others" (FLÔR, 2009, p.16).

In addition to the relationship between everyday and scientific knowledge, the appropriation of the language of Chemistry is another relevant aspect, especially in relation to reading, which according to Wenzel and Maldaner (2014) is fundamental for student learning. In this regard, among different types of texts that can be approached by reading and writing in class, in the present research we opted to work with a scientific article (CA) and especially with texts of scientific dissemination (TDC), which treat scientific knowledge with a less technical language, but rich in information based on studies and research.

3.1 READING AS A DIDACTIC RESOURCE IN THE TEACHING OF CHEMISTRY

In the world, it is necessary to interpret in a coherent way what one reads or experiences, because it is these understandings that build in our cognitive universe the conceptions about the concepts presented, both in scientific productions and also in the elaboration of hypotheses in an attempt to explain some phenomena. (...) One of the spaces for the development of these skills should be the school environment, where reading is an important factor in the teaching and learning process, as it is from this that knowledge related to the various areas of study is built (ANDRADE et al, 2017 p.142).

By considering reading as an essential element of learning, Silva (1998) argues that the science teacher is also a reading teacher, therefore, reading and writing are skills that should also be worked on in chemistry classes, to help students acquire knowledge, whether in the school field or in life in society. Reading is one of the most important forms of learning; this has been pointed out in studies that demonstrate that the improvement in the ability to read also results in the improvement of the ability to learn (ANDRADE et al., 2017). Learning is effective when the reader is able to understand the texts read, which in most cases does not occur due to the lack of subsidies from previous readings that favor this understanding (KLEIMAN and MORAES, 2003).

According to Freire's (2006) propositions, reading is an essential element in the formation of citizenship and is inherent to the political act, as it enables an awareness of the position of the individual member of a society, understanding the relations that exist in it and his role in these relations. By becoming aware of their experience and their reading of the world, the individual understands their limits and potentialities within society.

From this perspective, we cannot disassociate the important role that the school has in the formation of citizenship with reading, as they are intrinsic elements, since the citizen, before relating to the world of words, relates to the reading of the world. Andrade et al., (2017) reiterate that, in the first years of life, with the beginning of language development, the citizen learns to read the world around him and, from this reading of the world, begins to discover the reading of words, and the social relationship experienced by the citizen is an important factor for the understanding of the texts read, because reading is effective when what is read has meaning for the subject. Reading is, in this view, essential to all subjects because it enables an understanding and learning of the social relations of the world in which they are inserted, since it is a socially constructed act that is triggered and expanded in the coexistence with the world and with others.

In view of the above, the importance of reading in the construction and formation of the identity of critical and socially active citizens is evident, and for this, it needs to be further

explored in schools as a didactic resource in Science classes. Students can glimpse through reading more meaning in the contents and disciplines that are offered to them and have more appreciation for socialized knowledge (TEIXEIRA and SILVA, 2007).

With regard to the Teaching of Chemistry, reading is one of the obstacles in the teaching and learning process, due to the notorious difficulty that students demonstrate in understanding texts focused on this area (FRANCISCO JUNIOR et al., 2008). In my teaching practice, I found that it is challenging to teach chemical content in a way that seems to add little to the student's education, since we perceive great disinterest and difficulty in understanding the subjects worked on in the classroom. According to Teixeira and Silva (2007), the difficulties associated with reading by students in high school are permeated by lack of motivation in the act of reading and the scarce understanding of various texts, especially scientific, with the need for planning and teacher mediation.

However, some alternatives can be considered to minimize the difficulties faced by students and, in this context, dynamic and planned reading can be a great contribution to this process (WENZEL et al., 2018).

According to the studies of Wenzel and Maldaner (2014), learning Chemistry requires the appropriation and signification of its language, which presents peculiarities such as symbols, formulas, concepts that need to be internalized and signified by students. I understand that it is precisely in the language of Chemistry that part of the difficulty in understanding the curricular component lies, since it is treated mechanically for memorization purposes. Hence the importance of attention to the language established in the classroom and to its modes of use, whether through writing, speaking and/or reading. Considering the specificities of the Chemical/Scientific language, Bargalló (2005) points out that:

Scientific language can act more as a barrier than as a bridge to facilitate the learning of most students. Students are used to a direct, contextualized conversation, which combines linguistic resources with gestures, looks, tones of voice and who, through dialogue, have the possibility of clarifying and reformulating the text, finding themselves in a different situation in front of a scientific text (BARGALLO, 2005, p. 33-34).

It is important to emphasize that reading, as much as it is an important ally of the Chemistry discipline, needs to be planned and thought out cautiously according to the target audience, level of understanding of the concepts, among other aspects with the need to bring the student's language closer to the Chemistry language.

Reading needs to be used in the school in a coherent way, as a contribution that generates understanding and does not cause more distancing of the student in relation to

Chemistry and for that, the teacher has an essential role in this process because he is the one who must outline reading strategies to be applied, so that the interest and scientific curiosity of the students is stimulated and makes it possible to define problems, to raise, analyze and represent results, conclusions and propose interventions (TEIXEIRA JÚNIOR, SILVA, 2007). On this,

The text should provide the student not only with the reading of the word from his historical-social experience (reading the world) but also the possibility of rewriting his world, transforming, at the same time, his reading of the initial word. In this sense, school reading needs to be modified, especially in terms of the students' relationship with the text. To this end, reading strategies should provide a more personal contact with the texts (Francisco Júnior, 2010 p.221).

Although many studies have found the relevance of reading in different areas of knowledge for a full citizenship education, which is not limited to school activities, but which goes beyond the walls of classrooms, there are still timid works aimed at this focus in disciplines that comprise the natural sciences, such as Chemistry, object of the present study. In addition, most publications are works that carry out a literature review, with a smaller number of studies that demonstrate experiences in the teaching of Chemistry, especially in basic education (COLPO et al., 2019).

Despite this, the studies published on the subject in focus have shown very satisfactory results. For example, Guaita and Gonçalves (2015), in a study carried out with 25 students from the 2nd year of High School, made use of texts in Chemistry classes from the journal *Química Nova na Escola* and used the three pedagogical moments as a strategy. The authors concluded that "the reading strategy contributed to identifying students' knowledge about the subjects studied and favoring their evolution" and reiterate that "there are indications that the learning of reading was, to a certain extent, increasing during the course of the activities" (GUAITA, GONÇALVES, 2015, p. 60). This growth portrays the need to expand spaces for reading in the classroom, in which the student can learn to read and position himself in front of the texts.

Another important study was carried out by WENZEL and COLPO (2018) with 29 students from a 1st year class, using TDC in which the theme Radioactivity was worked on from the book *A Brief History of Science* (BYNUM, 2014). The authors concluded that it was "possible to provide students with an approximation with specific terms of chemical language, as well as the discussion of historical facts and everyday knowledge related to radioactivity content" (WENZEL, COLPO, 2018 p.141).

In this sense, spaces are needed in classrooms that enable the dialogue of the insertion of reading as a methodology for teaching Chemistry, since, following the perspective of Ferreira and Queiroz (2015, p. 132), when mentioning the use of DCT, they point out that "studies on classroom interventions using DCT indicate the occurrence of innovative and motivating teaching methodologies". Such methodologies need to be planned, so that the proposed reading is not merely reproduced by the student, but that it provides interaction between the reader and the text, and enables the young person to appropriate the scientific language.

3.2 SCIENTIFIC TEXTS (CA AND TDC) AS A METHODOLOGICAL STRATEGY IN SCIENCE TEACHING

There is a consensus among several studies that the practice of reading is essential in the teaching and learning processes, as it provides the development of imagination, creativity, communication and critical positioning in front of the text, in addition to helping in the correlation with the social context of the student and assisting in the formation of citizenship. (ZISMANN et al, 2019; TARGINO DE MOURA et al, 2019; FATARELL et al., 2014). In this sense, Francisco Júnior (2010) argues that the use of reading allows the reader not only to understand his context, but above all the possibility for the student to rewrite his world with his own way of thinking and positioning himself in front of his universe of life. Within this understanding of the importance of reading, Zismann et al (2019, p.128) say that "when the student is instigated to interpret, to position himself in front of the text, he expands his critical capacity and, with this, qualifies the modes of writing, argumentation and understanding".

In this discussion about the relevance of reading in the production of knowledge in any area, the importance of different readings in the production of knowledge in the teaching of Chemistry is highlighted, since very often its teaching is plastered on the reading of textbooks and handouts with a large volume of numerical information such as formulas and mathematical quantities, which alone do not enhance a dialogue about chemical terms and their relationship with everyday life (ZISMANN et al, 2019).

Ribeiro and Mesquita (2012) show in their study that, in general, the teaching of Chemistry has contributed little to the critical formation of students and this training that takes place in High School is the result of a non-contextualized formative process. Maldaner (2006) points out that contextualizing the teaching of Chemistry is being able to walk in the world of the student's experience and concepts, allowing the student to enter an abstract world and

towards the real world, allowing students to start talking in chemistry about situations they experience, resignifying the learning process.

In Freire's perspective, contextualization should be understood as the development of values and attitudes to form citizens able to exercise conscious citizenship in their social environment, because "when man understands his reality, he can raise hypotheses about the challenge of this reality and seek solutions. Thus, he can transform it and with his work he can create a world of his own: his self and his circumstances" (FREIRE, 1997, p. 30). Regarding the importance of contextualization for the teaching of science, Wartha, Silva and Bejarano (2013) comment that:

[...] Contextualization is clearly the guiding principle for the teaching of science, which means a more complex understanding than the simple exemplification of everyday life or a mere superficial presentation of contexts without a problematization that actually provokes the search for understandings on the topics of study. Therefore, contextualization should not be seen as a resource or proposal for a methodological approach, but rather as a guiding principle (2013, p. 90).

In view of the need to instigate reading in students of the Chemistry discipline in basic education, especially in high school, in order to qualify the readings used by students at this level of education, different studies point to the use of such scientific texts (CA and TDC) as a methodological strategy for the teaching of Chemistry (FATARELL et al., 2014).

The scientific texts addressed are characterized by the use of simpler and more appropriate language for a non-specialized audience, not initiated in science, where the more technical, scientific-chemical terms dialogue with social and historical aspects, which makes reading more accessible in the context of the classroom (CUNHA and GIORDAN, 2015). In these texts, explanations of a more scientific nature approach everyday facts through examples. This facilitates the reader's understanding of the more specific aspects of chemistry, and with this the teacher assumes the contextualization of knowledge and overcomes the perspective of the transmission of chemical content (TARGINO DE MOURA et al, 2018).

In the view of Ferreira and Queiróz (2012), both CA and TDC have specific characteristics that favor their use in the process of obtaining information by the public not literate in science, whose main elements to stand out as preponderant in these texts are scientificity, didacticism and secularism. For the authors, the traces of scientificity come from scientific discourse, related both to scientific praxis and to possible negative consequences of products of science. Secularism brings evidence of everyday discourse and contemplates

different forms of contextualization. And didacticism is related to aspects of the didactic discourse such as explanations, resumptions and methodological guidelines.

From this perspective, according to Zismann et al, 2019:

It is possible to say that TDC differs from chemistry texts, usually present in textbooks, it also differs from a scientific article, because in this the author does not appear and there is no concern to establish a dialogue with the reader that is not initiated in the area. In TDC, the author is present, can, in some cases, be the character of the text and seeks to establish a dialogue with the reader (2019, p.129).

It is relevant to mention that the scientific text does not focus on teaching, but can be used in classes as an instrument to assist in the learning process, as pointed out by Cunha and Giordan (2015). In the perception of Zismann et al, (2019), the use of these texts in the classroom brings the student closer to the world of science, as it provides students with contact with up-to-date information about science and technology, with events in their daily lives, also bringing curious, interesting and fun aspects, providing another way of seeing the dreaded Chemistry. Other relevant aspects provided by scientific texts that we can point out are the stimulus to the development of reading skills, critical and reflective spirit, always in a movement of guided reading (FATARELL et al., 2014).

In addition, Santos and Mortimer, 2009, emphasize that the formation of the individual for citizenship is considered a fundamental objective of science teaching. In this sense, several didactic strategies are suggested aiming at the incorporation of socio-scientific issues and the promotion of decision-making, including the debate of open questions as an important strategy. Martins et al. (2004) argue that these texts can function as important support materials for the triggering of debates that promote students' access to scientific knowledge and, at the same time, the socialization of this knowledge in the classroom, linking science updates to the students' life context.

In summary, the problem of this research stems from experiences lived throughout my teaching career whose focus is the insertion of reading mediation activities in Chemistry classes in Basic Education, specifically in the 1st year of High School. Looking at the insertion and organization of reading in the teaching of Chemistry proved to be important to help students to have a differentiated and less mechanized look at the discipline. A dialogue about the methodology of the research follows.

4 METHODOLOGICAL PATHS

Methodology is the path of thought and practice exercised in the approach to reality (MINAYO, 2009).

In this section, the methodology used in this research is presented, the locus of research, the participants, the activities of reading Scientific Dissemination Articles used with the students, the construction of information, in addition to addressing the legal aspects that guarantee the participation of the students involved in the research and the systematization of the data produced.

The procedures adopted are important in the research process, as they allow the researcher to respond to the proposed problem and, consequently, achieve the expected objectives. In addition to bringing the researcher closer to the object of study, these procedures make it possible to trace new scientific paths, so that a theory can be reformulated, if it already exists, that is, constructed, if the results present new perspectives for the researched phenomenon (VERGARA, 2005).

Thus, the present research focuses on investigating practices of mediation of reading texts of scientific dissemination in the context of Chemistry classes in the 1st year of high school, in addition to identifying reading habits in these students; analyze reading mediation processes and their possible contributions to Chemistry learning and develop an educational product with reading mediation strategies in Chemistry classes.

4.1 METHODOLOGY ADOPTED: TYPE OF RESEARCH AND ANALYSIS OF INFORMATION

The present work is a qualitative research, of the pedagogical intervention type, which according to Damiani et al. (2013, p. 58) contemplates the "planning and implementation of interferences (changes, innovations) - aimed at producing improvements in the learning processes (...) - and the subsequent evaluation". Intervention research seeks alternatives to concrete problems in teaching and should not be confused with teaching and extension projects or their reports with reports of experiences. It is an applied investigation, in which academic production allows teachers to investigate their own practice (DAMIANI et al., 2003).

They are considered as research aimed at the concrete world because it is a research that deals with subjects, used and applied for the solution of clear and perceptible problems, different from those that occur with specific controls of variables such as in laboratories, which use the scientific method as a recurrent practice. They are opposed to basic research, which aims to expand knowledge, without concern for its possible practical benefits (GIL, 2010).

In some points, pedagogical intervention research is similar to action research, and can be summarized as follows, based mainly on the ideas of Tripp (2005) and Thiollent (2009): Intention to produce changes, attempt to solve problems, applied character, need for dialogue with a theoretical framework, possibility of producing knowledge. This research

format proposes to subsidize decision-making related to changes in educational practices and improvements in the quality of teaching, in addition to evaluating pedagogical innovations, which is in accordance with the proposal of a research in the context of the professional master's degree.

The analysis of the information had as a theoretical and methodological foundation some aspects of content analysis (BARDIN, 2011). According to Bardin (2011), content analysis can be organized into three phases: a) pre-analysis; b) exploitation of the material; c) treatment of the results. In the pre-analysis, we did the floating reading and the choice of the materials that were analyzed, in order to identify themes related to the focus of the study, that is, reading and its possible contributions to the learning of Chemistry. The materials analyzed were written productions of the students, which consisted of: reading record diary, glossary and research reports, produced in the context of reading mediation activities.

The exploration of the material associated with the theoretical study on the object of the research made it possible to identify themes that guided the selection of the information present in the materials and the treatment of the results. Thus, in this study we used thematic analysis, which involves identifying the "nuclei of meaning" that constitute the analyzed material, specifically the students' written productions. The presence of these nuclei and their frequency "can mean something for the chosen analytical objective" (BARDIN, 2011, p.135). were: a) Scientific language and mother tongue, b) Food and citizenship education and c) relationship with the content in focus. These themes are not mutually exclusive and overlap in some aspects, however, their definition was fundamental for the analysis of the information in the research and enabled the emergence of relevant aspects for our study interest, that is, reading mediation activities.

As it is a professional master's research, the main objective of the analysis was to investigate the practice of the research teacher when using reading mediation strategies in order to identify contributions and propose improvements in his classes. By producing knowledge about reading mediation in Chemistry classes, the analysis of the students' productions in this research can also contribute to other teachers to develop strategies and propose other ways of working with reading texts in Chemistry teaching. Below we describe the context of the research.

4.2 CONTEXT OF THE RESEARCH

The research was developed in a State School of the Public Education Network⁶, located on the island of Mosqueiro,⁷ which has been in operation since 1976. The School is considered one of the pioneers on the island of Mosqueiro and comes from the School "Reunida de Carananduba",⁸ which on August 28, 1976, was renamed "State School of 1st Grade Professor Abelardo Leão Condurú", in honor of the great public figure of Pará Abelardo Leão Conduru⁹. Later, the school was renamed Escola Estadual de Ensino Fundamental e Médio Professor Abelardo Leão Condurú.

The educational institution serves around 986 students distributed between Elementary School (6th to 9th grade) and High School (1st to 3rd grade) in the morning, afternoon and night shifts and has infrastructure consisting of (10) classrooms, one (1) auditorium, one (1) multidisciplinary laboratory, one (1) sports court and one (1) library. The school develops extracurricular activities focused on music, art and poetry, such as the Soirée that takes place annually and is a moment when students present their artistic productions such as music, dance, poems and socialize in the school court with the school community. In addition to the Soirée, the school promotes extra-class activities in museums, universities and other spaces for the democratization of knowledge as an incentive to art and culture, conducted by professors of the disciplines of History and Sociology.

The school's technical staff consists of a manager and deputy managers, pedagogical coordinators, teachers and support staff (administrative agents, doormen, lunch cooks and cleaners), totaling about 60 employees working in the institution. Figure 4 below illustrates in "a" the entrance to the district of Mosqueiro where the school shown in "b" where the research was carried out is located.

⁶ State School where the present research was carried out. The institution is located on the outskirts of Mosqueiro, in the Carananduba neighborhood.

⁷ Mosqueiro Island is an administrative district of the municipality of Belém. Mosqueiro is a river island located on the eastern coast of the Pará River, in the southern arm of the Amazon River, in front of the Guajará Bay. It has an area of approximately 212 km² and is located 70 km away from the center of the capital Belém. Its population is estimated at 20 thousand inhabitants according to data from the Brazilian Institute of Geography and Statistics (IBGE). Information taken from the official website of the city of Belém: <http://www.belem.pa.gov.br>

⁸ Information collected from the School's management and the website <http://jornalcorreiojurunense.blogspot.com/2011/04/reinauguracao-da-escola-abelardo-leao.html>

⁹ Abelardo Leão Conduru was an important figure in the political scene of Pará who in the 20s, 30s and 40s assumed several important public positions among which the following stand out: State Deputy, Mayor of Belém, Senator of the Republic. He had great influence on Mosqueiro Island where he founded the famous Farol neighborhood, and his residence was later transformed into the then known Hotel do Farol. Data obtained from the <http://mosqueirando.blogspot.com/2014/02/na-rota-da-historia-abelardo-leao.html> website

Figure 4

a- Entrance portal of the district of Mosqueiro; b- State School where the research was carried out



Source: Author, 2019.

4.3 CHOICE OF SCHOOL AND YEAR FOR RESEARCH DEVELOPMENT

In the school where the research was carried out, I felt the need to stimulate reading in the discipline of Chemistry, since the difficulties in discussions and resolutions of situations - a problem during the classes taught with students of the 1st year of High School were permeated by difficulties of interpretation and scientific vocabulary, especially focused on the periodic table, which is the subject developed in the classes during the present research. Although in the 9th grade of Elementary School students already work on Chemistry content focused on the Periodic Table, I realize the difficulty in understanding the subjects related to this content. As a Chemistry teacher, I came to the conclusion that it is necessary to have methodological strategies to work with these difficulties of students in the first year of high school.

It was after these observations that I decided to work on methodological strategies with the reading of TDC focused on chemical elements, from the journal "Química Nova na Escola" and, at the same time, contextualize the study of chemical elements with the regional and local culture through a feed article from the "Brazilian Journal of Endocrinology and Metabology". Below, I discuss a little more about the profile of the students involved in the research.

4.4 PROFILE OF THE STUDENTS PARTICIPATING IN THE RESEARCH AND LEGAL ISSUE

The present research was carried out in the second two months of the 2019 school year, during the classes of the Chemistry discipline with an approximate workload of 24 hours/classes, divided into 3 hours of weekly classes, and had as participants a class of 39 students from the 1st year of High School in operation in the morning shift. The class

consisted of 16 female students and 23 male students, aged 15 to 17 years. At the time of the research, the students were residents of the Carananduba neighborhood or its surroundings (neighborhoods of São Francisco, Bonfim, Caruara, Marahú, Paraíso, Baia do Sol), located on Mosqueiro Island.

To start this study, the research proposal was presented to the school board, which signed the Informed Consent Form (ICF) (Appendix A). Next, we addressed the participants by presenting the ICF with a brief explanation about the work developed in compliance with the requirement of the Professional Master's Degree in Education, Science and Mathematics at UFPA and the objectives of the research (Annex B), signed by those responsible for being under 18 years old. The anonymity of the participants was guaranteed by the use of codes that represent the students in the research, such as A1, A2, B1, B2, etc.

4.5 STAGES OF THE RESEARCHED ACTIVITY AND INSTRUMENTS USED

The research was basically outlined in 04 stages, comprising different moments in which reading as a methodological resource was the core of the research, and writing was taken into account in some stages as a methodological contribution.

For each stage, instruments were used that made the research feasible. The research instruments are essential for the researcher to collect initial data and evaluate the scope of the intervention actions carried out. According to González Rey (2005), the instruments of a research are characterized as "any situation or resource that allows the other to express himself in the context of the relationship that characterizes the research" (p.42).

Among the most common instruments used are observations, questionnaires, interviews, formation of reading and discussion groups and others (Weller, 2006). Therefore, in this study I used observation, questionnaires and written productions of the students as research instruments.

Below, I describe the four stages that make up the research scenario of the present study.

- At the first moment with the students, we talked about the research, commented on the relevance of the study and the related objectives and, at the end of the dialogue, the students received a Consent Form (ICF), so that a responsible person could authorize their participation in the study. In the following week, the consent forms were returned and a semi-structured questionnaire was used, called Q1 (Annex C) in this study, whose objective was to perform a diagnostic evaluation to investigate the students' reading, interpretation and writing habits. We sought to investigate possible difficulties

encountered in readings, especially of scientific articles and scientific dissemination, in order to establish strategies to approach the later stages.

- An article considered easy to understand concerning "healthy eating" was selected¹⁰. The reading strategy used was group reading, followed by a conversation circle in a subsequent class and the use of a diary to record study notes by the students, in addition to the elaboration of a glossary referring to the text worked in class.
- Students were asked to read individually in class a text published by the University of Évora¹¹ entitled "Brief history of the Periodic Table". After the reading, a collective discussion was held in class related to the main points observed by the students in the text. At another time, an oral presentation was held in the format of an expository class and dialogued with the use of a multimedia image projector, addressing the Periodic Table.
- In order to relate the readings and activities developed concerning healthy eating (stages 1 and 2) with the discussions regarding the periodic table of chemical elements, in this stage the students were invited to form working groups (WGs). Thus, the WGs were instructed to research foods belonging to the food cuisine of Mosqueiro Island in order to research the chemical composition and consequently the chemical elements present in these foods. To this end, each TG chose a food of their preference to research. The documentary "Mosqueiro island of flavors" was shown,¹² which shows the gastronomic potential of the island of Mosqueiro and the traditional and healthy cuisine, seeking to bring the local popular culture closer to the Chemical bias in Mosqueirense's food, through the teaching of the Periodic Table. Subsequently, the professor provided the students with a series of articles on different chemical elements, from the Revista Química Nova na Escola¹³ – QNEsc. The research was socialized in a dynamic and interactive way in class through discussions so that each group had access to the work carried out by the other teams. In order to preserve the data obtained in each stage of the research, each WG produced a folder/logbook to store their text productions and questionnaires applied in group and at the end, they were delivered to the professor who proposed the research for later systematization.

¹⁰ Sichieri, R. et al. Recommendations for Healthy Eating and Nutrition for the Brazilian Population. *Arq Bras Endocrinol Metab* v.4, 4n.3, 2000.

¹¹ University of Évora, Department of Chemistry, International Year of Chemistry. Available at: <https://quimicaparatodosuevora.blogspot.com/2019/02/breve-historia-da-tabela.html>

¹² Shown on TV Cultura on the website <http://www.portalcultura.com.br/node/50285>) and made available on the video-sharing platform You Tube at the address: <https://www.youtube.com/watch?v=K4bluHI3a8U&t=72s>

¹³ Revista Química Nova na Escola available on the website <http://qnesc.sbq.org.br/online/qnesc04/>

5 RESULTS AND DISCUSSIONS

As already mentioned in step 1 of this study, an evaluation was carried out to investigate the initial profile of the students' reading, interpretation and writing habits, based on a semi-structured questionnaire – Q1 (appendix). The analysis of the question "What is your reading preference?", illustrated in Figure 4 showed that the literatures used by the students as their preference are books, which were mentioned by 48%. The genre of these books was not investigated in this research, but it can be inferred that they are probably more directed to the children's age group. In second place were comic books/comic books, which represent 46% of the total number of readings identified, and in third place were magazines and newspapers, which correspond to only 3%, and no student mentioned scientific articles and scientific dissemination as preferred reading.

Figure 5

Reading preferences of those surveyed



Source: Author, 2019.

The analysis of the data leads us to suggest that these literatures most cited in the study are associated with the universe of young people and their contexts of experiences, which modulates their behavior as readers and justifies the preferences for such readings. For this reason, comics/comics and books are the most sought after reading objects by students, reaching 94% of the total number of students, who, on the other hand, confirm that this same audience has little interest in reading magazines, newspapers and articles.

The little or no search for scientific articles or texts of scientific dissemination by students of Basic Education, specifically in High School, the level to which this study was directed, may show low interest or difficulty in accessing scientific culture and scientific knowledge in such texts. This leads us to the following questions: What would be the reason

for this possible lack of interest in scientific culture? Is reading articles considered more far-fetched/difficult by this readership? Does the investigated public have difficulty accessing materials such as texts for scientific dissemination? Would it be a methodological failure of the schools and lack of pedagogical support to stimulate these readings?

For an analysis of the students' notes in the questions previously discussed, an evaluation of the students' statements elaborated in the Q1 questionnaire was carried out, in which the students were asked: "For you, what is your greatest difficulty in reading articles or texts of scientific dissemination?" The answers obtained allow us to observe that 85% of the students' statements refer to difficulties in understanding what they read in the articles or that they are unable to abstract information of this textual genre. Table 2 shows some of the main statements that represent the aforementioned percentage of students who talk about difficulties in understanding scientific texts:

Table 3

Answers obtained from students during a questionnaire about the difficulties they have in relation to reading articles or texts of scientific dissemination (TDC)

STUDENT	ANSWERS OBTAINED BY QUESTIONNAIRE
A2	"Why some things I understand and some things I don't."
B1	"My biggest difficulty is that I don't consider what I'm reading and I don't understand what I read, there are words that I can't read."
B2	"My biggest difficulty is not being able to understand what I read, I really like to read, but there are things I don't understand."
A3	"A lot of information in the article that you can't understand things."
B5	"I'm going to be truthful, I don't like to read articles, because I don't understand much of what I read"
B6	"Understand what he means"
A7	"Sometimes I can't understand some words in the article"
A9	"The difficulty sometimes of understanding and comprehending, because some articles have arguments that I have never heard of".
B8	"Often the understanding of some terms and words that I don't know or that is little used in my daily life".
B9	"understand what he wants to convey to us" (student B9).
B10	"I have difficulty with some different words"
A13	"to understand what he says".
A14	"I read and reread, but I can't understand it a lot of the time."
B13	"There are some articles that I read and understand, but there are some that I read and I can't reason what it says because it's difficult."

Source: Author, 2019.

Table 2 shows us different records of the students about the difficulties they present in reading articles and DCT, which were pointed out in different ways, but all converging to a point that is the "difficulty in understanding what they read". In an analysis of some of these statements shown in table 3, we can observe that student B1 reports "I don't understand what I read, there are words that I can't read", evidencing the difficulty in understanding due to lack

of knowledge of words found in the text. This same element was verified in students A7, B8 and B9 who talk in their speeches about the difficulty of "understanding words" that they did not know before reading the articles. Thus, it was possible to infer that a possible vocabulary limitation makes it difficult to construct the interpretation and comprehension of the texts during reading. The analysis of the other statements, even though they do not explicitly mention that the difficulty is due to the lack of understanding of unknown terms found in the texts read, suggests that these limitations of comprehension permeate in most cases for the same reasons.

On this, Ferreira & Horta, (2014) discuss:

Difficulties in the act of reading continue to be one of the main obstacles to school success and performance, often causing difficulties in other areas of learning, reflecting on the student's entire school career. Difficulties in learning to read can manifest themselves in the acquisition of basic skills, especially in the decoding phase, but also, later, in the phase of comprehension and interpretation of texts (Ferreira & Horta, 2014 p. 145).

The lack of motivation in the act of reading is related to the difficulty of understanding what one reads, especially scientific texts that are generally pointed out as difficult to understand (Teixeira & Silva, 2007). However, with appropriate strategies, reading can be successful and become a great ally in the evolution of the student in different aspects of his or her school life, and for this reason it deserves to be more valued in formal school education environments (Guaita and Gonçalves, 2015).

5.1 ANALYSIS AND DISCUSSION OF THE TEACHING ACTIVITIES DEVELOPED

The information constructed in the present research was organized around the sequence of activities developed in class, in order to highlight the reading mediation strategies and the relevant aspects that emerged in each activity, based on the themes defined in the exploration of the material and that we previously presented: a) Scientific language and mother tongue, b) Food and citizenship formation and c) relationship with the content in focus.

5.1.1 Reading activity and conversation circle with mediation and written production

We selected a scientific article on "healthy eating"¹⁴ and the reading strategy used was group reading with the teacher as mediator of the process.

¹⁴ Sichieri, R. et al. Recommendations for Healthy Eating and Nutrition for the Brazilian Population. Arq Bras Endocrinol Metab v.4, 4n.3, 2000.

Figure 6

Recording of reading activity – Individual and collective



Source: Author, 2019.

To encourage reading in the classroom under the teacher's mediation, students were instructed to read the text again outside the classroom, with the aim of deepening the content of the article. They also received guidance to highlight in their individual readings points considered relevant for later discussion in a conversation circle. Thus, as had been outlined, during the classes of the week following the extra-class reading, a "conversation circle" was held in which the students talked about points that they considered most relevant in the text, in order to socialize the different notes with the class. In this way, they participated by reporting passages of interest and difficulties, exemplifying their statements with their own experiences and bringing their daily actions closer to the new information obtained in the text, in addition to incorporating new meanings and scientific concepts.

Figure 7

Record of the conversation circle about the article related to "healthy eating"



Source: Author, 2019.

After completing the conversation circle, the students received "record diaries" to produce a text addressing the points considered most relevant in the reading, which were used as a contribution to the collective discussions.

Figure 8

Records of textual production and production of the glossary referring to the text already mentioned



Source: Author, 2019.

We highlight below some texts from the students' written materials that illustrate possible contributions to scientific learning and that help us to know the aspects that most caught the attention of young people when reading the scientific article on healthy eating.

In the reading record, it was possible to identify the choice of excerpts from the text that brought scientific information about foods for daily consumption by the students, which is in accordance with the content of the discussions in the conversation circle, in which they sought to relate aspects of their eating habits with scientific concepts present in the text:

Among the foods in the Brazilian diet with the highest fiber content are cassava flour, beans, peas, corn, peanuts, jiló, pine nuts, sweet potatoes, baroa potatoes, yams and taioba (A3 – reading record).

Beans are one of these rescue elements, due to their content in fiber, folic acid and iron. (A2 – reading record).

In their reading records, the students selected excerpts from the text under study with the potential to expand knowledge about foods from their universe of experiences, from the insertion, in their writing, of terms from scientific language such as fiber, folic acid and iron. Although students were not asked to use these terms in another activity that would request their use in different contexts, it is important that students have contact with these aspects.

Science learning implies that the relationship with scientific language occurs in different situations, in which students learn new meanings for the terms used in class. In other excerpts from the students' records, we can identify the presence of the theme and the content in focus, that is, food and the periodic table. In these passages, chemical elements and their relationship with food are mentioned,

Reducing salt consumption requires a large reduction in the consumption of processed foods with a high amount of sodium such as chips, smoked and canned foods, as well as avoiding adding salt to foods already prepared (A5 – reading record).

(...). The identification of foods, or groups of foods, whose consumption should be encouraged, (...). Beans are one of these rescue elements, due to their content in fiber, folic acid and iron (A7 – reading record).

(...). Sources of calcium are also sources of cholesterol and saturated fats, and should therefore be considered together in the preparation of the guides (A4 – reading record).

For a good life and good nutrition, macronutrients must be consumed in the diet in greater quantities, micronutrients in smaller quantities, folic acid, vitamins E, C with the use of an intake of 200 mg/day, equivalent to the intake of five servings of fruits and vegetables; also sodium and calcium (...). (A6 – reading record).

According to Vygotsky (1998), words have an internal history of development, that is, they cannot be transmitted directly to students. This is an interesting theoretical justification for the contact of students with knowledge about chemical elements, for example, calcium and sodium, in a concrete context, food, instead of talking about them only in the study of the periodic table itself, as an isolated content and unrelated to the contexts of the students' experiences.

Reading and writing are fundamental skills for the formation of individuals with social and political responsibility that need to be worked on in Natural Sciences classes. In this regard, Wenzel et al., (2018) consider that:

In addition to the use of the specific language of Chemistry, it is essential that the classroom becomes a space for the formation of readers, that is, that students learn to position themselves in front of the text, that they dialogue responsibly with the reading carried out, so that reading is a process of interaction between a reader and a text, in an interactive reading movement, where both the reader and the way in which one reads is considered. In Chemistry classes, it is essential that the teacher pays attention to the fact of forming and producing readers with social and political responsibility and with the ability to judge, evaluate and decide in the field of technical and scientific domain. And one way to do this is the appropriation of chemical language, its conceptual understanding through the significant use of the language of chemistry (WENZEL et al., 2018, p.99).

In the excerpts selected by students A1 and A5, it was possible to identify positions based on scientific knowledge about food and its repercussions on people's lives:

Thus, a proposal for healthy eating, for the prevention of chronic non-communicable diseases, must propose diets that are within the reach of society as a whole, and that have an impact on the most important factors related to various diseases (A1 – reading record).

The proposal of a diet for the Brazilian population also has two other assumptions: the rescue of healthy eating habits typical of Brazilian food, whose consumption should be encouraged, rather than formulating prohibitions (A5 – reading record).

Reading in Chemistry classes can contribute to the student having a more significant education from the citizen point of view. Through its contents, principles and concepts, Chemistry can stimulate a change in citizen attitude, especially with regard to people's rights and duties, giving them the ability to demand from society and governments sensible and coherent attitudes that effectively improve our lives (LIMA, 2012). These aspects could be identified in the following records:

Adolescents are particularly influential in their lifestyle and should be primarily included in collective health programs (A2 – reading record).

Fostering consumer information activities and establishing specifications for labeling by the Ministry of Health would be important goals within this perspective (A3 – reading record).

The students were instructed to also produce a glossary with the words considered unknown in their vocabularies. It was possible to observe in the glossaries two main aspects: the selection of words more related to scientific language and those that we identified as generally in use in our mother tongue. In the examples we selected referring to scientific language, the definitions constructed by the students, in general, were related to Science content beyond the chemical content, as we can illustrate in the following examples:

Metabolism: set of chemical transformations experienced by substances introduced into the body, the most important of which is the production of energy (A6 – Glossary).

Epidemiological: It is the study of the frequency, distribution and determinants of health problems in human populations (A5 – Glossary).

Macronutrients: these are nutrients that human beings need in greater quantities in their diet, in this case they are carbohydrates, proteins and lipids (A3 – Glossary).

Micronutrients: these are nutrients needed in smaller quantities in the diet, in the case of human beings they are vitamins and minerals (A3 – Glossary).

The activity of constructing the glossary allowed us to identify that the reading of the text contributed to broaden the students' contact with scientific language and the establishment of interdisciplinary relationships within the area of Natural Sciences. On the other hand, we consider it important to highlight that the development of the scientific vocabulary of young people did not occur in spite of the literacy process itself in the mother tongue, which is permanent and was related to the learning of reading and interpretation of a specific textual genre, the scientific article. In other records, we observed words closer to what we identified as in general use of the mother tongue:

Assumption: that one assumes, pretext, that one assumes in advance, that is, what one imagines and thinks about a certain thing or situation (A2 – Glossary).

Foster: Promote the development of, exercise, facilitate, stimulate (A2 - Glossary).

Effectiveness: is the ability to produce and maintain an effect, which can be positive or negative (A1 – Glossary).

The definitions researched by the students and recorded in their glossaries did not always coincide with the meaning of the words present in the text. student A4 identified the definition of words that did not coincide with their meaning present in the text:

Content: text or content of any writing or document (A1 – Glossary).

Supplementation: 1. Provision of assistance. 2. Adding cash to make up a certain amount (A4 – Glossary).

In the text read in the classroom, the content referred to the proportion of nutrients, such as fiber and fat, in food products. Supplementation, in turn, is related to the addition of certain nutrients to the population's diet. This demonstrates that the activity of the glossary is important for the identification of the dictionary meaning of the word, however, in order to contribute more effectively to the interpretation of the text, it is necessary to relate the definition of the words with their use in a concrete context.

In this context, the figure of the teacher is fundamental in the sense of making reading possible through mediation and encouraging the practice of reading in an increasingly constant way in the life of the student, as discussed by Almeida et al, (2012):

Mediating reading, therefore, is more than reading a book and recommending it to other readers. For the mediation of reading to occur, it is necessary to make the story interesting for the reader, to discuss it, to ask questions, to show the benefits that reading offers and the power of transformation that it has in people's lives (Almeida et al., 2012 p.477).

When reflecting on the activity of elaborating the glossary, I understand that feedback could have been made in relation to the students' production that related the words defined by them and the text worked. This was not done at the time of the teaching action, which was possibly related to the fact that, as a professor in the area of Natural Sciences, my gaze was more directed to the terms of scientific language.

5.1.2 Study of the Periodic Table with the use of Readings and Expository/Dialogued classes

After the conclusion of the previous phases, stage 3 of the research was developed, in which we worked on the content Periodic table. To start the theme, students were proposed to read individually in class a text published by the University of Évora¹⁵ entitled "Brief history of the Periodic Table". The objective of the reading was to encourage students to know, through an easy-to-understand scientific text, historical aspects related to the construction and development of the Periodic Table. The student could understand aspects of the production of knowledge related to the periodic table, and not just the ready-made and structured table without the opportunity to follow its historical/scientific evolution as it usually occurs. After the reading, a joint class discussion was held related to the main points observed by the students in the text.

At another time, in order to assist in the theoretical foundation and strengthen the knowledge obtained through the text previously read, an oral presentation was held in the format of an expository class and dialogued with the use of a multimedia image projector, addressing two teaching modules concerning the Periodic Table, which were:

- Module 1: Building the periodic classification of chemical elements (The concept of Family or Group, concept of Period, general characteristics of the periodic table, predicting the electronic configurations of valence);
- Module 2: Periodic properties (atom size, ionization energy, electron affinity, in addition to the study of metals, ametals and semimetals, as well as other periodic properties such as melting temperature and density).

During the discussion of the modules, the students were instigated to associate the knowledge related to the periodic table with their daily context, in order to go beyond the abstraction so present in the discipline of chemistry and allow the student to visualize such knowledge in a contextualized way. In this discussion, the professor addressed the theme "food", previously worked with the reading of the initial scientific article. The idea was for

¹⁵ University of Évora, Department of Chemistry, International Year of Chemistry. Available at: <https://quimicaparatodosuevora.blogspot.com/2019/02/breve-historia-da-tabela.html>

students to realize that it is possible to understand the periodic table as knowledge associated with different science content and topics, such as the chemical composition of food, which, in my view, could resignify the process of teaching and learning Chemistry.

5.1.3 Research related to regional/local cuisine

In order to relate the readings and activities developed concerning healthy eating (stages 1 and 2) with the discussions regarding the periodic table of chemical elements, in this stage the students were invited to form working groups (WGs). Thus, the WGs were instructed to research foods belonging to the peculiar cuisine of Mosqueiro Island in order to research the chemical composition and consequently the chemical elements present in these foods. To this end, each WG chose a food of their preference to research, and the chosen ones were: fish, shrimp, cassava flour and tucupi, tapioca, açai and corn.

To promote the research carried out by the students on regional cuisine, after the formation of the WGs and research carried out by them, the documentary "Mosqueiro island of flavors" was shown,¹⁶ which shows the gastronomic potential of the island of Mosqueiro and the traditional and healthy cuisine, seeking to bring the local popular culture closer to the Chemical bias in Mosqueirense's food, through the teaching of the Periodic Table.

As the objective of the proposal was to understand which chemical elements are most present in the composition of the foods chosen by each group, the coordinating professor of the research provided the students with a series of articles on different chemical elements, from the *Revista Química Nova na Escola*¹⁷ – QNEsc. Each group read and studied the articles on the chemical elements and sought to relate them to the foods that each team researched. The chemical elements covered in the articles were: Actinium, Aluminum, Argon, Beryllium, Boron, Calcium, Carbon, Iron, Chlorine, Sulfur, Scandium, Fluorine, Phosphorus, Francium, Lithium, Hydrogen, Helium, Magnesium, Manganese, Neon, Nitrogen, Oxygen, Palladium, Potassium and Sodium.

After reading the articles and researching the nutrients of the chosen foods, each WG produced a written text making a general overview of the research carried out regarding the typical foods of Mosqueiro Island and its relationship with the chemical elements based on the reading of the articles of the journal *Química Nova na Escola*. The research was socialized in a dynamic and interactive way in class through discussions so that each group had access to the work carried out by the other teams.

¹⁶ Shown on TV Cultura on the website <http://www.portalcultura.com.br/node/50285>) and made available on the video-sharing platform You Tube at the address: <https://www.youtube.com/watch?v=K4bluHI3a8U&t=72s>

¹⁷ New Chemistry at School Magazine available on the website <http://qnesc.sbq.org.br/online/qnesc04/>

The culmination of this stage took place with an interview that was directed to each WG. The questions that guided the interviews were previously defined in themes associated with the regional cuisine of Mosquense (Açaí, flour, fish, tucupi, corn, tapioca), in which the members of the teams had autonomy to speak and answer the questions raised, based on the subject of the Periodic Table and its relationship with the daily life of the subjects. These questions were addressed in an interview questionnaire (Q2 – annex D) previously selected so that we could have an opinion of the degree of understanding and empowerment of the subject of the Periodic Table.

In order to preserve the data obtained in each stage of the research, each WG produced a folder/logbook to store their text productions and questionnaires applied in group and at the end, they were delivered to the professor who proposed the research for later systematization.

6 FINAL CONSIDERATIONS

In the present work, which consists of a research on the practice itself, I investigated in which terms reading mediation activities could contribute to learning in Chemistry classes at the high school level. For this, I sought to develop a proposal that would insert reading practices in the approach to Chemistry contents. The activities developed involved individual and collective reading of scientific articles, texts of scientific dissemination, preparation of reading records, glossary and group research. The development of such activities was associated with the relationship between: scientific language and mother tongue, which contributed to the learning of Science and literacy in the students' mother tongue; between the theme of food and citizenship education, with contributions to the social significance of scientific knowledge and the possibility for students to learn about positions regarding the theme in focus; with the content under study, with the potential to broaden students' view of the periodic table beyond a chemical content isolated from topics of their interest or from content in the area of Natural Sciences.

What can the school do about it? Invest more in reading AC or TDC in Chemistry classes? I see that it would be an important contribution to the students' learning, their contact with scientific language and with a textual genre that they initially demonstrated to have little contact with. What about the texts that students already read? They could also be considered at school, as part of the classes. This would be a way to bring the universe of young people closer to the school culture and thus access their motivations and interests in the teaching and learning processes of Chemistry.

At first, the difficulties of understanding became evident with the introduction of scientific texts, because although they address a more accessible language, there is still a peculiar language of this textual genre with common terms in the area. However, during the course of the research, it was possible to notice significant improvements in the appropriation of scientific language, showing that the practice of reading favors the fluidity of comprehension and textual interpretation. In addition, it was noticed that the individual and collective readings and discussions provided students with greater participation and involvement, as well as deepening and argumentative power as a result of the evolution and improvement of the scientific genre. Also, according to the readings carried out, it was possible to observe that the practice of writing well and signifying concepts is allied to a practice of dialogical reading, of a reader who positions himself in front of the text.

Therefore, based on the results obtained, we defend the importance of readings as a methodological contribution in the teaching of Chemistry because it stimulates new and different practices in the context of Chemistry, thus promoting the facilitation of such a complex and diverse process that is the act of teaching and learning. Reading, writing and orality are essential instruments to foster learning and criticality in the teaching of Chemistry, the results point to how significant it is to bring different teaching strategies to the classroom and the need for constant mediation of the teacher, who must always be willing to follow the process, as well as, of the student's interactive positioning.

Thus, we reiterate the importance of expanding reading and writing practices, as well as a dialogue about them, throughout the students' school life, so that we can perpetuate practices that become something pleasurable and meaningful, in addition to a technical, quick reading without dialogue and writing that is limited to simple copying.

DEDICATION

I dedicate this work to the loves of my life!

My mother Irene Ferreira de Mendonça who always dedicated herself very hard to the education of her children, so that we became "men of value", a widow and a woman full of strength and determination who knew how to conduct very well the task of raising and educating her offspring.

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ANNEXES

ANNEX A – Free and Informed Consent Form for the School



FEDERAL UNIVERSITY OF PARÁ
 INSTITUTE OF MATHEMATICAL AND SCIENTIFIC EDUCATION
 GRADUATE PROGRAM IN TEACHING IN SCIENCE AND MATHEMATICS EDUCATION
 (Professional Master's Degree)
 University Campus of Guamá – Basic Sector
 Av. Augusto Corrêa, 01. CEP 66075-110 – Belém/PA
 Phone/fax: (91)3201-8070 – e-mail: ppgdoc.ufpa@gmail.com

Belém, August 1, 2019.

The ongoing research is led by the master's student, Hélio Nascimento da Paixão Júnior, as well as his advisor, Professor Dr. Wilton Rabelo Pessoa from the Institute of Mathematics and Scientific Education (IEMCI) of the Federal University of Pará (UFPA). The theme of the research is: THE USE OF TEXTS OF SCIENTIFIC DISSEMINATION AS A DIDACTIC/PEDAGOGICAL RESOURCE IN THE TEACHING OF CHEMISTRY.

Following ethical precepts, we inform you that your participation will be absolutely confidential, which implies the concealment of names that may identify you in the final report or in any subsequent publication. Therefore, your involvement will not cause any damage to your person, family or the Institution you study. The institution has total freedom of refusal, as well as may request the deletion of your data, withdrawing your consent without any penalty or prejudice, when it so wishes. We thank you for your collaboration, emphasizing that it greatly contributes to the formation and construction of current knowledge in this area.

Prof. Dr. Dr. Wilton Rabelo Pessoa Hélio Nascimento da Paixão Júnior
 Research advisor Researcher

Being aware of the information contained in this Informed Consent Form, I _____, bearer of RG No. _____ no the exercise of the function of manager of this teaching unit, _____ autorizo the use, in this research,



of the necessary data, both with regard to the information provided by our employees and students/guardians, as well as the images captured throughout the research.

Subscription

APPENDIX B – Free and Informed Consent Form for Research Participants



FEDERAL UNIVERSITY OF PARÁ
INSTITUTE OF MATHEMATICAL AND SCIENTIFIC EDUCATION
GRADUATE PROGRAM IN TEACHING IN SCIENCE AND MATHEMATICS EDUCATION
(Professional Master's Degree)

University Campus of Guamá – Basic Sector
Av. Augusto Corrêa, 01. CEP 66075-110 – Belém/PA
Phone/fax: (91)3201-8070 – e-mail: ppgdoc.ufpa@gmail.com

Belém, August 1, 2019.

The ongoing research is led by the master's student, Hélio Nascimento da Paixão Júnior, as well as his advisor, Professor Dr. Wilton Rabelo Pessoa from the Institute of Mathematics and Scientific Education (IEMCI) of the Federal University of Pará (UFPA). The theme of the research is: THE USE OF TEXTS OF SCIENTIFIC DISSEMINATION AS A DIDACTIC/PEDAGOGICAL RESOURCE IN THE TEACHING OF CHEMISTRY.

Following ethical precepts, we inform you that your participation will be absolutely confidential, which implies the concealment of names that may identify you in the final report or in any subsequent publication. Therefore, your involvement will not cause any damage to your person, family or the Institution you study. The institution has total freedom of refusal, as well as may request the deletion of your data, withdrawing your consent without any penalty or prejudice, when it so wishes. We thank you for your collaboration, emphasizing that it greatly contributes to the formation and construction of current knowledge in this area.

Prof. Dr. Dr. Wilton Rabelo Pessoa Hélio Nascimento da Paixão Júnior
Research advisor Researcher

() I AGREE TO PARTICIPATE IN THE RESEARCH

I DO NOT ACCEPT TO PARTICIPATE IN THE SURVEY

Signature of the Participant (responsible in case of minor)

Researcher's Signature

ANNEX C – Questionnaire Q1

Semi-structured questionnaire for diagnosis and survey of the reader's profile – Q1

1) Do you have the habit of reading? If not, why?

Yes

No

2) Do you understand what you read?

No

Not entirely

Yes

3) How often do you read? Reference in Books Per Year – LPA.

No EPS

A little – 1 to 3 LPA

Reasonably – 4 to 10 LPA

Quite 11 or + EPS

4) What is your Reading preference?

Books

Magazines

Comics/Comics

Newspapers

() Articles

5) In your student life, how many articles have you read?

() None – 0

() A little – 1 to 5

() Reasonably – 6 to 10

() Quite 11 or +

6) How did you acquire the articles for reading and research?

() Through the teacher

() Books and magazines

() Specialized sites

() Other _____

7) For you, what is your biggest difficulty in reading articles?

8) What is the importance of scientific articles for your life and in your daily life?

9) How can reading articles help you in your life?

ANNEX D – Interview questionnaire – Q2

List of questions regarding the Group interview.

I. Do you know the periodic table?

II. What is the use of the periodic table?

III. Does the periodic table make sense to you?

- IV. Do you find the periodic table difficult or complicated?
- V. What makes the periodic table difficult or complicated?
- VI. What is the relationship between the periodic table and your day-to-day life?

APPENDIX F - Semi-structured questionnaire for evaluation at the end of the study – Q3

1) Did you find reading the texts difficult?

YES

NO

2) Did you already know the information in the texts covered?

YES

NO

3) Did you find the content interesting?

YES

NO

4) Would you like to take more classes like these?

YES

NO

5) Were you able to participate in the debates?

YES

NO

6-. Do you believe that the methodology used with the use of articles and the teacher's mediation helped your learning in the Chemistry discipline? Comment on your impression of the process.

ANNEX G – Registration Journal

ANNEX I: Tables of the number of papers published in ENEQ distributed by Area of Knowledge in the period from 2008 to 2018.

National Meeting of Chemistry Teaching/Publications by area

ENEQ 2008 – Curitiba/PR

Items	Area	Published Works
1	Curriculum and Assessment	27 works
2	Teaching and Learning	146 works
3	Education and Culture	16 works
4	Teaching in Non-Formal Spaces	23 works
5	Experimentation in Teaching	50 works
6	Teacher training	95 works
7	History and Philosophy of Science	17 works
8	Language and Cognition	11 works
9	Didactic Material	34 works
10	Information and Communication Technology	38 works

ENEQ 2010 – Brasília/DF

Items	Area	Published Works
1	Curriculum and Assessment	29 WORKS
2	Environmental Education	40 WORKS
3	Teaching and Learning	158 JOBS
4	Education and Culture	11 WORKS
5	Teaching and Inclusion	23 JOBS
6	Teaching in Non-Formal Spaces	17 WORKS
7	Experimentation in Teaching	48 WORKS
8	Teacher training	41 WORKS
9	History and Philosophy of Science	20 JOBS
10	Language and Cognition	20 JOBS
11	Didactic Material	63 WORKS
12	Information and Communication Technology	33 WORKS
TOTAL WORKS 2010		503

ENEQ 2012 – Salvador/BA

Items	Area	Published Works
1	STS Approach and Chemistry Teaching	25 JOBS
2	Curriculum and Assessment in Chemical Education	32 JOBS
3	Environmental Education and Chemistry Teaching	43 JOBS
4	Teaching and Learning	248 WORKS
5	Chemistry Teaching and Inclusion	36 WORKS
6	Teaching in non-formal spaces and Scientific Dissemination	28 JOBS
7	Experimentation in Teaching	122 WORKS
8	Teacher training	180 WORKS
9	History and Philosophy of Chemistry	21 WORKS
10	History, philosophy and Sociology of Science in the teaching of Chemistry.	12 JOBS
11	Language and the Teaching of Chemistry	36 WORKS
12	Didactic Material in the Teaching of Chemistry	85 WORKS

13	Educational Policies and the Teaching of Chemistry	2 JOBS
14	Information and Communication Technology	42 WORKS

ENEQ 2014 – Ouro Preto/MG

Items	Area	Published Works
1	STS Approach and Chemistry Teaching	52 WORKS
2	Curriculum and Assessment in Chemical Education	38 WORKS
3	Environmental Education and Chemistry Teaching	55 WORKS
4	Teaching and Learning	260 WORKS
5	Inclusion and Educational Policies	42 WORKS
6	Teaching in non-formal spaces and Scientific Dissemination	44 WORKS
7	Experimentation in Teaching	119 WORKS
8	Teacher training	164 WORKS
9	History, Philosophy and Sociology of Chemistry	36 WORKS
10	Language and Cognition in the Teaching of Chemistry	34 WORKS
11	Didactic Material in the Teaching of Chemistry	142 WORKS
12	Information and Communication Technology	51 WORKS
13	Other	10 WORKS
TOTAL WORKS 2014		1047

ENEQ 2016 – Florianópolis/SC

Items	Area	Published Works
1	STS Approach and Chemistry Teaching	105 WORKS
2	Curriculum and Assessment in Chemical Education	36 WORKS
3	Environmental Education and Chemistry Teaching	76 WORKS
4	Teaching and Learning	427 WORKS
5	Teaching in non-formal spaces and Scientific Dissemination	65 WORKS
6	Experimentation in Teaching	152 WORKS

7	Teacher training	207 WORKS
8	History, Philosophy and Sociology of Science	69 WORKS
9	Language and Cognition	31 WORKS
10	Didactic Material in the Teaching of Chemistry	177 WORKS
11	Inclusion and Educational Policies in the Teaching of Chemistry	61 WORKS
12	Information and Communication Technology	74 WORKS
TOTAL WORKS 2016		1480

ENEC 2018 – Rio Branco/AC

Items	Area	Published Works
1	STS Approach and Chemistry Teaching	16 WORKS
2	Curriculum and Assessment in Chemical Education	1 WORK
3	Environmental Education and Chemistry Teaching	6 JOBS
4	Teaching and Learning	50 JOBS
5	Teaching in non-formal spaces and Scientific Dissemination	11 WORKS
6	Experimentation in Teaching	15 JOBS
7	Teacher training	22 WORKS
8	History, Philosophy and Sociology of Science	6 JOBS
9	Language and Cognition	3 JOBS
10	Didactic Material in the Teaching of Chemistry	40 WORKS

11	Inclusion and Educational Policies in the Teaching of Chemistry	8 WORKS
12	Information and Communication Technology	10 WORKS
TOTAL WORKS 2018		188

Recomendações de Alimentação e Nutrição Saudável para a População Brasileira

artigo original

RESUMO

Apresentamos sugestões para a definição de guias alimentares para a população brasileira, excetuando as crianças. Os principais objetivos dessas recomendações são a manutenção de peso saudável e a prevenção da obesidade, das doenças cardiovasculares, do diabetes mellitus tipo 2 e da osteoporose. As mensagens para o público têm duas pressuposições: retomar hábitos saudáveis da dieta brasileira e estimular o consumo de alimentação saudável ao invés de formular proibições. As principais mensagens incluem: consumo de alimentos variados, em 4 refeições ao dia; manutenção de um peso saudável; aumento da atividade física diária; ingestão de arroz e feijão todos os dias, acompanhados de legumes e vegetais folhosos; ingestão de 4 a 5 porções de frutas todos os dias; redução do açúcar; evitar uso de refrigerantes; para lanches, comer frutas ao invés de biscoitos, bolos e salgadinhos; comer pouco sal; usar óleos e azeite ao invés de outras gorduras; tomar leite e comer produtos lácteos, com baixo teor de gordura, pelo menos 3 vezes por dia. (*Arq Bras Endocrinol Metab* 2000;44/3: 227-32)

Unitermos: Guias de alimentação; Obesidade; Doença cardiovascular; Osteoporose; Diabetes; Prevenção.

ABSTRACT

We present suggestions for dietary guidelines for healthy Brazilians, excluding young children. These guidelines aim to prevent obesity, cardiovascular diseases, type 2 diabetes mellitus and osteoporosis. The messages to the public were based on two presumptions: to get back traditional Brazilian healthy dietary patterns and to stimulate the consumption of these foods more than to formulate prohibitions. The main messages are: eat at least four meals a day, and do not skip meals; maintain a healthy weight; increase daily physical activity and exercise; eat rice and beans with vegetables everyday; eat four to five portions of fruits everyday; reduce sugar, sweets and sodas; choose a fruit instead of deep fried foods or sweets for snacks; use salt only in moderation; use oil or olive oil instead of other fats; drink or eat low fat dairy products at least three times a day. (*Arq Bras Endocrinol Metab* 2000;44/3: 227-32)

Keywords: Dietary guidelines; Obesity; Cardiovascular disease; Osteoporosis; Diabetes; Prevention.

O ESTABELECIMENTO DE GUIAS DE ALIMENTAÇÃO e nutrição saudável tem por base o reconhecimento de que um nível ótimo de saúde depende da nutrição. Com o aumento da obesidade e das doenças associadas à obesidade, no Brasil, há que se combinar orientações para a redução das deficiências nutricionais, ainda presentes, com orientações visando a prevenção das doenças crônicas não transmissíveis.

Rosely Sichieri
Denise C. Coitinho
Josefina B. Monteiro
Walmir F. Coutinho

Instituto de Medicina Social, UERJ - Universidade Estadual do Rio de Janeiro (RS), Departamento de Nutrição, UNB - Universidade Federal de Brasília e Ministério da Saúde (DCC), Departamento de Nutrição e Saúde - UFV (JBM) e Associação Brasileira para o Estudo da Obesidade (WFM).

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Neste cenário, as medidas preventivas ocupam lugar de destaque, não só em função de que a prevenção precoce das doenças associa-se a melhor qualidade de vida, mas também porque, as medidas terapêuticas para a obesidade, um dos principais problemas nutricionais do presente, têm sido de pouca valia.

A base científica para prevenção baseia-se em dois componentes. O primeiro seria o conhecimento dos processos biológicos e epidemiológicos subjacentes ao aparecimento das doenças e o segundo a efetividade das intervenções (1).

É pequeno o conhecimento acumulado, no Brasil, sobre a efetividade de intervenções para prevenção das doenças crônicas. Grande parte da experiência preventiva no Brasil tem origem na prevenção das doenças infecciosas e das doenças carenciais, cuja prevenção tem um caráter mais específico. Para as doenças crônicas este quadro é muito diferente. Grande parte das chamadas doenças crônicas, como infarto do miocárdio, diabetes, cânceres, hipertensão, apresentam-se intimamente relacionadas e há uma verdadeira rede de relações das doenças entre si, bem como dos fatores de risco a elas associados. Assim, a hipertensão arterial associa-se ao diabetes tipo 2, que por sua vez associa-se à redução do HDL colesterol e ao aumento de triglicéridios (2). O tratamento clínico não pode ignorar estas associações, e o mesmo deve ocorrer com os programas de prevenção. Além destas doenças estarem associadas, os fatores de risco para as doenças crônicas não transmissíveis ocorrem de forma conjunta e interdependente. Deixar de fumar associa-se a ganho de peso (3,4) e, comportamentos como realizar atividade física de lazer e comer mais frutas agrupam-se nos mesmos indivíduos (5).

Portanto, mesmo que muitos estudos epidemiológicos em doenças crônicas busquem um nutriente específico que seria o responsável pela diminuição da incidência, e mesmo que em alguns casos este conhecimento possa representar, no futuro, a forma mais efetiva de prevenção para uma doença específica, a abordagem coletiva das doenças crônicas não transmissíveis parece ser a forma mais indicada de prevenção primária.

Assim, uma proposta de alimentação saudável, para prevenção das doenças crônicas não transmissíveis, há de propor dietas que estejam ao alcance da sociedade como um todo, e que tenham um impacto sobre os mais importantes fatores relacionados às várias doenças. Aumentar o consumo de frutas e verduras e estimular o consumo de arroz e feijão são exemplos de proposições que preenchem estes requisitos.

Recente publicação do *World Cancer Research Control* (6), em conjunto com o *American Institute for Cancer Research* também enfatiza uma perspectiva glo-

bal para a prevenção do câncer. Nesta publicação considera-se que modificações da dieta, em conjunto com a abolição do tabagismo, reduziriam em dois-terços a incidência global dos cânceres. Ainda nesta publicação, sugere-se que modificações no sentido de uma vida mais saudável, teriam um impacto, em relação às doenças crônicas, similar ao causado pela melhoria das condições de saneamento, na redução de doenças infecciosas.

A mesma abordagem tem sido proposta para a vigilância do diabetes tipo 2, com avaliação de sistemas de doenças e não de doenças isoladas (7). Consistente com estas observações, guias alimentares para os países desenvolvidos, já há algum tempo, têm se voltado para a manutenção da saúde e a redução do risco das doenças crônicas em geral (8). Muitos países na América Latina também desenvolveram guias (9) e para o Brasil o Instituto Danone realizou, recentemente, um encontro para definição de uma alimentação equilibrada para a população brasileira (10).

Também relevante no estabelecimento de recomendações alimentares ou de guias alimentares é como tratar assuntos conflitantes ou que causem apreensão desnecessária na população. O consumo de álcool, por exemplo, é considerado um fator de proteção para as doenças cardiovasculares; contudo, tem sido difícil adotarmos uma medida de saúde pública que considerasse o consumo de álcool, dada sua repercussão nas doenças por causas externas e alguns cânceres. Um outro exemplo é o da importância dos ácidos graxos trans no desenvolvimento da doença cardiovascular e de como se transforma este conhecimento em ação preventiva, sem causar na população o sentimento de que as medidas anteriores como, por exemplo, redução das gorduras saturadas de nada valem.

Quanto à base científica para propor guias alimentares para a prevenção de doenças crônicas não transmissíveis ela é bastante ampla. As doenças cardiovasculares declinaram de forma importante nos países desenvolvidos decorrente de ações efetivas tanto de prevenção primária como secundária. Nos Estados Unidos, nos últimos 30 anos houve uma redução da mortalidade por doença coronariana da ordem de 50%, atribuível tanto ao tratamento quanto à prevenção primária (11). Para a América Latina como um todo, a prevenção das doenças cardiovasculares ainda é um desafio (12). Contudo, Lotufo & Lolio, 1996 (13), em análise da mortalidade por doenças cardiovasculares no estado de São Paulo, mostraram que a tendência ascendente da mortalidade por doenças coronarianas e cerebrovasculares reverteu-se na década de 70, e que alterações de fatores de risco importantes, como dieta e tabagismo, estariam associados à redução da

incidência destas doenças.

Embora muitos estudos indiquem a importância de diferentes fatores da dieta como fatores de risco para cânceres e diabetes tipo 2, a prevenção dos cânceres e do diabetes é ainda incipiente mesmo nos países desenvolvidos (2,1).

Por outro lado, a obesidade é uma condição que aumenta o risco de morbidade para as principais doenças crônicas: hipertensão, dislipidemia, diabetes, doença coronariana, alguns tipos de câncer e colecistite e, embora não se conheça uma estratégia adequada de prevenção, sua prevenção e tratamento apresentam-se como um dos grandes desafios deste século (14). A importância que a obesidade vem assumindo no Brasil (15) não pode ser ignorada e, a anunciada epidemia de obesidade para os Estados Unidos, é fato também no Brasil. Portanto, o estabelecimento de dietas saudáveis deve contemplar como prioridade a prevenção do ganho de peso. Incluir o consumo alimentar e a atividade física no âmbito de comportamentos para uma vida saudável é talvez a mais importante tarefa de promoção da saúde.

Do ponto de vista da alimentação saudável, sugere-se que as recomendações devem basear-se em alimentos mais do que em nutrientes. Assim, a Organização Mundial de Saúde, em publicação recente (9), sugere o estabelecimento de metas realísticas de consumo de alimentos específicos, sendo estes alimentos identificados em função dos nutrientes que se pretendam abranger.

No estabelecimento das recomendações para a população brasileira consideramos como relevante as intervenções referentes a prevenção da obesidade, das doenças cardiovasculares, câncer, diabetes tipo 2 e osteoporose e, quanto à definição dos nutrientes, foram incluídos aqueles cujos achados são mais consistentes na literatura: consumo de gorduras, com ênfase nas gorduras saturadas e trans, de ácido fólico, vitamina C e E, sódio, cálcio e no consumo de fibras.

A proposta de uma dieta para a população brasileira tem, ainda, outros dois pressupostos: o resgate dos hábitos alimentares saudáveis próprios da comida brasileira; e a identificação de alimentos, ou grupo de alimentos, cujo consumo deva ser estimulado, mais do que formular proibições. O feijão é um destes elementos de resgate, pelo seu conteúdo em fibras, em ácido fólico e em ferro.

O desenvolvimento de guias para o Brasil é também resposta ao crescente interesse do público em geral, dos profissionais de saúde e dos planejadores em saúde, em relação ao papel da dieta na promoção da saúde e prevenção das doenças crônicas. Propomos que seja criada uma dinâmica nacional de discussão de estratégias a

serem implementadas nesta área e que estas se dêem de forma contínua e integrada, com a participação dos membros da sociedade civil, das universidades, dos serviços e da imprensa. Estas recomendações visariam atender, conforme sugerido por Barata & Barreto, 1996 (16), as necessidades como expressão das potencialidades humanas e não aquelas redefinidas e priorizadas pela ótica exclusiva do serviço de saúde. Fomentar atividades de informação ao consumidor e estabelecer especificação para rotulagem pelo Ministério da Saúde seriam metas importantes dentro desta ótica.

PESO SAUDÁVEL

As controvérsias sobre o peso adequado para adultos e idosos, com uma conduta mais frouxa de controle de peso para os idosos, embora não completamente superadas, parecem tender para o ideal de manter-se magro na vida adulta. Manter um peso corporal adequado e não ganhar peso durante a vida adulta parece associar-se a menor mortalidade e maior bem estar (17).

Os exercícios/atividade física devem ser altamente estimulados, pois aumentam a mobilidade e consequentemente a qualidade de vida. Parece haver boas razões para encorajar exercícios regulares e pequena perda de peso, mesmo entre pessoas mais velhas com sobrepeso, com vistas a sua longevidade e qualidade de vida (18,19).

As mulheres na pós menopausa parecem ser um grupo particularmente vulnerável ao aumento de peso, deposição abdominal de gordura e grande dificuldade para perder peso (20). Os resultados de uma recente meta-análise, com mulheres na pré menopausa, submetidas a dietas com restrição relativamente severa (800 a 1200kcal/dia), por pelo menos 10 semanas, mostraram que, embora a taxa de metabolismo basal em obesas diminua significativamente, tanto com dieta hipocalórica quanto com dieta associada com programa de exercício, a redução da taxa de metabolismo é menor na presença do exercício (21).

Adolescentes são particularmente influenciáveis em seu estilo de vida e deveriam ser prioritariamente contemplados em programas de saúde coletiva. Vários estudos indicam que a manutenção de um peso considerado adequado entre meninas adolescentes se faz através de práticas alimentares inadequadas, como omitir refeições, e que o consumo de nutrientes como cálcio e ferro é inadequado neste grupo (22).

Para adultos considera-se como peso saudável, o peso relativo, avaliado pelo índice de massa corporal (IMC= peso em kg/altura² em m) de até 24,9 (23). Para adolescentes sugere-se também a utilização do

IMC, contudo os pontos de corte adequados são ainda objeto de discussão (24).

MACRONUTRIENTES

A definição dos macronutrientes em sociedades onde a prevalência de obesidade é importante, passa necessariamente pela provisão de energia e sua capacidade de acumular-se como tecido adiposo. Há na literatura uma importante discussão sobre se existe uma associação entre consumo de gordura e obesidade (25), ou se o que realmente importa são as calorias consumidas (26). Dado que optar pela vertente de que as calorias totais são o principal fator associado à obesidade, não impede que no futuro se agregue a idéia de que a gordura tem um papel especial, propõem-se que as guias devem indicar claramente que o importante é a redução do consumo calórico total, principalmente dos itens de alta densidade calórica como doces, refrigerantes, tortas, etc.

Acumulam-se também evidências de que a substituição das gorduras por carboidratos refinados, como tem ocorrido em grande parte dos produtos industrializados, nas versões *light* e *diet*, pode aumentar o risco para a doença coronariana. Assim, os guias não deveriam sugerir a substituição de gordura por carboidrato (27). As gorduras líquidas com óleo de soja, canola, girassol, etc. são os melhores substitutos para as gorduras com ácidos graxos trans e as saturadas. Para os carboidratos, a opção preferencial deve ser para os carboidratos com alto teor de fibras.

Entre os alimentos da dieta brasileira com maior teor de fibra incluem-se farinha de mandioca, feijão, ervilha, milho, amendoim, jiló, pinhão, batata doce, batata baroa, cará e taioba (28).

MICRONUTRIENTES

Reconhecendo a importância de algumas vitaminas e minerais na prevenção de doenças crônicas, a *National Academy of Science*, dos Estados Unidos, em contraste com práticas passadas, está considerando a possibilidade de ingestão acima das recomendações para alguns micronutrientes que possam estar associados à redução das doenças crônicas. É necessário, contudo, que se conheça bem a segurança da ingestão de altas doses de nutrientes (29).

ÁCIDO FÓLICO

A ingestão suficiente de ácido fólico antes da concepção e muito no início da gravidez diminui o risco de defeitos no tubo neural: espinha bífida, anence-

falia, e encefalocele. Suplementação com ácido fólico diminui este risco de 50 a 75%. Adicionalmente, vários estudos apontam para o papel protetor do ácido fólico, via redução dos níveis de homocisteína, na doença cardiovascular (30). Nos Estados Unidos, a suplementação já está ocorrendo para este nutriente, e é interessante notar que é praticamente impossível atingir, nesta população, os níveis adequados de ingestão de 400µg, somente através da dieta. No Brasil, se a dieta tradicional com feijão - que é uma das principais fontes em nosso meio de ácido fólico -, fosse a base da alimentação e considerando-se que o conteúdo de ácido fólico do feijão preto cozido é de 256µg (31), seria possível atingir as recomendações só com a dieta. Resta saber o quanto é destruído no processo de cocção caseira, visto que de 50 a 90% do ácido fólico pode ser destruído no processamento (32).

Existem evidências de que a combinação de ácido fólico com vitamina B12 resulte em reduções ainda maiores nos níveis de homocisteína sérica (30).

VITAMINA E

Resultados de várias pesquisas estudando o efeito da vitamina E sobre as doenças do coração mostraram efeitos protetores associados com ingestão acima das da RDA. Evidências epidemiológicas indicam uma forte relação dose-resposta entre a diminuição do risco de doenças de coração e o aumento da ingestão de vitamina E na dieta e através de suplementos. Uma proteção significativa começa com ingestão diária de 67mg de alfa tocoferol. A oxidação da lipoproteína de baixa densidade (LDL) diminui significativamente em indivíduos que receberam quantidade acima de 400UI, mas não em indivíduos que receberam quantidade menores do que 200UI. Ensaio controlado, duplo cego, mostrou uma significante diminuição de infarto do miocárdio não fatal em sujeitos que consumiam vitamina E como suplemento (29).

VITAMINA C

A vitamina C inibe a síntese química de nitrosaminas (a maioria delas é cancerígena), importante fator de risco para câncer do estômago. A inibição ocorre no conteúdo gástrico, mas a inibição não é completa até que a ingestão atinja cerca de 1.000mg. Estudos epidemiológicos e ensaios clínicos sugerem que uma ingestão de vitamina C muito maior do que a recomendação de 60 a 90mg, pode reduzir o risco de doenças crônicas como problemas cardíacos e câncer, especialmente quando combinados com alta ingestão de vitamina E (29). Levine et al., 1999 (33) e recente revisão sobre vitamina

C (34) sugerem a ingestão de 200mg/dia, o equivalente a ingestão de cinco porções de frutas e vegetais.

SÓDIO

Embora existam controvérsias sobre o papel do sal na gênese da hipertensão arterial, não parece haver risco em se reduzir o consumo para no máximo 3.000mg de sódio ou 7,5g de sal para a população sem hipertensão, e para 2.300mg de sódio ou 6g de sal para os hipertensos (35). O consumo diário per capita do ENDEF- Estudo Nacional sobre Despesa Familiar, 1974, foi de 12g de sal e em pesquisa recente no município do Rio de Janeiro, a estimativa de consumo foi também de 12g, com base na quantidade de sal adquirida mensalmente (15).

Redução do consumo de sal requer grande redução do consumo de alimentos processados com alta quantidade de sódio como *chips*, defumados e enlatados, bem como evitar adicionar sal aos alimentos já preparados (36). Produtos enlatados têm até 20 vezes mais sal do que o produto natural. O processamento dos enlatados pode, contudo, ser feito com menor teor de sódio, estratégia que deveria ser estimulada pelo Ministério da Saúde, bem como a rotulagem dos produtos em relação ao sal.

CÁLCIO

Estimular um adequado consumo de cálcio parece ser uma importante estratégia de prevenção em relação à osteoporose, sendo que a maximização do pico de massa óssea parece ser fundamental. Estima-se que mais de 51% do pico de massa óssea seja acumulado durante a puberdade nas mulheres. Jackman, 1997 (37), concluiu que 95% da quantidade total de mineral do osso deposita-se entre os 18 e os 22 anos, com o cálcio da dieta sendo muito importante na otimização do pico de massa óssea. Ensaios controlados randomizados de suplementação de cálcio, em crianças e adolescentes, mostraram que o aumento da ingestão de cálcio aumenta o acréscimo de cálcio no osso. O *Food and Drug Administration* dos Estados Unidos autorizou, inclusive, esta propaganda nos rótulos dos produtos com cálcio. Os alimentos fontes de cálcio são também fonte de colesterol e gorduras saturadas, e devem, portanto, ser considerados em conjunto na elaboração dos guias.

DEZ PASSOS PARA UMA ALIMENTAÇÃO ADEQUADA

Visando a manutenção de peso saudável e a prevenção de obesidade, doenças cardiovasculares, diabetes tipo 2 e osteoporose, recomendamos:

1. Consuma alimentos variados, em 4 refeições ao dia. Pular refeições não emagrece e prejudica a saúde;
2. Mantenha um peso saudável e evite ganhar peso após os 20 anos. Evite também o aumento da cintura;
3. Faça atividade física todos os dias. Inclua na sua rotina andar a pé, subir escada, jogar bola, dançar, passear e outras atividades;
4. Coma arroz e feijão todos os dias acompanhados de legumes e vegetais folhosos;
5. Coma 4 a 5 porções de frutas, todos os dias, na forma natural;
6. Reduza o açúcar. Evite tomar refrigerantes.
7. Para lanches coma frutas ao invés de biscoitos, bolos e salgadinhos;
8. Coma pouco sal. Evite alimentos enlatados e produtos como salame, mortadela e presunto, que contêm muito sal. Evite adicionar sal à comida já preparada. Aumente o uso de alho, salsinha e cebolinha. Alimentos ingeridos na sua forma natural como feijão, arroz, frutas, grãos e verduras têm pouquíssimo sal;
9. Use óleos e azeite no preparo de bolos, tortas e refeições;
10. Tome leite e coma produtos lácteos com baixo teor de gordura, pelo menos 3 vezes por dia.

Componentes da alimentação adequada por grupos de alimentos:

Porções diárias Exemplos		
Feijões e sementes	2 - 4	Feijão, lentilha, ervilha, grão de bico, amendoim
Arroz, pão e outros grãos de preferência integral e tubérculos	6 - 7	Pão, arroz, aveia, batata macarrão, cará, milho, mandioca ou farinhas
Verduras e legumes	3 - 5	Todos
Frutas	4 - 5	Todas
Leite e derivados	3 - 4	Leite, iogurte, queijo (com baixo teor de gordura)
Equivalentes em porções: Feijão - 70g; Arroz - 50g; Frutas - 100g; Verduras - 50g; Leite - 200ml		

Este tipo de dieta, com 3 porções de feijão, 6 porções de arroz, 3 porções de verduras, 4 frutas e 3 porções de leite equivale a 1.710kcal, 12,7g de fibras, 2.300mg de sódio, 15g de ferro, 322µg de ácido fólico, 232mg de vitamina C e 1.100mg de cálcio.

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Endereço para correspondência:

Rosely Sichieri
Instituto de Medicina Social - UERJ
Av. São Francisco Xavier 524, 7o andar
20551-030 Rio de Janeiro, RJ
Fax: (21) 264-1142
e-mail: sichieri@uerj.br



Breve história da Tabela Periódica

Apesar dos poucos conhecimentos de Química que cada um possa ter, com certeza que já ouviu falar da Tabela Periódica, uma disposição sistemática dos elementos químicos em função das suas propriedades. Como surgiu a Tabela Periódica actual? É a esta pergunta que se procura responder nas linhas seguintes onde se pretende fazer uma *Breve História da Tabela Periódica*.

Um pré-requisito necessário para construção da Tabela Periódica foi a descoberta individual dos elementos químicos. Embora vários elementos fossem conhecidos desde a antiguidade, nomeadamente o ouro, a prata, o estanho, o ferro e o cobre, a primeira descoberta dita científica de um elemento ocorreu em 1669 quando o alquimista Henning Brand descobriu o fósforo. A partir daí, muitos outros elementos foram sendo descobertos e o conhecimento relativo às suas propriedades físicas e químicas foi aumentando. Antes de 1800 eram conhecidos 34% dos elementos actualmente existentes, no século XIX a percentagem aumentou para cerca de 75% e no século XX descobriram-se os seguintes. Através da percepção da existência de algumas regularidades no comportamento dos elementos até então descobertos, os cientistas começaram a procurar modelos para reconhecer as suas propriedades e desenvolver esquemas para a sua classificação e ordenação.

A ordenação de John Dalton

No início do séc. XIX John Dalton, um químico e físico inglês, listou os elementos, cujas massas atómicas eram conhecidas, por ordem crescente de massa atómica, cada um com as suas propriedades e seus compostos. Não houve uma tentativa de efectuar qualquer arranjo ou modelo periódico dos elementos. Facilmente se constatou que a lista não era esclarecedora: vários elementos que tinham propriedades semelhantes (halogéneos, por exemplo) tinham as suas massas atómicas muito separadas.



John Dalton
(1766-1844)

ELEMENTS	
Hydrogen	Strontian
Acid	Barytes
Carbon	Lime
Oxygen	Zinc
Phosphorus	Copper
Sulphur	Iron
Magnesia	Silver
Lead	Gold
Soda	Platina
Potash	Mercury

Símbolos químicos de Dalton

As tríades de Johann W. Döbereiner

Em 1829, Johann W. Döbereiner, professor de Química na Universidade Friedrich Schiller de Jena (Alemanha), teve a ideia de agrupar os elementos em três, ou *tríades*. As tríades estavam separadas também pelas massas atômicas, mas com propriedades químicas muito semelhantes. A massa atômica do elemento central da tríade seria supostamente a média das massas atômicas do primeiro e terceiro elementos. Esta ideia tornou-se relativamente popular nessa época. No entanto, nos 30 anos seguintes, vários cientistas constataram que, para vários elementos, estes tipos de relações químicas se estendiam para além da tríade. Infelizmente, a investigação nesta área foi prejudicada pelo facto dos valores rigorosos das massas atômicas nem sempre serem conhecidos.



Johann W. Döbereiner
(1780-1849)

			Intensity of Chemical Affinity
22 1.325 = Cl.	455 129 = HCl	942.650 = $\frac{\text{Cl}}{2}$	3
789.145 = I.	1590.770 = HI	2078.290 = $\frac{I}{2}$	1
$\frac{1010.470}{2} = \text{Br.}$	$\frac{2045.899}{2} = \text{HBr.}$	$\frac{3020.940}{2} = \frac{\text{Br}}{2}$	2

Lei das Tríades de Döbereiner

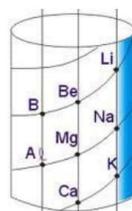
O cilindro (ou parafuso telúrico) de Chancourtois

O primeiro esboço de periodicidade dos elementos deve-se provavelmente ao geólogo francês Alexander Emile Beguyer de Chancourtois. Em 1862 Chancourtois propõe uma classificação dos elementos pela sua disposição na superfície de um cilindro. Os elementos dispunham-se sobre uma linha diagonal formando um ângulo de 45° com a horizontal,

desenhando uma espiral e estavam ordenados por ordem crescente de massa atômica (em números inteiros) de forma que os que tinham propriedades semelhantes se situavam na mesma linha vertical. Assim, deu-se conta que as propriedades dos elementos eram uma função da sua massa atômica o que o levou a propor que "as propriedades dos elementos são as propriedades dos números." De Chancourtois foi o primeiro a reconhecer que propriedades semelhantes reaparecem a cada sete elementos e usando este esquema foi capaz de prever a estequiometria de vários óxidos metálicos. Infelizmente, o sistema era complexo pois incluía também compostos. A sua proposta não foi muito conhecida e divulgada porque o esquema era relativamente complexo.



Alexander de Chancourtois
(1820-1886)



Cilindro de Chancourtois

Lei das Oitavas de Newlands

Em 1863, John Alexander Reina Newlands, químico industrial inglês e professor de química no City College em Londres ordenou os elementos por ordem crescente de massa atômica e constatou que um dado elemento apresentava propriedades semelhantes ao oitavo elemento a contar a partir dele. A esta relação Newlands chamou a "Lei das Oitavas", que dizia ser uma espécie de repetição por analogia com as oitavas da escala musical (Dó, Ré, Mi, Fá, Sol, Lá, Si,...Dó,...). O principal problema com que Newlands se deparou foi o de que a sua lei apenas funcionava correctamente para as duas primeiras oitavas, na terceira e nas seguintes não se verificava. Apesar de ter sido ridicularizado pela Sociedade de Química de Londres, Newlands sugere, com a Lei das Oitavas, uma classificação sistemática onde começa a surgir o princípio envolvido na actual classificação dos elementos.



John Newlands
(1837-1898)

H	Li	Ga	B	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca	Cr	Ti	Mn	Fe
Co, Ni	Cu	Zn	Y	In	As	Se
Br	Rb	Sr	Ce, La	Zr	Di, Mo	Ro, Ru
Pd	Ag	Cd	U	Sn	Sb	Te
I	Cs	Ba, V	Ta	W	Nb	Au
Pt, Ir	Tl	Pb	Th	Hg	Bi	Th

Lei das Oitavas de Newlands

Tabela de Lothar Meyer e Mendeleev

Em 1864 Julius Lothar Meyer, químico alemão, estudou a relação existente entre o volume atômico dos elementos e as respectivas massas atômicas. Representou graficamente o volume atômico em função da massa atômica relativa e, através da curva obtida, conseguiu agrupar vários elementos em famílias. Chegou assim a uma classificação periódica dos elementos que tinham propriedades semelhantes, um esboço da tabela periódica actual. Mais ou menos por essa altura, Dimitri Ivanovitch Mendeleev, químico Russo, enquanto escrevia um livro de química inorgânica, também procurou organizar os elementos de acordo com as suas propriedades. Mendeleev criou uma carta para cada um dos elementos conhecidos. Cada carta continha o símbolo do elemento, a massa atômica e as suas propriedades químicas e físicas. Colocando as cartas numa mesa, organizou-as por ordem crescente das suas massas atômicas, agrupando-as em elementos com propriedades semelhantes, ou seja, listou os elementos de uma linha ou coluna por ordem de massa atômica, iniciando uma nova linha ou coluna quando as propriedades dos elementos se começavam a repetir. Formou-se assim, tal como obtido por Lothar Meyer, o esboço da tabela periódica actual. A vantagem da tabela periódica de Mendeleev sobre outras é que esta exibia semelhanças, não apenas em pequenos conjuntos, como as tríades. Mostravam semelhanças numa rede de relações vertical, horizontal e diagonal. Uma das razões para o sucesso da tabela foi o de deixar lacunas quando parecia que o elemento correspondente ainda não tinha sido descoberto. A partir daqui, Mendeleev conseguiu prever algumas propriedades de elementos químicos que ainda não haviam sido descobertos na sua época. Outra razão foi ocasionalmente ignorar a ordem sugerida pelas massas atômicas e alternar alguns elementos adjacentes para melhor classificá-los em famílias químicas. Com o

desenvolvimento das teorias da estrutura atómica verificou-se à posteriori que Mendeleev tinha, inadvertidamente, ordenados os elementos por ordem crescente de número atómico. O trabalho de Mendeleev foi amplamente aceite, sendo assim considerado o pai da tabela periódica actual. No entanto, de forma justa, tanto ele quanto Lothar Meyer deveriam ser considerados os verdadeiros pais da actual classificação periódica. O azar de Meyer foi que em 1868 construiu uma tabela alargada dos elementos e entregou a um colega para avaliação. Enquanto isso, Mendeleev deu a conhecer a sua tabela à comunidade científica através de publicação em 1869, enquanto que a de Meyer veio a conhecimento apenas em 1870. Azar...



Julius Lothar Meyer
(1830-1895)

I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.
B=11,5	Al=27,3						Si=113,4	Th=232,7
C=11,97	Si=28						Sn=117,5	Pb=208,4
		Te=82						
N=14,01	P=30,9		As=74,9				Sb=122,1	Bi=207,5
			V=51,2				Ta=182,2	
O=15,86	31,98		Se=78				Te=128,1	
			C=52,4				Mo=95,6	W=183,5
F=19,1	Cl=35,38		Br=79,75				I=126,5	
			Mn=54,8				Ru=101,5	Ds=185,6 ?
			Fe=55,9				Rh=104,1	Kr=196,7
			Co=58,8				Pd=106,2	Pt=196,7
Li=7,01	Na=22,99	K=39,04					Rb=85,2	Cs=132,7
							Cu=63,3	Ag=107,68
							Zn=64,9	Sr=87,0
								Ba=136,6
								Cd=111,6
								Hg=199,6

Tabela dos elementos de J. L. Meyer



Dimitri Ivanovitch Mendeleev
(1834-1907)

Series	Group I	Group II	Group III	Group IV	Group V	Group VI	Group VII	Group VIII
1	H=1							
2	Li=7	Be=9,1	B=11	C=12	N=14	O=16	F=19	
3	Na=23	Mg=24,4	Al=27	Si=28	P=31	S=32	Cl=35,5	
4	K=39,1	Ca=40	Sc=44	Ti=48,1	V=51,2	Cr=52,3	Mn=55	Fe=56, Ni=58,5, Co=58,9, Cu=63,2
5	Rb=85,3	Zn=65,4	Ga=70	Ge=72	As=75	Se=78	Br=80	
6	Rb=85,4	Sr=87,5	Y=89	Zr=91,7	Nb=94,2	Mo=95,9	Cd=112	Rh=103, Ru=101,3, Pd=106, Ag=107,5
7	(Ag)=107,8	Cs=132,9	Ba=137	La=138,5	Ce=140,5	Pr=140,9		
8								
9	(-)							
10								
11	(Au)=198,7	Hg=200,4	Tl=204,1	Pb=208,9	Bi=209			
12								

Tabela dos elementos de Mendeleev

A tabela periódica actual

Embora a tabela de Mendeleev/Meyer tenha demonstrado a natureza periódica dos elementos, apenas no séc. XX foram encontradas explicações para as razões das propriedades dos elementos variarem periodicamente.

O desenvolvimento, nomeadamente dos modelos atómicos e teoria quântica, permitiram racionalizar o conhecimento das propriedades dos elementos e chegar à configuração da actual tabela periódica. Esta foi ampliada ao longo do tempo, à medida que novos

elementos foram sendo descobertos. A tabela actual contém 118 elementos, dispostos em linhas horizontais (períodos) e verticais (grupos), por ordem crescente de número atómico. As linhas horizontais são dispostas de modo que os elementos com propriedades semelhantes fiquem nas mesmas colunas (grupos ou famílias). O grupo é considerado o mais importante método de classificar os elementos. Em alguns grupos, os elementos têm propriedades muito semelhantes e exibem uma tendência clara nas propriedades ao longo do grupo. A estes grupos foram dados nomes triviais, por exemplo, os metais alcalinos, metais alcalinos terrosos, halogénios, gases nobres, etc.. Alguns outros grupos na tabela periódica mostram menor grau de semelhanças/tendências verticais e são referidos simplesmente pelo seu número de grupo. Embora os grupos sejam a forma mais comum de classificação de elementos, existem zonas da tabela periódica onde as tendências horizontais e semelhanças nas propriedades são mais significativas do que as tendências verticais. Na Tabela Periódica, cada elemento é apresentado, nomeadamente, com o seu símbolo e número atómico. Muitas versões da tabela apresentam também outras propriedades atómicas e propriedades físicas.

A Tabela Periódica actual

Ao longo do séc. XX foram aparecendo representações alternativas da Tabela Periódica, principalmente por razões didácticas. No entanto, a Tabela Periódica “tradicional” que é a que conhecemos mantém-se como a representação aceite da disposição sistemática dos elementos químicos em função das suas propriedades.

A tabela periódica é agora omnipresente fornecendo um enquadramento útil para classificar, sistematizar e comparar as muitas formas diferentes de comportamento químico. A tabela tem encontrado muitas aplicações em química, física, biologia, engenharia e ciência dos materiais.

Paulo Mendes

Prof. Auxiliar do Departamento de Química

Escola de Ciências e Tecnologia

Centro de Química de Évora

ANNEX M. Summary and participation of the Event

**UTILIZAÇÃO DE TEXTOS DE DIVULGAÇÃO CIENTÍFICA COMO RECURSO DIDÁTICO NO ENSINO DE QUÍMICA**

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JÚNIOR; Hélio Nascimento da Paixão ¹, PESSOA; Wilton Rabelo ², COSTA; Josineide Pantoja da ³

RESUMO

UTILIZAÇÃO DE TEXTOS DE DIVULGAÇÃO CIENTÍFICA COMO RECURSO DIDÁTICO NO ENSINO DE QUÍMICA (Ensino de Química) O estudo da Química pode ampliar a visão dos estudantes sobre seu universo de vivências, ao mesmo tempo em que considerar tais contextos pode facilitar a compreensão desta ciência. No entanto, percebemos que ainda existe uma resistência ao seu estudo por parte dos alunos, principalmente ao deparar-se com método tradicional de ensino, no formato passivo e transmissivo, que privilegia nomenclaturas, fórmulas e cálculos como aborda Vasconcellos (2005). O presente trabalho propõe apresentar e discutir contribuições da interação entre mediação de leitura e ensino de química, já que a utilização dos textos de divulgação científica (TDC) como recurso didático pode ser considerada um meio facilitador da aprendizagem. Pesquisas como as de Francisco Júnior, Ferreira e Hartwig (2010) e Brabo e Souza (2019) defende a integração da leitura, escrita e oralidade como forma de fomentar a aprendizagem e as competências necessárias da atual conjuntura social, econômica e política. Na percepção de Zismann et al, (2019), o emprego de TDC em sala de aula aproxima o aluno do mundo da ciência, pois oportuniza aos estudantes um contato com informações atualizadas sobre ciência e tecnologia, com acontecimentos de seu cotidiano, trazendo ainda aspectos curiosos, interessantes e divertidos, proporcionando uma outra maneira de ver a temida Química. Nesse contexto, a presente pesquisa tem como objetivo propor a mediação de leitura como recurso didático no ensino da Química, por meio da literatura científica, com o uso de textos de divulgação científica - TDC, com intuito de promover e melhorar a construção do conhecimento científico em sala de aula na educação básica. Partimos da ideia que, despertar a curiosidade pela busca de novas informações, motiva o aluno a se envolver em sua aprendizagem, por isso, é importante promover sua apropriação desde o ensino básico, com o uso da linguagem científica no processo de ensino e aprendizagem da Química. A metodologia deste estudo consiste na mediação de leitura de TDC utilizada como veículo de aprendizagem aos estudantes do primeiro ano do ensino médio, de uma Escola da Rede Pública de Ensino da Ilha de Mosqueiro/PA e, sobretudo, como forma de auxiliar os estudantes a pensar e se posicionar criticamente diante da sociedade, frente a um contexto. O presente estudo identificou elementos fundamentais para melhoria do processo de ensino-aprendizagem da disciplina de Química, no que versa a leitura de TDC como recurso metodológico. Nesta pesquisa apresentamos resultados prévios que sugerem que os estudantes

participantes do estudo, tiveram pouco ou nenhum contato com TDC. As atividades desenvolvidas no decorrer desta investigação constituíram o primeiro contato com esse gênero de leitura para grande maioria dos alunos, expondo a necessidade de se promover mais atividades, voltadas para leitura e escrita científica concernente ao Ensino da Química. Em síntese, essa interação estabelecida entre leitor e texto científico pode contribuir para tornar a aprendizagem mais efetiva, o que torna relevante a continuidade deste e outros estudos com essa abordagem. **Palavras-chave:** mediação de leitura, ensino da química, formação cidadã.

PALAVRAS-CHAVE: Mediação de Leitura, Ensino de Química, Formação Cidadã