Revista ARACÊ
ISSN: 2358-2472

INSTRUMENTS FOR THE ANALYSIS OF THE RELATIONSHIP WITH KNOWLEDGE IN THE AREA OF NUTRITION

https://doi.org/10.56238/arev6n4-342

Submitted on: 11/20/2024 **Publication date:** 12/20/2024

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ABSTRACT

In this article, we propose three research instruments that can be used to analyze the relationship with knowledge in the area of Nutrition, both in work situations and in formal learning environments, especially universities. Through one of the proposed instruments, called the M(SN) Nutritional Knowledge Matrix, we analyzed 29 syllabuses of disciplines related to Maternal and Child Nutrition (NMI) from public institutions in the Northeast Region of Brazil. We found that the vast majority of documents (90.95%) prioritize the description of study content related to NMI to the detriment of information related to the students' teaching and learning process. In other words, learning, as well as professional performance, is not highlighted in the syllabus of the disciplines. Thus, we believe that the M(SN) instrument has proven to be an appropriate tool to indicate guidelines for the restructuring of disciplines and PPCs, aiming to broaden the restricted view of guiding documents for the training of Nutrition professionals, which focus only on the contents to be addressed, but do not include suggestions to think about the personal and social relationships that teachers and students establish with the so-called Nutritional Knowledge.

Keywords: Nutrition Teaching, Maternal and Child Nutrition, Menus, Nutritional Knowledge Matrix, Relationship with knowledge.

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ISSN: 2358-2472

INTRODUCTION

In this article we propose three research instruments that can be used to analyze the relationship with knowledge in the area of Nutrition, both in work situations and in formal learning environments, especially universities. The proposal is based on some ideas already established in previous works, especially Arruda and Passos (2015) and Arruda and Passos (2017), the latter published in REPPE – Journal of Educational Products and Research in Teaching.

Considering that Nutrition Science emerged on the world stage between 1914 and 1918, the emergence of this area in Brazil occurred from the 1930s onwards (Vasconcelos, 2010). It is an interdisciplinary field that involves several areas of knowledge, such as Chemistry, Biology, Physiology, Biochemistry and Genetics, establishing dialogues with Clinical Practice and Epidemiology (Prado *et al.*, 2011). In general, Nutrition is related to the issue of food, and is sometimes considered as the "science of food" (Mitchell, 1978, *apud* Prado *et al.*, 2011, p. 930).

With regard to Nutritional Education, interest in the area arose in Brazil in the 40s, linked to government programs for the protection of workers (Boog, 1997). As Boog (2004, p. 2) states:

> Nutrition Education is responsible for developing systematized strategies to boost the culture and appreciation of food, conceived in the recognition of the need to respect, but also to modify beliefs, values, attitudes, representations, practices and social relations that are established around food (Boog, 2004, p. 2).

In other words, "educating in the field of nutrition implies creating new senses and meanings for the act of eating [...] implies knowing deeply what food is" (Boog, 2004, p. 2). However, changing a person's eating habits is not a simple task, since food consumption is subject to economic, social and cultural factors (Oliveira; Thébaud-Mony, 1997).

In fact, in recent decades, eating habits have undergone a great change, with a decrease in the intake of fruits, vegetables and greens, and an increase in the consumption of processed foods, which has produced several health problems, such as obesity, diabetes, hypertension, etc. (Lamas; Cadete, 2017).

According to Castro (2015), food integrates five dimensions: human rights, biological (nutritional and health aspects), sociocultural (value system, relationship of individuals and collectives with food), economic (labor relations established within the food system, food prices) and environmental (forms of production, commercialization and consumption of

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food). From these dimensions emerges the concept of Food and Nutrition Security (FNS), which is defined as:

> [...] the realization of everyone's right to regular and permanent access to quality food, in sufficient quantity, without compromising access to other essential needs, based on health-promoting food practices that respect cultural diversity and are socially, economically and environmentally sustainable (Kepple; Segall-Corrêa, 2011, p. 188).

Taking into account that food is part of everyday life and is influenced by different factors, teaching and learning to eat becomes paramount in any nutritional intervention carried out by a professional nutritionist. That is why Food and Nutrition Education (FNE) in Brazil is recognized as a strategic action to achieve FNS and guarantee the Human Right to Adequate Food (DHAA) (Brazil, 2018), as FNS will be more effective in actually changing an individual's diet when they learn about Food and Nutrition Science than following a food protocol.

According to Vaz *et al.* (2024), the National Common Curricular Base (BNCC) itself indicates that the EAN can be included as a transversal and integrative curricular component, given its importance, needing to be a field of knowledge and continuous and permanent, transdisciplinary, intersectoral and multiprofessional practice that aims to promote the autonomous and voluntary practice of healthy eating habits. The authors studied FNE within the scope of the School Feeding Program (PNAE) specifically school meals, they emphasized that it is not every educational process that contributes to the formation of this FNS profile, one of the requirements is that the degree of search of the school and the teacher for the autonomy of students is an important point for the challenge of teaching-learning in everyday life.

Ottoni *et al.* (2022) emphasize that FNE disciplines should promote space for the problematization of factors related to food consumption, development of strategies to promote healthy eating habits, and awareness of the importance of promoting health and FNS, going beyond the biological and normative understanding of food, and thus preparing the nutritionist for his role as an educator and valuing critical thinking instead of memorizing content, which brings the reflection of extrapolation to other areas of Nutrition.

Among the various areas of Nutrition, we have a special interest in Maternal and Child Nutrition (NMI). A mandatory and fundamental component for a complete professional training of bachelor's degree holders in Nutrition, the NMI discipline covers all nutritional aspects necessary for full human development, from before pregnancy to the adolescence

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of the future child. In addition, this curricular component guarantees the indispensable instructions for adequate nutritional conduct throughout pregnancy, aiming at both maternal and fetal health.

Another point of great relevance for this discipline is the preventive character that it enacts by allowing the training of professionals with the ability to combat obesity in children and adults, in addition to being able to mitigate pathologies related to nutritional deficiencies, propose healthy eating habits for life, thus avoiding the emergence of diseases throughout growth and adult life (Vitorino *et al.*, 2020).

To ensure an appropriate instruction of these professionals in relation to the area in which they will work, it is extremely important that the teaching process is adequate to result in the effective training of the professional. However, it is known that, currently, in Brazil, health professional training based on content-based and technicist methodologies prevails with low contribution to meeting the current social needs, because the undergraduate period, carried out largely in a rigid way in terms of teaching and learning processes, does not sufficiently promote a critical-reflective character on the part of students (Colares; Oliveira, 2018; Roman *et al.*, 2017).

Considering what has been exposed in the previous paragraphs, it seems to us that a change in eating habits, desired by Nutritionists and difficult to be carried out, could be analyzed from the point of view of the subject's relationship with what we could call "knowing how to eat". In other words, our hypothesis is that a change in eating habits would be facilitated if the subject changed his relationship with food knowledge.

Such reflections lead us to the theme of the relationship with knowledge in general (Charlot, 2000), through which we assume the perspective that food practices can be considered from three dimensions: the epistemic, the personal and the social, which will be described in the next section. Through these three dimensions, several analyses could be carried out regarding the relationship with Nutritional or Food Knowledge.

In general terms, we can say, therefore, that this article has two objectives:

(i) To propose research instruments for the analysis of the relationship with knowledge in the area of Nutrition/Food;

(ii) To apply one of these instruments in the analysis of the syllabus of 29 NMI courses from universities in the Brazilian Northeast.

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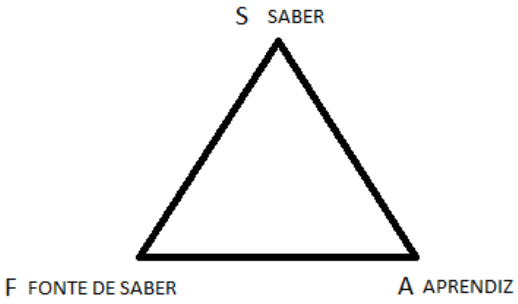
THEORETICAL FOUNDATION

In order to achieve objective (i) indicated at the end of the previous section, we will start from two fundamental concepts (or themes): learning configurations and the relationship with knowledge.

In our research group, the term Learning Settings (CA) designates "all learning possibilities and environments, physical or virtual, whether formal, informal or non-formal" (Arruda; Passos, 2015, p. 11).

A Learning Configuration has a triangular structure, consisting of three places (S, F and A) where: S is the knowledge in question (in the case of this article, Nutritional Knowledge); A is the apprentice, who could be a student or student, or an apprentice in the general sense (for example, a patient who needs to learn about his symptoms and appropriate treatments prescribed by the professional who attends him); finally, F is the source of learning, which can be a person (a teacher, a doctor, a nutritionist, among other people), a book, a *website*, a social network, etc. The source is independent of the subject who learns, and can be real or virtual (Arruda; Passos, 2015). A CA can be represented as in Figure 1:

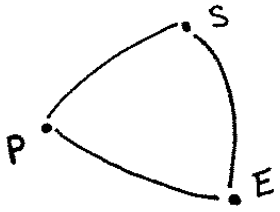
Figure 1 – Learning Configuration (CA)



Source: Arruda and Passos (2015, p. 11).

The simplest example of a CA is the standard classroom, as shown in Figure 2:

Figure 2 – Representation of a standard classroom



Source: Chevallard (2005, p. 26).

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In Figure 2, S is the knowledge to be taught, P is the teacher and E is the students. We have used this representation several times, since at least 2011, being called the didactic-pedagogical triangle (Arruda; File; Passos, 2011; Rue; Passos, 2015; Rue; Passos, 2017).

From the CA we can analyze the relationship with knowledge (S) that the source (F) and the learner (A) establish with S. The second fundamental theme of this article concerns, therefore, the relationship with knowledge. According to Charlot (2000, p. 80):

> [...] The relationship with knowledge is the relationship with the world, with the other and with himself, of a subject confronted with the need to learn. [...] it is the (organized) set of relations that a subject maintains with everything related to 'learning' and knowledge.

However, in general, the relationship with knowledge is "a form of relationship with the world" (Charlot, 2000, p. 77), but always taking into account that this relationship is mainly a relationship with learning. Such a world, mentioned above, could be a school, or a classroom, which would correspond to a formal learning configuration. But, as we also learn outside of school, at work and at leisure, this world encompasses all day-to-day activities.

Our reflections on the theme of the relationship with knowledge, indicated by Charlot, in particular those applied to the school world, led us to the conclusion that a subject talks about his relations with the world (whatever it may be) from three points of view or dimensions: epistemic, personal or social[5]. We call these dimensions R3 Relations:

Table 1 – R3 Relations

Categories	Descriptions
Epistemic relationship	The subject demonstrates an epistemic relationship with the world when he uses discourses that refer to knowledge, knowledge and/or information, expressing himself, in general, through oppositions such as I know/I don't know, I know/I don't know, I understand/I don't understand, etc.
Personal relationship	The subject demonstrates a personal relationship with the world when he uses discourses that refer to feelings, emotions, senses, desires and interests, expressing himself, in general, through oppositions such as like/dislike, want/don't want, feel/don't feel, etc.
Social relationship	The subject demonstrates a social relationship with the world when he uses discourses that involve values, agreements, precepts, beliefs, laws, which originate inside or outside the school world, expressing himself, in general, through oppositions such as I value/do not value, should/should not (do), can/cannot (am or am not authorized to do), etc.

Source: Adapted from Arruda and Passos (2017, p. 113).

[5] Such denominations were inspired by Charlot's epistemic, identity, and social relations, but they are conceptually different. The R3 relationships have been applied to several research proposals of our group since 2011.

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From the concept of Learning Configurations and R3 Relations, it was possible to develop some research instruments called Matrices (Arruda; Passos, 2017), composed of nine cells that form a 3x3 Matrix.

There are three types of Matrices, named as follows: Teacher M(P) Matrix; Student Matrix M(E); Matrix of Knowledge M(S). In them, knowledge is, in general, a content of the area of Science and Mathematics. Such instruments have been applied, since 2011, in various situations related to the area of Science and Mathematics Teaching, when the first Matrix was published (Arruda; File; Passos, 2011; Rue; Benicio; Passos, 2017a.). In particular, they were used to analyze some institutional documents such as summaries (Conti; Steps; Arruda, 2014) and Pedagogical Course Projects (PPCs) (Levandovisk *et al.*, 2021).

When we observe the considerations reached by Conti, Passos and Arruda (2014) and Levandovisk *et al.* (2021), it is apprehended that the syllabuses are incomplete, essentially prioritizing the content, distancing teachers from curricular knowledge and, in addition, do not express what results should be expected for the learning of the discipline in question and what actions would need to be developed by the teacher trainers. Although the conclusions are not encouraging, the effectiveness of the Matrices to analyze such types of documents has been proven.

THE MATRIX OF NUTRITIONAL KNOWLEDGE – M(SN)

In the case of this article, the first objective is to propose instruments analogous to the Matrices for the area of Nutrition. For this, we need to assume that the activities developed by a Nutritionist can also be represented in a triangular form, that is, through Learning Configurations and analyzed through the relationship with knowledge. Initially, we have to delimit and understand what the Nutrition professional does and in which settings he works.

According to Resolution 600/2018 of the National Council of Nutritionists – CFN (https://www.cfn.org.br/index.php/areas-de-atuacao/), this professional can work in six areas:

> I. Collective Food Nutrition Area – Management of Food and Nutrition Units (UAN).
> II. Clinical Nutrition Area – Nutritional and Dietary Therapy Assistance in Hospitals, Outpatient Clinics, in Offices and at Home.
> III. Area of Nutrition in Sports and Physical Exercise – Nutritional and Dietotherapeutic Assistance for Athletes and Sportsmen.

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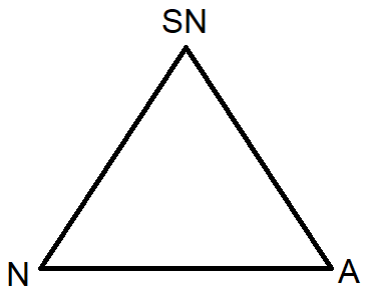
IV. Area of Nutrition in Collective Health – Individual and Collective Nutritional Assistance and Education.
V. Nutrition Area in the Production Chain, in the Food Industry and Trade – Development and production activities and trade of products related to food and nutrition.
VI. Area of Nutrition in Teaching, Research and Extension – Coordination, teaching, research and extension activities in undergraduate and graduate courses in nutrition, professional improvement courses, technical courses and others in the area of health or related.

Although each of these areas corresponds to a different configuration, our hypothesis is that whatever their area and place of activity (hotels, hospitals, clinics, schools, restaurants, public or private companies, specialized care, health surveillance, food production, undergraduate and graduate courses, etc.), the relationships with knowledge that involve the activities of a Nutritionist with his patient, client, collaborator or student can be represented by a structure like the one in Figure 3, where: SN is the Nutritional Knowledge: N is the Nutritionist (or teacher of a nutrition discipline); and A is the subject who has to learn about nutrition, who could be a student of a higher education course, a patient who has to change his eating habits, an athlete, among other human beings.

In Figure 3 we bring the representation of the nutritional triangle:

Figure 3 – Nutritional triangle



Source: The authors.

In addition, as we did in the case of relations with knowledge in the school world (Arruda; Passos, 2017), the edges of the triangle in Figure 3 express certain relationships between the actors represented by the vertices: N-SN is the relationship that the Nutritionist has with Nutritional Knowledge; A-SN is the relationship that the student/patient/client has with Nutritional Knowledge; and N-A is the relationship between these two subjects, considering that what is at stake between them is Nutrition, as a knowledge to be taught and/or learned. It is important to emphasize that the meaning of the edges must be adapted according to the specific configuration of the ongoing investigation.

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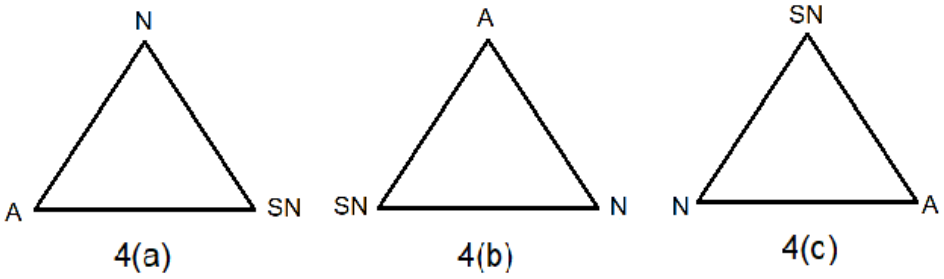
According to our research tradition, Nutritional Knowledge (NS), although it is a non-human (it is a knowledge), functions, in the structure of Figure 3, as an actor in the full sense of the term, that is, it can transmit actions just like N and A[6]. In this sense, the nutritional triangle can be investigated from three different points of view: from the view of N, from the view of A, and from the "view" of SN. In practice, this means that we have three nutritional triangles, as shown in Figure 4.

Figure 4 – Nutritional triangles

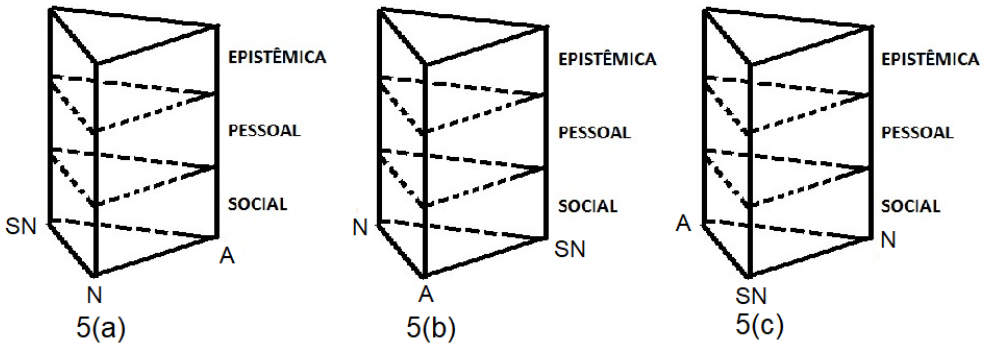


Source: Adapted from Arruda and Passos (2017).

We agree that the actor who is at the upper vertex is the one under investigation, that is: in 4(a) we are interested in N's view of the functioning of the triangle; in 4(b), we investigated A's vision; and in 4(c) it is about SN's "vision" of the triangle (this will be clarified later in this article).

The next step for the elaboration of the research instruments referred to in objective (i) consisted of applying the R3 Relations (Chart 1) to the triangles in Figure 4. This brings us to three prisms, as shown in Figure 5,

Figure 5 – Nutritional prisms obtained from the triangles



Source: Adapted from Arruda and Passos (2017).

[6] The idea that SN is an actor – or an actant – is based on Actor-Network Theory (ANT). For further clarification, see Arruda, Passos and Broietti (2021).

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Figure 5 shows that when we apply the R3 to the triangles in Figure 4, they acquire three dimensions: they become prisms. That is, we can look at the three triangles from an epistemic, personal, and/or social point of view. To arrive at the instruments referred to in objective (i) we have to open the prisms, as shown in Table 2.

Chart 2 – Nutritional matrices obtained from the prisms

	N-SN	N-A	A-SN
Ep			
Pe			
OS			

2(a)

	A-N	A-SN	N-SN
Ep			
Pe			
OS			

2(b)

	SN-A	SN-N	N-A
Ep			
Pe			
OS			

2(c)

Source: Adapted from Arruda and Passos (2017).

Matrix 2(a) will be called the Nutritionist's Matrix, indicated by M(N), addresses the effects of the Nutritionist's action in his workplace (office, classroom, etc.). Matrix 2(b), called the Nutrition Learner Matrix – M(A) – considers the relationship of this learner/patient/client with Nutritional Knowledge. Finally, Matrix 2(c), entitled Matrix of Nutritional Knowledge, with the acronym M(SN), assumes the determinations of Nutritional Knowledge (SN), both in the action of the Nutritionist (N) and in the relationships that the learner (A) can establish with N and SN in the triangle of Figure 3. In particular, as we will see below, this third Matrix can be adapted to analyze the syllabus of disciplines that involve content related to Nutrition.

In this article, due to the space available and the data we have, we will explore only the Matrix of Nutritional Knowledge M(SN), leaving the other two for future research. In general, we can say that, for the specific case of this research, the edges can be interpreted as follows:

- The N-SN edge concerns the *content* explained in the syllabus, which the Nutritionist must master to practice the profession (relationship between N and SN).
- The A-SN edge refers to the *learning* of the learner (the student, in this case) about the content covered in the course (relationship between A and SN).
- The N-A edge refers to the *teaching* carried out by N (relationship between N and A).

It is convenient to call this Matrix of Nutritional Knowledge, adapted for the analysis of menus, M(SN)E, to indicate the specificity of the case. This Matrix is represented in Chart 3, in its general form.

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We remind you that, in the case of this Matrix, N is a teacher who teaches content related to Nutrition; A is a higher education student, a student of N; and SN is Nutritional Knowledge, that is, a content specified by the syllabus of a discipline. Another observation: the Matrix in Chart 3 has the same structure as the Matrix of Knowledge M(S), "developed for the Teaching of Science and Mathematics" (Arruda; Passos, 2017, p. 111-112), which focused on formal learning situations (Basic Education or Higher Education classrooms).

Chart 3 – Nutritional Knowledge Matrix M(SN)E adapted for menu analysis

Determinations of the Syllabus on R3 Relations	1 Apprenticeship (segmento SN-A)	2 Content (segmento SN-N)	3 Teaching (segmento N-A)
A Epistemic (knowledge)	Cell 1α It concerns the determinations of the syllabus in relation to A's learning about Nutrition from an epistemic point of view	Cell 2α It concerns the determinations of the menu in relation to the content of Nutrition that N must master from an epistemic point of view	3α cell It concerns the determinations of the syllabus in relation to the teaching of Nutrition from the epistemic point of view
B Staff (direction)	Cell 1β It concerns the determinations of the syllabus in relation to A's learning about Nutrition from a personal point of view	Cell 2β It concerns the determinations of the menu in relation to the content of Nutrition that N must master from a personal point of view	Cell 3β It concerns the determinations of the syllabus in relation to the teaching of Nutrition from a personal point of view
C Social (value)	Cell 1γ It concerns the determinations of the syllabus in relation to A's learning about Nutrition from a social point of view	Cell 2γ It concerns the determinations of the menu in relation to the content of Nutrition that N must master from a social point of view	Cell 3γ It concerns the determinations of the syllabus in relation to the teaching of Nutrition from a social point of view

Source: The authors.

In the next section, we will apply the M(SN)E Matrix to the available data, that is, to the syllabi related to the NMI disciplines of 29 courses.

METHODOLOGY

The research we carried out is documentary, inserted in a qualitative approach, which used as a data source the syllabuses of the disciplines that were dedicated to the content of Maternal and Child Nutrition (NMI) of the Pedagogical Projects of the Nutrition Courses (PPCs) of the public HEIs in the Northeast Region of Brazil. As already indicated in

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the previous section, in this article the M(SN)E Matrix was assumed as the analytical instrument.

To define which PPC syllabuses would be analyzed, a search was carried out on the website: https://emec.mec.gov.br/, with the following fields filled in: 'Search for' by inserting 'undergraduate courses'; 'Course' inserting 'Nutrition'; 'Modality' was marked 'at a distance' and 'in person'; 'Degree' was marked 'bachelor'; 'free of charge' the option 'yes' was chosen; 'Situation' was chosen as 'In Activity', and then it was followed to identify the Nutrition Courses of the HEIs located in the Northeast. We also contacted the coordinators of these courses via phone and/or e-mail.

All this movement culminated in obtaining the PPCs of the current undergraduate courses, from which we selected the syllabuses of the disciplines that presented contents related to NMI, and those that did not present these subjects were not included in the analysis. Thus, the terms "Maternal-Infant Nutrition", "Maternal-Infant" or "Life Cycles" were established as search triggers for the menus linked to the theme.

With the menus in hand, the analysis began in the first months of 2023. First, by verifying the theoretical and practical workloads of the disciplines, the academic semester in which it was offered, the existence of a 'pre' or 'co' requirement and, finally, the year in which it was in the curricular structure of the PPCs.

With this material, we began to interpret the menus in the search for fragments that could be allocated in the M(SN)E Matrix. In a movement similar to that carried out by Conti, Passos and Arruda (2014) and Levandovski *et al.* (2021), we will consider in the analyses only line 1 (epistemic) of M(SN)E, presented in Chart 3. To facilitate the analysis, we need to make a more detailed description of each cell, as shown below:

1. *Cell 1α*: Refers to the determinations of the syllabus in relation to A's (student's) learning about Nutrition from an epistemic point of view. It focuses on the skills that students should acquire, based on the content and how it was addressed; what they show they know or do not know about this content; what are their perceptions, previous ideas and learning difficulties in relation to content related to Nutrition and the profession of Nutritionist.
2. *Cell 2α*. It concerns the determinations of the syllabus in relation to the *content* of Nutrition that N (teacher) must master from an epistemic point of view. It involves: the description of contents and practices related to Nutrition in pregnancy, lactation, childhood and adolescence; Explanation of the objects and places where the content

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can be found, such as books, articles in periodicals, magazines, videos, internet, library, universities, etc.

3. *Cell 3α*. It concerns the determinations of the syllabus in relation to the *teaching* of Nutrition from an epistemic point of view. It involves information about how the teacher's relationship with the instructional materials, experiments, instruments will take place; the ways in which it carries out the planning of objectives, contents, activities, evaluation, material resources; the methodological approaches that should be used, etc.

For the presentation and analysis of the data, the following steps were adopted: i) Definition of the HEI that is the subject of the syllabus; ii) Each sentence in the syllabus was indicated by a number (units of analysis – AU); some sentences in the syllabus had to be separated by blocks of subjects, observing books on the respective themes; iii) Analysis and classification of each AU, according to the epistemic relationship present, whether it was related to content, teaching or learning; iv) The AUs were distributed in cells 1α, 2α or 3α, according to the description of each cell; v) Description of the perceptions and interpretations made in each menu; vi) Reflection on the probable impact on vocational training.

For the interpretation and analysis of the data, the procedures of Content Analysis (CA) presented by Bardin (2004) and Moraes (2003) were adopted. We are also inspired by what Sousa and Santos (2020, p. 1397) indicate to us, when they say that CA "aims to analyze what was said in the midst of an investigation, constructing and presenting conceptions around an object of study", and Moraes (2003, p. 192) when he states that textual analysis, as the field in which CA is located, they seek to "describe and interpret some of the meanings that the reading of a set of texts can arouse".

For this article, due to the objectivity in the discussion and presentation of what was done during the research, and because of the number of pages that would be necessary to present the data in its entirety, only one of the applications of the M(SN)E Matrix, in the epistemic line, will be exemplified.

RESULTS AND DISCUSSIONS

Of the 15 public HEIs in the Northeast that offered, at the time, the Bachelor's Degree in Nutrition, it was possible to access the PPC of 14 of them. Of the 17 PPCs

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obtained (since there was an institution that sent more than one PPC, because they were in a transition process between PPCs), 29 course syllabuses that contemplated Maternal and Child Nutrition were analyzed and the identified fragments were accommodated in line 1 of the M(SN)E Matrix presented in Chart 3.

Chart 4 details the disciplines whose syllabi were analyzed, indicating their name, their respective academic semesters (in parentheses), universities and *campuses,* and the year of the PPC. The workload of the disciplines varied between 30 hours and 204 hours, the theoretical between 10 am and 136 hours and the practical between 10 am and 68 hours.

Table 4 – Information regarding the disciplines dedicated to NMI

Disciplines (semesters)	Universities (campus)	Years (PPC)	Total workloads (practical/theoretical)
Maternal and Child Nutrition (6th)	UFPE – Federal University of Pernambuco (Vitória)	2012	60 (30/30)
Nutrition in Women's and Children's Health Care (5th)	UNEB – State University of Bahia (Salvador)	2012	75 (45/30)
Pathophysiology and Diet Therapy in Pediatrics (8th)			60 (30/30)
Maternal and Child Nutrition (6th)	UFPB – Federal University of Paraíba (João Pessoa)	2007	45 (45/-)
Maternal and Child Health Practice (6th)			30 (10/20)
Maternal and Child Health (5th)			45 (45/-)
Nutrition of pregnant women and children (6th)	UFOB – Federal University of Western Bahia (Barreiras)	2014	90 (60/30)
Maternal and child nutrition (7th)	UFMA – Federal University of Maranhão (São Luís)	2006	60 (30/30)
Nutrition and Dietetics in the Life Cycle I (5th)	UFPI – Federal University of Piauí (Teresina)	2018	60 (45/15)
Nutrition and Dietetics in the Life Cycle II (6th)			45 (-/-)
Nutrition and Life Cycle 1 (5th)	UFPI – Federal University of Piauí (Picos)	2011	60 (-/-)
Nutrition and Life Cycle 2 (6th)			60 (-/-)
Maternal and Child Nutrition (7th)	IFCE – Federal Institute of Education, Science and Technology of Ceará (Limoeiro do Norte)	2022	80 (60/20)
Nutrition in Pediatrics (8th)			40 (30/10)
Maternal and Child Nutrition (6th)		2015	60 (-/-)
Nutrition in Pediatrics (7th)			40 (-/-)
Maternal Nutrition and Dietetics (5th)	UFRN – Federal University of Rio Grande do Norte (Natal)	2020	30 (20/10)
Nutrition and Dietetics from Childhood to Adolescence (5th)			45 (30/15)
Maternal and Child Nutrition (5th)	UFAL – Federal University of Alagoas (Maceió)	2010	120 (-/-)
Maternal-Child Clinical Nutrition I (6th)			60 (-/-)
Maternal-Child Clinical Nutrition II (7th)			60 (-/-)
Maternal and Child Nutrition (5th)	UFS – Federal University of Sergipe (São Cristóvão)	2009	60 (-/-)
Nutrition and Life Cycle I (4th)		2010	60 (-/-)

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Nutrition and Life Cycle II (5th)	UFCG – Federal University of Campina Grande (Cuité)		30 (-/-)
Nutritional Care in Life Cycles I (8th)	UFRB – Federal University of Recôncavo da Bahia (Santo Antônio de Jesus)	2021	204 (136/68)
Maternal Nutrition (5th)	UFBA – Federal University of Bahia (Vitória da Conquista)	2022	68 (34/34)
Child and Adolescent Nutrition (6th)			68 (34/34)
Maternal and Child Nutrition (6th)	UPE – University of Pernambuco (Petrolina)	2017	60 (45/15)
Maternal and Child Nutrition (7th)		2013	60 (45/15)

Source: The authors.

For each of the 29 syllabuses analyzed, a form was prepared, such as those presented in Tables 5 and 6. The numbers in parentheses indicate the unit of analysis (AU). The last two rows of the forms show the distribution of the AUs in the cells of row 1 of the M(SN)E Matrix, shown in Chart 3.

Chart 5 – Analytical sheet of the discipline of Maternal Nutrition and Dietetics (UFRN)

SUBJECT: Maternal Nutrition and Dietetics			
UNIVERSITY: Federal University of Rio Grande do Norte			
WORKLOAD: 30h, 20h theoretical and 10h practical			
PPC: 2020			
SUMMARY: Maternal Health Care Policies (1). Nutrition in obstetrics: nutritional assistance in prenatal care; physiological aspects during pregnancy; physiological complications during pregnancy; food practices and cultural diversity; nutrient needs and recommendations; food and nutrition planning, from the perspective of promoting healthy eating, food and nutritional security and collective health (2). Pregnant adolescent (3). Nutritional attention in the most common diseases during pregnancy (4). Breastfeeding: lactation physiology, breast milk composition and breastfeeding management (5). Food and nutritional care in lactation: specific physiological characteristics; nutrient needs and recommendations; food and nutrition planning, from the perspective of promoting healthy eating, food and nutritional security and collective health (6). Attention to ethical principles and professional posture, from the point of view of welcoming and humanization, co-responsibility and individual autonomy (7). Practice on nutrient needs and recommendations (8); Dietary Planning during pregnancy, from the perspective of promoting healthy eating, food and nutritional security and collective health (9). Practice on breastfeeding management (10). Practice on nutrient needs and recommendations (11); Dietary planning in lactation, from the perspective of promoting healthy eating, food and nutritional security and collective health (12). Attention to ethical principles and professional posture, from the point of view of welcoming and humanization, co-responsibility and individual autonomy (13). Extension practices carried out in public maternity hospitals and Health Units (14).			
Determinations of the menu upon R3 Relations	1 Apprenticeship (Cell 1α)	2 Content (Cell 2α)	3 Teaching (Cell 3α)
A Epistemic (knowledge)	7	1, 2, 3, 4, 5, 6, 9, 12	8, 10, 11

Source: The authors.

As shown in Chart 5, the distribution of the syllabus of the Maternal Nutrition and Dietetics discipline at UFRN focuses on the three cells of M(SN)E-line 1. However, the vast

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majority of the syllabuses analyzed indicate only the content (Cell 2α), which should be addressed in the classroom, as we can see in the case of the Maternal and Child Health course sheet at UFPB (Chart 6).

Chart 6 – Analytical sheet of the Maternal and Child Health discipline (UFPB)

SUBJECT: Maternal and Child Health			
UNIVERSITY: Federal University of Paraíba (João Pessoa)			
WORKLOAD: 45h, 45h theoretical and 0h practical			
PPC: 2007			
SUMMARY: Characterization of the maternal-infant group (1). Physiology of pregnancy (2). Course and weight of the pregnant woman (3). Feeding the pregnant woman (4). Lactation physiology (5). Feeding of the breastfeeding woman (6). Growth and development and evaluative aspects (7). Infant digestive physiology (8). Nutritional requirements of the infant (9). Infant feeding (10). Breastfeeding (11). Preschool and school nutrition (12). Knowledge and preparation of maternized industrialized milks (13).			
Determinations of the menu upon R3 Relations	1 Apprenticeship (Cell 1α)	2 Content (Cell 2α)	3 Teaching (Cell 3α)
A Epistemic (knowledge)		1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13	

Source: The authors.

Considering the 29 menus, we distributed all 232 AUs in the M(SN)E-line 1 Matrix, as shown in Chart 7.

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Table 7 – Distribution of the 232 AUs in the M(SN)E-line 1 Matrix

	1 Apprenticeship (Cell 1α)	2 Content (Cell 2α)	3 Teaching (Cell 3α)	TOTAL
Total AUs M(SN)E – line 1	11	211	10	232
Percentage %	4,74	90,95	4,31	100,00

Source: The authors.

From Chart 7, we prepared Graph 1, which shows the distribution of the units of analysis, referring to all the analyzed syllabus, in the cells of the M(SN)E-line 1 Matrix, which indicate the epistemic relationship: with learning (Cell 1α), with content (Cell 2α) and with teaching (Cell 3α).

As we can see, there is a great discrepancy in the distribution and classification of the AUs present in the syllabus, since 211 of them configured an epistemic relationship with the content, 10 of them with teaching and 11 with learning. In this sense, we conclude that there is a similarity between the documents in prioritizing the description of the study contents related to the NMI to the detriment of information related to the teaching process and student learning.

However, due to the analyses carried out, we evidenced a contemplation of all cells in the epistemic relations, in the disciplines belonging to the Federal University of Rio Grande do Norte (UFRN), where we can find AUs related to content (8), teaching (3) and learning (1) (Chart 5). However, when an interpretative analysis is made, we see that the AUs allocated in cell 3α, related to teaching, only indicate that something practical should be done, but does not provide details of how this would actually be executed.

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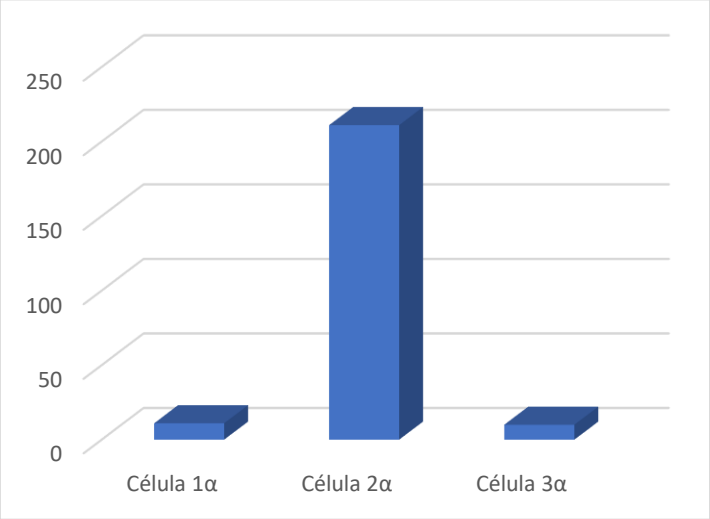
Graph 1 – Distribution of the 232 AU in the M(SN)E-line 1 Matrix



Source: The authors.

Rozendo *et al*. (1999), investigating teaching practices in health courses, found such teaching methods: lecture, case discussion, practical laboratory class, practical clinical class, seminar, debate with the whole class, group work and practical field class; So, only from classes that we can mention as practical we have three types and when teaching them, different tools can be used. In a clinical practice class, for example, clinical cases can be used for analysis, outpatient care in a school clinic, visits to patients admitted to teaching hospitals or the use of the OSCE (Structured Objective Clinical Examination), and these practices can complement each other, but using only one leads to gaps in training, such as lack of contact with patients or lack of familiarity with the future work environment.

An investigation into teachers' classroom practice in EAN subjects, Ottoni et al. (2022) found that the Cartesian paradigm and traditional education model is being challenged and overcome; Faculty members work to incorporate the humanities and social sciences into their curricula with active teaching and assessment methods, which develop critical thinking and stimulate the value of the field, so that students can promote health and healthy eating practices when they become nutritionists.

Alves and Martinez (2016, p. 161) define the PPC as:

> A normative document for undergraduate courses, with information about the design and structure of the course. It can be understood as an instrument of demarcation for "university practice", conceived collectively within the institution, oriented to this and to each of its courses. It should provide opportunities for the construction of intentionality for the performance of the institution's social role, focusing on teaching, but closely linked to the research and extension processes. [...] The intended vision must also be configured, carrying out the actions, reflecting on them, evaluating them and incorporating new challenges.

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However, the syllabuses of the Nutrition courses analyzed here, for the most part, did not establish guidelines for the teacher's action in the classroom, such as methodological proposals and/or practical instructions on how to carry out their "university work".

An interesting case was observed in the menus of the Nutrition course at the University of Pernambuco (UPE). At the time of our analyses, it had two active PPCs, 2013 and 2017, shown below in Charts 8 and 9.

Chart 8 – Analytical sheet of the Maternal and Child Nutrition (UPE) discipline – 2013

SUBJECT: Maternal and child nutrition			
UNIVERSITY: UNIVERSITY OF PERNAMBUCO			
WORKLOAD: 60h, 45 theoretical hours 15 practical hours			
PPC: 2013			
SUMMARY: Nutrition during pregnancy, lactation, first year of life, normal childhood and adolescence and with more frequent diseases with an interest in Nutrition (1). Nutrition and the processes of growth and development (2). Current problems in child nutrition (3). Nutrition of high-risk newborns (4). Prophylaxis of the most frequent diseases in pediatrics and interest in Nutrition (5). Breastfeeding and its physiology (6). Artificial breastfeeding (7). Dietary planning for the maternal-infant group (8). High Risk Newborn Nutrition (9)			
Determinations of the menu upon R3 Relations	1 Apprenticeship (Cell 1α)	2 Content (Cell 2α)	3 Teaching (Cell 3α)
A Epistemic (knowledge)		1, 2, 3, 4, 5, 6, 7, 8, 9	

Source: The authors.

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Chart 9 – Analytical sheet of the Maternal-Child Nutrition (UPE) discipline – 2017

SUBJECT: Maternal and child nutrition			
UNIVERSITY: UNIVERSITY OF PERNAMBUCO			
WORKLOAD: 60h, 45 theoretical hours 15 practical hours			
PPC: 2017			
SUMMARY: In this course, the student will solve his doubts and develop his critical sense (1 – SEC 3) by knowing the physiological and pathological aspects and the dietary therapeutic conduct in the pathologies that affect the maternal-infant group (2 – SEC 1), in addition, he will be able to describe (3 – SEC 3) the benefits of breastfeeding and when necessary indicate the use of infant formulas (4 – SEC 1). The student will also be able to understand (5 – SEC 3) the dietotherapeutic conduct for the main pathologies that affect the pediatric age group (anemia, obesity, diabetes, metabolic syndrome, gastroesophageal reflux disease, respiratory diseases), as well as the inborn errors of metabolism (6 – SEC 1). In this way, students will be able to elaborate and solve Clinical Cases (7 – SEC 2/SEC 3).			
Determinations of the menu upon R3 Relations	1 Apprenticeship (Cell 1α)	2 Content (Cell 2α)	3 Teaching (Cell 3α)
A Epistemic (knowledge)	1, 3, 5, 7	2, 4, 6	7[7]

Source: The authors.

As we can see, there was a change in relation to the syllabus between the two PPCs: while in the older one the syllabus items were concentrated in cell 2α (relationship with content), in the most current PPC there was a significant shift in the distribution of AUs to cell 1α (learning). Why did this happen? We have some hypotheses, indicated below.

Firstly, it was observed that in the construction of the 2017 PPC, more professors with PhDs and training in Nutrition participated than in 2013. Another very important point is related to the need to update the PPC, due to changes in the world and Brazilian scenario in relation to food and nutrition. The third point concerns the inclusion of the extension curriculum in the curricular matrix of Higher Education courses. The extension curriculum was included in the 2017 PPC as part of the methodological conception and in the syllabus of mandatory and elective courses. This insertion is exposed in the PPC for the following reasons:

> The extension in the methodological conception of the Nutrition course promotes sustainable development from a socially relevant university perspective. It establishes as guidelines the dialogical interaction, interdisciplinarity and interprofessionality; the inseparability of teaching-research-extension; the impact on the student's education and on social transformation, having as pillars the systematization of extension work and its universalization. [...] This allows the enrichment of the student experience and the reaffirmation of the ethical and solidarity commitments of the Brazilian university (UPE, 2017, p. 23).

[7] UA 7 of this syllabus was included in Cell 1α because it concerns something related to student learning. But it was also inserted in Cell 3α, because the mention of working with Clinical Cases also indicates to the teacher a way or a method of working with the contents, which can be characterized as teaching.

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Rue; Passos and Elias (2017) applied the matrix to understand the effects on the teacher's action in the classroom in the curricular change to a Blocked System in public schools in the State of Paraná; they mainly observed the incidence of speeches in column 1 (knowledge/content), which does not normally occur in basic education, because teachers do not comment much on the content, because in general they have a good education and mastery of the subject is not a major problem for them; But because it is a curricular change, teachers had to adapt to the new situation and reflect mainly on the distribution of content in the general planning and the new planned class time.

So, perhaps, depending on the focus or objective of the change in a document, the concerns are different in relation to content, teaching and learning, as we could see in UPE's 2017 PPC, in which extension was one of the main starting points for the remodeling. And thus, we observed that there was a concern regarding the role of the student as an active person in the university and in society, and a need to reformulate the syllabus to guide this process of change.

A more consistent answer to the question raised would, however, require further investigations, probably involving interviews with the elaborators of the menus.

FINAL CONSIDERATIONS

As stated in the Introduction, the article had two objectives. The first of them consisted of proposing research instruments for the analysis of the relationship with knowledge in the area of Nutrition/Food. Three instruments were proposed, in the form of three 3x3 Matrices called the Nutritionist's Matrix – M(N), the Nutrition Learner's Matrix – M(A) and the Nutritional Knowledge Matrix indicated by M(SN).

This third Matrix, M(SN), was used to analyze 29 Maternal and Child Nutrition (NMI) courses from universities in the Brazilian Northeast, more specifically, course syllabuses that involved content directly related to Nutrition, which was the second objective of the article. We observed that the vast majority of documents (90.95%) prioritize the description of study contents related to NMI to the detriment of information related to the students' teaching and learning processes. In other words, learning, as well as professional performance, is not highlighted in the syllabus.

Therefore, when taking as a basis the guidelines of the National Curriculum Guidelines for the Nutrition Course, it is perceived that many of the competencies and skills to train a Nutritionist with a critical view and able to develop actions for prevention and

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health promotion, both individual and collective, are not being obeyed with regard to the importance of this professional in the area that most impacts the vitality of the population.

Understanding that the PPC is a guiding document for the course for which it is intended and at the same time the syllabus, which is inserted in the PPC, is an instrument that can be configured as instructions for the teachers responsible for it, it is essential that it be a complete instrument, highlighting the various management responsibilities implied in the teaching performance, such as: information about the content to be addressed, teaching methods to be used by the teacher and/or learning objectives. If there are gaps related to these aspects, the professional's training can be compromised.

Considering the results presented here, which used the so-called Nutritional Knowledge Matrix – M(SN) as a basis for analysis, we found that these results are consistent with others found in the literature. We believe that the M(SN) instrument has demonstrated, therefore, to be an appropriate tool to indicate guidelines for the restructuring of disciplines and PPCs, aiming to expand the restricted view of documents guiding the training of Nutrition professionals, which focus only on the contents to be addressed.

In other words, it is not just a matter of indicating the contents, but thinking about the relationships that teachers and students establish with the so-called Nutritional Knowledge here.

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