



## The Didactic Contract from the Perspective of the Theory of Didactical Situations: An Integrative Review

Fernanda Maria Almeida do Carmo; José Airton de Oliveira Faustino; Maria Vanízia Mendonça de Lima; Milínia Stephanie Nogueira Barbosa Felício; Hermínio Borges Neto; Gilberto Santos Cerqueira

### Abstract

The phenomena related to the mathematical teaching and learning process have a significant and direct influence on the construction of knowledge and studying these issues is of interest to the theory developed by Guy Brousseau, called Theory of Didactical Situations. When dealing with the relations established between student, knowledge and teacher, Brousseau presents those that are specific, explicitly and implicitly, of the relationship between teacher and students, as well as their influences on the teaching and learning process, defining, for this, the Didactic Contract, which consists of the set of behaviors that the teacher expects from the student and the student from the teacher. With this, the following question arose for this work: What is the relevance of the Didactic Contract when designing teaching sequences with input in the Theory of Didactical Situations? The objective was, then, to carry out an integrative review in order to systematize information present in scientific articles about the Didactic Contract in the perspective of the Theory of Didactical Situations. A search for works was carried out in the databases Scielo, Google Scholar and Portal de Periódicos CAPES/MEC through the descriptors "Didactic Contract" and "Theory of Didactical Situations", with the following exclusion criteria: works not related to the theme and book, theses, dissertations and monographs. That is, only papers of the scientific article type were chosen. A total of one hundred and seventy-seven works were obtained as an initial result, of which thirteen were repeated. After reading the abstracts and adopting the exclusion criteria, sixteen articles remained, of which nine responded to the elaborated question. With the research, it was found, in the period consulted, a limitation of publications that deal specifically with the Didactic Contract and, in spite of that, it was concluded that the Didactic Contract is a very important element in a teaching and learning situation, because it can favor or cause an obstacle in the acquisition of new knowledge by the student.

**Keyword:** Didactic Contract; Theory of Didactical Situations; Science teaching.

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# **The Didactic Contract from the Perspective of the Theory of Didactical Situations: An Integrative Review**

**Fernanda Maria Almeida do Carmo**

College of Education, Federal University of Ceará, Fortaleza, CE, Brazil.  
fernanda@multimeios.ufc.br

**José Airton de Oliveira Faustino**

College of Education, Federal University of Ceará, Fortaleza, CE, Brazil.  
airton@multimeios.ufc.br

**Maria Vanísia Mendonça de Lima**

College of Education, Federal University of Ceará, Fortaleza, CE, Brazil.  
vanisia@multimeios.ufc.br

**Milínia Stephanie Nogueira Barbosa Felício**

College of Education, Federal University of Ceará, Fortaleza, CE, Brazil.  
milinia@multimeios.ufc.br

**Hermínio Borges Neto**

College of Education, Federal University of Ceará, Fortaleza, CE, Brazil.  
herminio@multimeios.ufc.br

**Gilberto Santos Cerqueira**

College of Education, Federal University of Ceará, Fortaleza, CE, Brazil.  
giufarmacia@hotmail.com

## **Abstract**

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**Keywords:** Didactic Contract; Theory of Didactical Situations; Science teaching.

## 1. Introduction

The Theory of Didactical Situations was developed by the French Guy Brousseau (1986), a researcher at the University of Bordeaux and one of the main pioneers of Didactics of French Mathematics in order to study the phenomena that are linked to the teaching and learning process of mathematics. It sought to introduce this theoretical model of interaction between the student, the knowledge and the teacher, arguing that it is these phenomena, added to the characteristics of teaching situations, that favor the acquisition of knowledge.

When idealizing this theory, Brousseau proposed didactic situations that could be reproduced at different times, in order to establish a general model for the teaching and learning of mathematical concepts, considering the particularity of each subject studied. With this theory, the aforementioned researcher did not intend to only use reproducible situations, but also to study and understand the relationships established between the teacher, mathematical knowledge and the student.

Reproducible situations would promote a change in the behavior of students who would start to acquire a set of knowledge resulting from significant learning. The change in student behavior would happen, because the teacher makes it possible, with the Theory of Didactical Situations, for the apprentice to assume the position of a researcher, acting actively in the construction of knowledge, reflecting on the studied subject, making conjectures and building concepts concerning the new knowledge at stake. In this pedagogical relationship established with the Theory of Didactical Situations, the teacher assumes the position of mediator of the new scientific knowledge.

For the construction of knowledge by the student, Brousseau also proposes the construction, analysis and experimentation of “didactic situations” – a term that gives name to the relationships established between student, knowledge and teacher. And to analyze the specific relationships that are established, explicitly and implicitly, between the teacher and his students, as well as to analyze the influences of these relationships in the teaching and learning process, the author defines the Didactic Contract, which consists of the set of behaviors that the teacher is expected by the student and the student by the teacher (ALMOULOU, 2007).

For Pais (2008) the concept of Didactic Contract is already widespread beyond Mathematics and the interest in this study comes from the possibilities of understanding certain conflicts in pedagogical practice. The Didactic Contract is what allows, and can guarantee, the significance of a problem or concept for the student, according to the way in which it was established. In other words, a poorly managed Didactic Contract can cause difficulties for the student, creating obstacles for the learning of new mathematical concepts. This contract should highlight the importance of student autonomy, since being the teacher responsible for its administration, it is up to him to respect the student's role and the capacity of his cognitive development.

It is clear in this panorama that the Didactic Contract assumes a role of great relevance for a didactic situation with contribution to the Theory of Didactical Situations, however, there is a considerable shortage of research in the area of mathematics teaching, which deal with the Didactic Contract. In this way, we chose the subject in evidence for this research, seeking to understand the influence of the Didactic Contract when establishing the relationships between teacher, student and knowledge in the classroom and its different effects on the teaching-learning of mathematical content. In this sense, this investigation aimed to carry out an integrative review in order to systematize information in scientific articles about the Didactic Contract in the perspective of the Theory of Didactical Situations.

## **2. Methodology**

An integrative literature review was carried out in order to systematize the information on the Didactic Contract from the perspective of Theory of Didactical Situations. The integrative review allows a broad understanding of theories, since when combining the data from theoretical and empirical literature, it forms a broad panorama, either of defining concepts or reviewing theories and evidence, in a very consistent way (SOUZA; SILVA; CARVALHO, 2010). That is, in order to synthesize results obtained in research, it integrates and analyzes, in a comprehensive and systematic way, a body of scientific knowledge already produced (ERCOLE; MELO; ALCOFORADO, 2014). The Integrative Review technique goes through six (06) phases, namely: (1) elaboration of the guiding question; (2) searching or sampling in the literature; (3) data collection; (4) critical analysis of the included studies; (5) discussion of results and (6) presentation of the integrative review.

In the first stage, which consists in the elaboration of the guiding question, the topic of interest for study was identified and the question was selected to carry out the integrative review. The Didactic Contract was chosen as a research theme from the perspective of Theory of Didactical Situations, seeking to answer the following guiding question: What is the relevance of the didactic contract when designing teaching sequences with a contribution to Theory of Didactical Situations? And what are the effects of their rupture? After the theme and the guiding question of the investigation were chosen, the second stage of the work went on, which was the search for related studies for review in the databases: Google Scholar, Scielo and the Portal de Periódicos CAPES/MEC. For this purpose, the following descriptors were established: Didactic Contract and Theory of Didactical Situations. The established search was based on the research period from 2015 to 2019, using the following vernaculars: English, French and Spanish.

The inclusion criteria were those articles that presented the theme of Theory of Didactical Situations with

a deliberate interest in the Didactic Contract or that brought a conceptual description of this element. Regarding the exclusion criteria of the publications found, the work that did not deal with the Didactic Contract in its established theme, as well as the duplicated articles in the databases consulted, were adopted as the elimination criterion. Table 1 presents a summary of the information from the consultation.

Table 1. Number of articles found in the databases

Database	Year	Number of scientific articles	Percentage (%)
Google Scholar	2015 – 2019	170	96,04%
Portal de Periódicos CAPES/MEC	2015 – 2019	06	3,39%
Scielo	2015 – 2019	01	0,56%
<b>Total</b>		<b>177</b>	<b>100%</b>

Source: Prepared by the authors.

In the data collection and critical analysis of the included studies, the selection of the paper related to the researched theme was made, based on the inclusion criterion initially established, in the reading of the abstracts of the publications, as well as considering the refinement of the research period in the years from 2015 to 2019. Of the total of 177 articles found, only 16 were selected, 14 of which were from Google scholar; 01 article found in the Portal de Periódicos CAPES/MEC and 01 in Scielo. The 161 publications were not related to the theme chosen for the present research, or they were books, theses, dissertations and course completion works, that is, they were not aligned with the chosen criterion for inclusion of works. It is worth mentioning that 13 articles among the 161 excluded publications dealt with duplicate works. It is also noteworthy that after reading the 16 selected works in full, only 09 remained for the discussion of the integrative review, due to the fact that 07 articles talk about the Didactic Contract, but do not focus on the theme of the guiding question of this research. Figure 1, called the Prisma Flow Diagram, presents more detailed information regarding the selection, inclusion and exclusion of works researched in the databases.

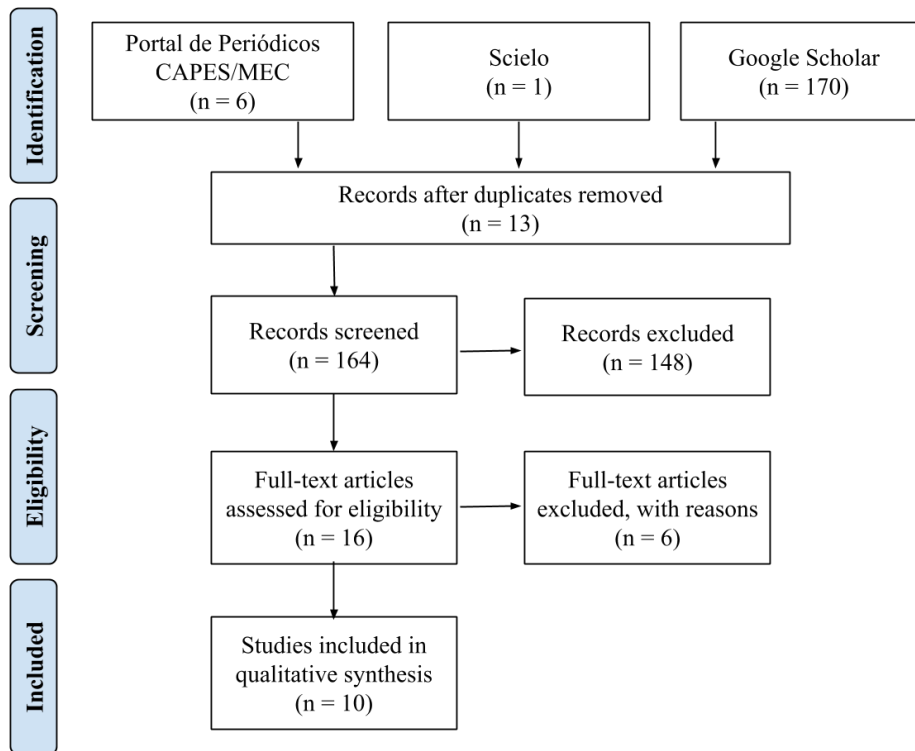


Figure 1. Prisma Flow diagram.

Source: <http://prisma-statement.org/PRISMAStatement/FlowDiagram>

After selecting the articles, considering the objective of answering the guiding question of the investigation, we sought to extract the information from the chosen publications, considering some criteria for collection, namely: objectives of the work, studied sample and results found. Finally, the discussion of the results found with the data collection was exposed and the integrative review was presented.

### 3. Results and Discussion

Table 2. Main references of articles included in the integrative review

Authors (year)	Goals	Main results	Conclusions	Cientific magazine
Oliveira; Mastroianni, 2015.	To investigate the conceptions of polyvalent teachers of the initial years regarding the theme Problem Solving.	It was identified that there is a choice of exercises instead of problems by the teacher. There is also a revelation of the prevalence of a Didactic Contract based on explicit or implicit procedures in relation to the tasks and occurrence of some of its effects.	The subjects of this research understand the relevance of their problematizing role in mathematics classes, but it is still difficult for them to organize an antagonist milieu, which causes imbalances and	Ensaio de pesquisa em educação científica

			adaptations in the students.	
Batista; Siqueira, 2019.	To highlight didactic aspects that a playful activity of Nuclear Instability provides for the teaching of concepts of Modern and Contemporary Physics.	It was observed that taking into account the implicit is one of the necessary conditions for students to be directed to the contents. Moreover, as the students were provoked to speak the elements of the Didactic Contract, these elements became explicit.	Nuclear Instability showed didactic aspects of playful character, when submitted to the concept of Didactic Contract.	Góndola, Enseñanza y Aprendizaje de las Ciencias
Souza <i>et al.</i> , 2017.	Conduct a bibliographic survey to identify and analyze research on Didactic Contract involving the approach of physical and chemical knowledge in Brazil.	The abusive use of analogies should be avoided, the effect of the Didactic Contract, as this can trivialize teaching and prevent learning from occurring. Thus, the researchers, in many moments, had to explain it, seeking a renegotiation. It was also observed that the effects of the Didactic Contract may emerge more than once in teaching situations.	There was a plurality of research involving the Didactic Contract. This shows that your investigation can be done in any classroom, including training in hospital settings.	Revista de Educação, Ciências e Matemática
Brick; Ferreira; Sena, 2016.	Explain the relationship between Didactic Contract and school evaluation	He pointed out that both the evaluation and the Didactic Contract reflect a certain educational and epistemological intention. In addition, the rules of the Didactic Contract, together with the traditional evaluation, condition the innovations of teaching practices.	Modifications in the assessment give rise to changes in the Didactic Contract and vice versa. Also, the moment of the evaluation can make some elements of the Didactic Contract explicit, besides being an indicator of its type.	Ensino de Ciências e Tecnologia em Revista
Souza <i>et al.</i> , 2017.	Analyze the Didactic Contract based on the criteria: expectations for the other, negotiations,	The action of casting questions to the class without giving time to answer is a strong indicator of occurrence of topaze effect. In addition, the negotiations, in the	The study of the Didactic Contract enabled the knowledge of the behaviors expected	Educação Química em Punto de Vista

	ruptures, renegotiations and effects.	establishment of a Didactic Contract, go beyond the negotiation of papers, although it directly involves the establishment of these parts of the responsibility	by teachers and students, in addition to assisting in the analysis of the relationships between teacher, student and knowledge.	
Teixeira, 2017.	Reflect on issues related to teaching and learning mathematics through the Problem Solving methodology, having as theoretical reference the Theory of Didactical Situations.	A mathematics teaching, in which mathematical concepts are defined from the outset, followed by application exercises, does not allow the student to develop skills to think, reflect, question and/or raise hypotheses. Evaluations with questions similar to those presented do not mobilize the search for strategies, procedures and representations necessary to solve problem situations.	The study of didactic situations allows to reveal and use the role of non-explicit or even not valid knowledge for the establishment and learning of mathematical knowledge.	Temas e Conexões
Nascimento; Menezes, 2018.	Investigate the evaluation and its influences on didactic phenomena, didactic transposition and the Didactic Contract in the mathematics classroom.	The approach taken by the teacher is systematic, because there is a report that mathematics is accurate, which can cause a barrier in the teacher-student-knowledge relationship; evaluation is not an occasion but a process; the student decorates for the test because it focuses on the result of the evaluation and not on the learning, resulting from a Didactic Contract established by the teacher.	The teacher reinforces implicitly in the Didactic Contract that knowledge will be measured in the test, reinforcing a traditional teaching method.	Revista Ciências e Ideias
Mastroianni; Oliveira, 2019.	Investigate teachers' beliefs and conceptions regarding didactic strategies related to	Because she did not know the class, the problem situation presented by the teacher was below the possibilities of the students, hindering mediation	Teachers understand that it is important to take the position of mediator in the teaching of	Revista de Educação Matemática



	Problem Solving and their application in class.	and making it impossible for students to evolve, caused by lack of planning. The teacher did not internalize the posture required by Theory Didactical Situations and induced the students to respond expected by her, causing the topaze effect of the Didactic Contract.	mathematics, however, they find it difficult to apply a methodology that leads to an investigative posture. In addition, they prefer to be led by the teacher.	
Giordano, 2016.	Study the possible contributions of the Descriptive Statistics approach through research projects.	The teaching material was not adequate, requiring the teaching intervention. The knowledge required transcended the sphere of mathematics. The breaking of the Didactic Contract proved necessary for the maturation of the groups and the development of investigative autonomy.	The project-based approach provides greater motivation and student involvement.	Revista Metáfora Educacional
Rodrigues; Menezes; Santos, 2017.	Propose the Course of Study and Research as a teaching methodology in undergraduate courses in Mathematics based on the concept of functions.	Higher education institutions have a dominant epistemology that does not allow itself to be studied and questioned by didactics. Thus, it is difficult to enter the academic environment with new methodological proposals. However, the teacher must do this in a reflexive way through tools that enable him to make an analysis of the actions adopted.	The use of the Study and Research Pathway as a teaching methodology causes changes in the attitude of the teacher and consequently of the students and to analyze these changes we have the option of the Didactic Contract.	Amazônia Revista de Educação em Ciências e Matemática

Source: Prepared by the authors.

Oliveira and Mastroianni (2015) carried out a study with multipurpose mathematics teachers from the early years, seeking to investigate, among other aspects, the validity and influence of the Didactic Contract in the use of the Problem Solving teaching methodology. During the observation of the teachers' practice, the topaze effect was identified, since “clues” were provided to students in search of the quick appearance of the correct answer. In addition, there was the practice called “metacognitive slip”, which was the teacher's indication that mathematical operation would be the key to problem solving, often bringing it as the focus

of the study object rather than the real one knowledge to be developed. There was also the incidence of the “journain effect or well-founded misunderstanding”, characterized by the professor's efforts to value the student's reasoning and, at the same time, to be concerned with the use of correct models.

It is emphasized that the effects of the Didactic Contract can compromise the learning objective in a didactic teaching situation, since through them, the teacher prevents the student from actively participating in the construction of his knowledge. By proposing ways for the student to overcome the difficulty more quickly, without committing much personal effort, the teacher neglects the student's intellectual development, while not favoring creating hypotheses, conjectures and elaborating concepts. This practice causes a negative factor to the student's learning and the teacher must be aware of this issue, since he must let the student play his role in the teaching-learning process, respecting his cognitive development.

Batista and Siqueira (2019), in the analysis of recordings of a Physics class on the content of Radioactivity, observed that the Didactic Contract promoted the intellectual involvement of students, by observing the rules to be obeyed for the performance of the activity, providing the teacher necessary tools to coordinate the situation. The teacher's warning about the purpose of the activity highlighted the implicit acceptance of its compliance by the students, that is, of the rules to be followed by them. In addition, a breach of the contract was identified when there was a change in the type of material used in class, even though it did not influence the performance of the activity, which ended up contributing to causing transgressive attitudes in students. As a result, there was a process of renegotiation of the Didactic Contract, in which the teacher reread the rules and continued to establish them, despite the fact that, throughout the activities, some commitments were not accepted by all students.

It can be seen here that the Didactic Contract was favorable to the teaching and learning situation and that its rupture served as a positive factor to overcome an obstacle in learning, causing an improvement in the students' performance. It is also noted that there was a renegotiation of the rules established implicitly between teacher and students. However, the new agreement favored the acquisition of content and was not characterized as a negative factor for the development of students. In this sense, it is worth emphasizing the need to renegotiate the Didactic Contract whenever a rupture or one of its effects occurs.

Brick, Ferreira and Sena (2016), based on a systematic literature review in the area of Education in Sciences, seek to explain the relationship between Didactic Contract and school evaluation, stating that the conception and evaluation practice adopted by the teacher permeates this contract, even if it is to maintain it, change it or break it. In addition, the rules established in it can be influenced by experiences lived by the teacher and students throughout their school lives. They also point out that evaluating students in a different way than what they are used to is enough to be characterized as a breach of the Didactic Contract, having to be renegotiated.

The study points out an important consideration about the implicit rules present in the Didactic Contract that can be easily identified at the moment that students are used to the way a teacher teaches a class or to evaluate students and there is a change. For example, when the teacher usually evaluates through the traditional test and then decides to evaluate through seminars. This generates reactions in the students and explains the rupture of the contract. In this perspective, Nascimento and Menezes (2018) also corroborate by presenting an experience in which the teacher draws the students' attention through warnings about the importance of those contents for the test. Given this, it ends up reinforcing the idea that assessment is an

occasion where students' knowledge will be measured. The student therefore tries to prepare for that moment, focusing on the result of the evaluation and not on the process that arrives until its date of completion. Thus, the teacher may not notice this implicit agreement established.

Souza et al. (2017), through a bibliographic search, carries out studies on works evolving the Didactic Contract in the teaching of Physics and Chemistry contents in Brazil, revealing low scientific production in the area. However, he considers that the analyzed works are significant, as they show that the Didactic Contract can manage paradoxes found in the classroom, for example, such as including unexpected situations in problems presented to students in order to contribute to their reorientation and make it most significant. However, if this behavior is used constantly, it will be included in the implicit rules of the contract.

These types of paradoxes are found in different contexts, as is the case of the teacher-student-knowledge relationship during a training situation in a hospital area, in which there is a lack of identification of this space as a school environment by the students themselves. Through these situations, we saw that the teacher must be prepared to face the paradoxes that are present in the classroom, especially those that present themselves through the rupture of the Didactic Contract and, at the same time, it is up to him to be creative and open to new forms of didactic relationships, so that teaching situations can continue with investment in those that may be new.

Giordano (2016) presents the influences of breaches of the Didactic Contract during the process of statistical literacy, affirming the existence of a didactic intention in the individual who goes through contradictions and imbalances, sometimes provoked by the teacher. The teacher also needs to strengthen relationships with students, creating an environment conducive to learning, offering help to them, but in the right measure, since too much help can make the student lose the opportunity to experience the potential investigative of an activity.

When proposing the application of the Study and Research Course as a didactic device, Rodrigues, Menezes and Santos (2017) state that if the teacher makes this option, he will break the Didactic Contract that was in effect until then. This implies a change in teaching methods on the part of the teacher and a different participation in the class by the student, causing difficulties for both teachers and students. However, the fact that the Study and Research Course is based on a generative issue, this will favor the expansion of creativity in problem solving by learners through the mediation of the teacher. In order to understand this new reality of the teacher-knowledge-student relationship, the authors propose the use of the Didactic Contract, considering that this concept seeks to understand the behaviors expected by both parties in a didactic session, highlighting the importance of the Didactic Contract for understanding teaching and learning relationship.

It can be seen that for a change in the attitude of students and teachers, it is necessary to break the previous norms that determined the behavior of both. For the understanding and establishment of these new implicit and explicit rules the Didactic Contract is a tool that enables this reflection action. Collaborating with the hypothesis of Rodrigues, Menezes and Santos (2017), we have the results found by Souza et al. (2017) that point to the importance of understanding the elements that arise in the teacher-knowledge-student relationship. In this study, the authors concluded that the study of the Didactic Contract enabled knowledge of the behaviors expected by teachers and students, in addition to assisting in the analysis of the

relationships between teacher, student and knowledge.

According to Mastroianni and Oliveira (2019), teachers in the initial grades of elementary school understand that it is important to assume the position of mediator in the teaching of mathematics, but they experience difficulties in applying a methodology that leads the student to become unbalanced and adapt. In addition, students give up taking an investigative stance and prefer to be led by the teacher. Therefore, the effects of the Didactic Contract explain these difficulties and categorize the teachers' mistakes when changing their posture, concluding that the study of relationships in the classroom contributes to the reflexive action of the teacher.

#### **4. Conclusion**

In this research, we sought to synthesize, through an integrative literature review, information related to the Didactic Contract and, through the researches studied in the review, it is concluded that the Didactic Contract is a very important element in a teaching and learning situation, since it can favour or cause an obstacle in the acquisition of a new knowledge by the student. Because, if conducted in the wrong way, it generates difficulties in the assimilation of concepts and, if well managed, will promote a meaningful learning of content by the student.

Given the relevance of this element in a classroom context, where the didactic triangle established by the relations between teacher-knowledge-student is instituted, one must take a close look at the issue of the effects on learning caused by the rupture of the Didactic Contract. Students often find it difficult to adapt to learning situations when such a break occurs. Thus, to remedy the situation, the contract renegotiation is recurrent. However, the teacher must be aware of the fact that the continuous negotiation of the Didactic Contract can negatively compromise the learning objectives. Because, aiming for his students to be successful in assimilating the contents, he can facilitate the apprentice's work, putting into practice some of the effects of the Didactic Contract, such as: topaze effect, jourdain effect, metacognitive slide and abusive use of analogy. This teaching attitude makes it impossible for the student to overcome difficulties through personal engagement and, consequently, deprives the apprentice to make conjectures, create hypotheses and take an active role in the construction of knowledge.

Through these considerations, the relevance of the theme addressed in this research is reinforced, paying attention to the limitations found in the research path, which was to find a profusion of publications that specifically dealt with the Didactic Contract in teaching sequences with input in the Theory of Didactical Situations and, also, in the question of the effects on learning generated by the rupture of the referred contract. To this end, it is expected that this research promotes reflection on the part of teachers about the importance of the Didactic Contract in teaching situations and that it will add information on the topic studied to the list of existing research in the area of science and mathematics education.

#### **5. References**

- [1] ALMOULOU, Sado Ag. Fundamentos da didática da matemática. Curitiba: Ed. UFPR, 2007.
- [2] BATISTA, C. A.; SIQUEIRA, M. Análise didática de uma atividade lúdica sobre a “instabilidade

nuclear”. *Góndola, enseñanza y aprendizaje de las ciencias*, v. 14, n. 1, p. 126-142, 2019.

[3] BRICK, E. M.; FERREIRA, G. K.; SENA, R. M. de. Relações entre o contrato didático e avaliação: uma revisão de literatura preliminar em educação em ciências. *Ensino de Ciências e Tecnologia em Revista*, v. 6, n. 1, p. 37-52, 2016.

[4] GIORDANO, C. C. Projetos interdisciplinares e letramento estatístico. *Revista Metáfora Educacional* (ISSN 1809-2705) – versão on-line. Editora Dra. Valdeci dos Santos. Feira de Santana – Bahia (Brasil), n. 21 (jul. – dez. 2016), 1 dez. 2016, p. 52-87.

[5] MASTROIANNI, Maria Teresa Merino Ruz; OLIVEIRA, Gerson Pastre. Resolução de Problemas nas aulas de matemática dos anos iniciais: um estudo junto aos professores polivalentes. *Revista de Educação Matemática*, [s.l.], v. 16, n. 22, p.232-251. 1 maio 2019.

[6] OLIVEIRA, G. P. DE; MASTROIANNI, M. T. M. R. Resolução De Problemas Matemáticos Nos Anos Iniciais Do Ensino Fundamental: Uma Investigação Com Professores Polivalentes. *Ensaio Pesquisa em Educação em Ciências* (Belo Horizonte), v. 17, n. 2, p. 455–482, 2015.

[7] NASCIMENTO, Álison Márcio Rafael; MENEZES, Marcus Bessa de. A avaliação no processo didático e suas influências. *Revista Ciências & Ideias*, Rio de Janeiro, v. 9, n. 3, p. 61-79, 2018.

[8] PAIS, L. C. *Educação Escolar e as Tecnologias da Informática*. 1. ed. Belo Horizonte: Autêntica, 2008.

[9] RODRIGUES, Rochelande Felipe; MENEZES, Marcus Bessa de; SANTOS, Marcelo Câmara dos. Licenciatura em matemática e o percurso de estudo e pesquisa: uma proposta do modelo epistemológico de referência para o ensino e aprendizagem do conceito de função. *Amazônia: Revista de Educação em Ciências e Matemáticas*, [s.l.], v. 13, n. 27, p.36-50, 30 set. 2017.

[10] SOUZA, Larissa Oliveira de et al. Observando a dinâmica do contrato didático em aulas de equilíbrio químico. *Educação Química En Punto de Vista*, [s.l.], v. 1, n. 1, p.59-78, 30 set. 2017.

[11] SOUZA, L. O. de et al. Uma análise das pesquisas brasileiras envolvendo contrato didático de conteúdos químicos e físicos. *Revista de Educação, Ciências e Matemática*, v. 7, n. 2, p. 109-122, 2017.

[12] SOUZA, Marcela Tavares de; SILVA, Michelly Dias da; CARVALHO, Rachel de. Revisão integrativa: o que é e como fazer. *einstein* (São Paulo), São Paulo, v. 8, n. 1, p. 102-106, Mar. 2010.

[13] TEIXEIRA, Paulo Jorge Magalhães. Para onde caminha o ensino de Matemática na escola básica? *Temas & Conexões*, Rio de Janeiro, n. 2, 2017.