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HIGH SCHOOL STUDENTS' CONCEPTIONS ABOUT THE TEACHER ACTIVITIES DEVELOPED THROUGH THE PEDAGOGICAL RESIDENCE IN CHEMISTRY PROGRAM

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ABSTRACT

The pedagogical activities in the teaching of Chemistry developed by the Pedagogical Residency Program have been of paramount importance in teaching the learning of basic education students in Brazil. In carrying out these activities, the contextualization of the content is satisfactory, by associating themes directed to the student's daily life with the contents in the teaching of Chemistry, since, this method provides the development of the fundamental skills of the citizen, such as participation and critical thinking . The daily contextualization of the theory can be shown in practice and, thus, it has the capacity to enable more than information, it enables a more dynamic and comprehensive questioning of the contents. This article presents some series of didactic activity strategies developed by residents with the aim of helping students to better understand Chemistry classes, after verifying that students faced great difficulties due to the traditional way of teaching, such as memorize formulas and solve mathematical problems. Therefore, the objective of this study is to understand the students' conceptions about the practical activities developed through the Pedagogical Residency Program, Chemistry subproject, and linked to this, diagnose their main considerations about the Chemistry discipline. With the help of these activities, it was observed the importance of the same for the student's learning. The results showed that students see pedagogical activities and residency as something very positive and that it actually helps in their teaching and learning process.

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INTRODUCTION

Chemistry is a science that studies the properties, compositions and transformations of matter (Santos, 2021; Bergamo, 2012). Therefore, the study of Chemistry is of fundamental importance for the student's personal development, as it provides a critical view of the world around him. But Chemistry, in general, is still seen as a difficult subject to understand, since many students are unable to assimilate how the concepts and chemical properties are associated, thus, they end up opting for the memorization of the contents that they point out to be important, which in most of the time it generates a discouragement in the discipline. When associating themes directed to the student's daily life in the teaching of the contents of Chemistry, the contextualization of the content is satisfactory, since, this method provides the development of the fundamental skills of the citizen, such as participation and critical thinking. Since, the daily contextualization of the theory can be shown in practice and, thus, has the capacity to enable more than information, it enables a more dynamic and comprehensive questioning of the contents (Viana et al., 2021; Silva and Santos, 2019; Sousa et al., 2015; Santos et al., 2011). Furthermore, teaching chemistry is considered very difficult from the

first year, as it is in this series that you have the first notions of the study of Chemistry, because during these period students are going through phases of educational transitions, and for this reason already demonstrate some learning difficulties (Souza et al., 2018). In this sense, it can be added that the discouragement on the part of the students to learn the contents in the school is attributed to the lack of motivation caused in the great majority of the times by the decontextualized and non-disciplinary way of the teachers to pass on such contents, imposing a traditionalist rule, treating matters in a cold and distant way from their daily lives (Fialho, 2011; Silva et al., 2016). Based on this, it is necessary to use teaching methodologies that relate theory to practice, arousing the student's interest in learning the contents, using an attractive language capable of bringing him as close as possible to his daily life. Theoretical and practical classes cover a methodological style that I see as being very efficient to teach different contents, thus arousing the curiosity and interest of the students, which consequently improves the learning of the chemistry contents. Practical classes have as main objective to provide the student with a better understanding of the chemical nature from concepts to its applicability by society, in addition, arousing interest and curiosity in the discipline (Almeida and Santos, 2018; Silva et al., 2020).

When referring to graduation, it must represent the fissure of the small evolution of research in teaching. Also in this line, students who are enrolled in higher education arrive with a different reality, as they are accustomed to decorate mathematical formulas in a mechanized way in order to achieve the necessary score in the entrance exam. Upon entering university, your reality is turned completely upside down, gaining a certain autonomy, independence and responsibilities for your studies. In this way, it is important that there is a way out of the convenience of just a spectator, assuming the position of researcher when building knowledge in an integral and autonomous way (Chaer et al., 2012). The practice of research promotes the formation of new knowledge. Especially when putting the theory into practice. Based on the philosophy that the objective of teaching is to foster knowledge, it can be said that teaching and research practices must be intimately linked in order to improve their pedagogical practices and, as a result of this action, increase chances of spreading even more perfected knowledge (Vilaça, 2010). For the author Novikoff (2010), she affirms that research and teaching are two essences intimately interconnected and of great importance, however, it explains that the two actions are in practice when the pedagogical area is treated, understood as distinct activities (Vilaça, 2010). The author asks that teaching is done, among other ways, in the act of researching. Research is done in the act of learning. Both have their own paths, but they intertwine in the search for knowledge. Vilaça (2010) and Santos (2020) point out that there is a great need for experimental practice to be carried out in the classroom, but in addition, there is even more the need and importance that both considerations, results and conclusions may arrive to the classroom, especially in schools. There is a great difficulty for these results to arrive in the classroom. While objectivism in the area of Natural Sciences, which develops without any adjustment, as it is the side of exact science when working on investigative methodologies, subjectivism on the part of the human and social sciences that acts through established methods, however adapts them through their needs on the part of research, such as Chemistry Teaching, for example (Mól, 2017).

For Cavalvanti et al. (2010), when the purpose of Chemistry Teaching is to build a link between school knowledge and the everyday world of students in primary and secondary education in the basic network, this becomes a major challenge. The chemistry taught needs to be linked to the students' daily lives based on their reality, however, most of the time the examples used by the students do not make any connection with their daily lives. The educator tends to use in his classes languages that he is not used to being quite scientific, in this way, the student cannot understand and capture the content, having a bad academic performance. In this way, the use of different generative themes to approach Chemistry has been found ways by education professionals so that students can have their attention turned to science and become interested in the content covered (Araújo and Santos, 2020). Analyzing the side of this perspective, at the moment when the practice of studying phenomena and the reality of everyday life is adopted, it can trigger situations that students may have experienced that for various reasons are generally not problematized and analyzed, consequently, in a a more systematic and methodical view on a physical and social level (Wartha et al. 2013), where it is necessary to give more attention to problematizing education, replacing banking education, as this way enables the student to have a critical insertion in the reality in which the same is present when stimulating creativity and reflection on the phenomena that surround it, defending the construction of students' autonomy (Lopes, 2011). For Lisbôa (2015), experimentation in teaching chemistry is one of the most important pillars of education that support the complex conceptual structure of teaching chemistry. Not being unique, it is interconnected with other pillars such as the one built between the history of chemistry and the socio-cultural context in which the student is inserted. In this way, knowledge about chemistry becomes an essential cultural tool to put citizenship into practice and, consequently, highlighting the importance in the curriculum of the basic education network. Analyzing this line of reasoning, experimental practices in the teaching of chemistry are characterized as an important didactic strategy, as it helps to form a favorable environment for the formation of approaches with theoretical and symbolic dimensions, and, however, phenomena of chemical knowledge. According to several reports in the literature, it is evident how important experimental practices are in class in the teaching of chemistry and science in general (Dantas et al., 2019; Oliveira, 2010).

Experimentation is extremely important from the moment that it helps the student to understand phenomena and complex concepts that encompasses chemistry, when applied in the Teaching of Chemistry, being considered an important pedagogical function. It is remarkable the need that students have to participate in a playful and dynamic activity during the teaching-learning process when referring to these concepts and phenomena within the school context, maintaining the connection between theory and practice (Costa and Santos, 2019; Plicas et al., 2010; Salesse, 2012). Salesse (2012) states that experimentation allows students to have greater contact with science, because when manipulating objects accompanied by their ideas, it makes the student able to think critically about the meaning between themselves and the teacher during the contents. It is important that the experimental practices are conducted in a pleasant way, that the student feels at ease, that the student takes advantage of the discovery of scientific knowledge and that he can share with others and not generate a feeling of competition between groups, making there is an exchange of ideas and curiosities when results are arising and discussing them (Matias et al., 2019; Medeiros Filho et al., 2020; Santos and Araújo, 2018). The function of carrying out the chemical experiment is to make the theory, until then passed in the classroom, be proven, leaving the mere concept to reality.

The Pedagogical Residency Program aims to expand and improve the traditional relationship between theory and practice during the training of undergraduates in some area of the degree, thus, a shared training intervention between the Universities where the program is expected is expected., linked, the graduating students that will be inserted and the public schools that will partner with the University (Santos, 2021). At the same time that the undergraduates are accompanied by supervisors at the Universities of their subproject, they will have the help of teachers (preceptors) linked to the public school in which the Project will operate, which, consequently, will help the public school teacher to obtain continuing education. in their area of expertise (Moretti, 2011). The Program has the importance of reaching a large mass of professionals and futures as well. The experience allows residents to develop and maintain a commitment to the school and the community in which the school is located; the Program's time is totally focused on school activities, together with the supervision of the preceptor and advisor, thus giving a unique experience in which only graduation will not be possible, as it will enrich the same with experiences also offer access to elaborate

intervention projects aimed at to their area of expertise, allowing the undergraduate to be able to carry out the teaching-learning practice with the students and the experience that the undergraduate will develop by being immersed in the school as a teacher and not just as an intern, which puts him in a position with less commitment and importance to the community, making it feel smaller (Giglioand Lugli, 2013). For Sáand Garritz (2014), the didactic sequence has the capacity to strengthen the relationships between the theory addressed at that moment and the practices that will be developed. The practice of this type of assessment tool is able to cover practical, social and technical dimensions for everyday life. By putting the didactic sequence into practice, the action allows you to integrate the didactic content with the scientific contents, including social causes, practical and technical dimensions. The didactic sequence is based on the interconnection of the research generated by observation practices and the concepts that are present. The production of didactic sequences in the initial training of the licensee is based on the students' learning to enable and thus transform their scientific language capacities (Santos et al., 2016; Stutz and Cristovão, 2011; Santos et al., 2017). The promotion of the activity contemplated the actions of epistemology and pedagogy, in which the epistemological that aims to build knowledge in action by interpreting reality and everyday life, such as understanding scientific methodologies and proving hypotheses; while the pedagogical one allows an intimately linked interaction between the teacher / student and student / student (Souza and Batinga, 2013). In this way, the didactic sequence aims to take advantage of the knowledge that students have, evolving it and giving importance and meaning to the science in which it is studied, expanding their knowledge and enriching by putting into practice teaching-learning with students at the same time putting science into practice with the student's reality (Puhland Lima, 2016; Santos et al., 2021). In this work, the importance of using practical-theoretical classes in the chemistry discipline is shown, promoting the use of low-cost materials in practices, contextualizing chemistry issues to the student's daily life. In this perspective, the present work aims to understand the students' conceptions about the practical activities developed through the Pedagogical Residency Program, a chemistry subproject, and linked to this, diagnose their main considerations about the discipline of chemistry.

MATERIALS AND METHODS

The methodology used for this study consisted of a series of pedagogical practices, which according to Franco (2015) are practices loaded with intentionality and this is because the sense of praxis itself is configured through the establishment of an intentionality, which directs and gives meaning to action. Thus, experimental methodologies, expository and dialogued classes and workshops held in the classroom, Chemistry laboratory and multisport gymnasium were used, all of these environments located within the school field of research. The activities were carried out between March and December 2019 at the EscolaCidadã Integral de EnsinoMédio Orlando Venâncio dos Santos, located in the city of Cuité, in the State of Paraíba, Brazil, with 50 students enrolled as study subjects. in the 2nd year of high school classes at that school. It is also worth mentioning that these practices were mostly carried out during classes in the subjects of Chemistry and Experimental Practices, which are offered in the curriculum of the students subject to the research. In Table 1, it is possible to observe the sequence of activities that were carried out, as well as other specific points, such as: content covered, duration of the class and discipline. This information is of fundamental importance for a clearer understanding of what has been worked on. To obtain data on the conceptions of the students who participated in these activities, a structured questionnaire was elaborated containing fourteen questions, two open and twelve closed. These questions contained questions related to both the discipline of Chemistry and the Pedagogical Residency Program, which were prepared through the experience of residents of the Chemistry subproject with students in basic education. Regarding the verification of open questions in the applied questionnaire, we use the concepts present in Content Analysis, where content analysis seeks to know what is behind the words on which it focuses (Bardin, 1977). In this sense, it is necessary to understand the message that students try to convey in the face of the questionnaire responses, in order to capture the main idea based there.

RESULTS AND DISCUSSION

The results of this work were obtained through the application of a structured questionnaire, requiring a thorough analysis to obtain coherent and concise information about the research. It is also worth mentioning that the applied questions served as support for obtaining feedback on the pedagogical activities carried out and, concomitantly, understanding the students' conceptions regarding the participation and language used by the residents of the Chemistry subproject. The following are some Tables and Graphs that best show these results. The first question contained the following question “Why study Chemistry?” This question being of a discursive nature, with the intention of students exposing their ideas about this discipline. Therefore, it is possible to see in Table 2 the responses of the students in a condensed form that is presented in a compact form, showing a percentage of the number of responses cited in a similar / equal way. From Table 2, a wide variety of responses can be observed in relation to question 1, showing that among these, the highest percentages are divided among students who answered that they did not know the reason for studying Chemistry or left the answer blank, with those who justified saying that chemistry is being studied in order to understand chemical experiments, which totaled a percentage of 22% in both responses. Then, it is notable to see that students argued that studying Chemistry is important to acquire more knowledge (18% of responses), to understand about its presence in everyday life (12% of responses) and to learn scientific things (10% of the answers), in this sense, it is evident that around 40% of the students have a significant notion that, when studying this science, they will be able to relate it to everyday life and thus learn new concepts in a clear way. It was also observed that 8% of students study Chemistry, claiming that the Government obliges them to such a situation due to the fact that it is inserted in the curriculum of Secondary Education (Santos and Silva, 2019). Finally, the answers that were less cited are justified by emphasizing that studying Chemistry is essential for academic training and that it is an interesting subject. Based on student responses, it is possible to verify the results obtained in question 2, where the students were asked about what they thought of the Chemistry discipline, since this question contained four alternatives and among them it was possible to choose only one that most suits them. it was convenient.

Thus, we see that the highest percentage of responses was 44%, where students affirm that it is a very interesting subject and then there are 26% in relation to the curious option, 20% in the option boring and 10% in the fun option. In question 3, the students needed to give an opinion on whether studying chemistry was important or not, and the results of this question indicate a very significant percentage of 86% of the students who affirm that the study of this discipline is important and only a small portion disagrees about this importance. Making a brief comparison between the data from questions 1 and 2, it can be seen that while the students state that it is important to study Chemistry, they see it as an interesting and curious subject, and may consider this as one of the points with which they associate this importance (Santos et al., 2016). The students were also asked, in question 4, as to the level of difficulty they found about the subject in question, where it was evidenced that almost half of these students affirm that it is of an average level, however, little less than the other half consider it as difficult and / or extremely difficult, leaving only 6% that they think is easy. In this sense, Rocha and Vasconcelos (2016) mention that the difficulties encountered in learning portray the disturbances that hinder the normality of the learning process, which leads to the failure to take advantage of its potential. Regarding question 5, which said “Is Chemistry present in your daily life?” It appears that 84% of the students affirm that Chemistry is present in the daily life and the rest disagrees with this statement.

Table 1. Sequence of activities developed

Subjects				
Experimental practices		Chemistry		courses
Hours: 2h / class		Hours: 1h / class		
Experiments	Contents	Methodology	Contents	Activity
Recognizingandclassifyingsolutions	Saturated, unsaturated and supersaturated solutions	expositoryanddialoguedclass	Hess's Law	CommemorationofChemist's Day
Alcoholcontent in gasoline	Solubility	expositoryanddialoguedclass	ChemicalEquilibrium	ChemistryMonitoring
Inflatingballoons	Chemicalkinetics	expositoryanddialoguedclass	EquilibriumConstants	Aid in elective discipline
In search of vitamin C	Oxide-reductionreactions	applicationofexamples	EquilibriumConstants	Aid in applications and corrections of weekly evaluations
Homemadefireextinguisher	Chemicalreactions	correctionofexamples	EquilibriumConstants	Assistance in bimonthly simulation applications and corrections
-		groupactivity	ChemicalEquilibriumand Constants	-
		expositoryanddialoguedclass	Le ChatelierPrinciple	
		applicationofexamples	Le ChatelierPrinciple	

Table 2. Answers obtained about why to study Chemistry

CitedAnswers	NumberofCitations	Percentage (%)
Toacquire more knowledge	09	18
Because the government forces us	04	8
Tounderstandchemicalexperiments	11	22
To know about everyday things	06	12
Because I find it interesting	02	4
Tolearnscientificthings	05	10
Why it is essential for training in high school	02	4
I don't know or they didn't answer	11	22
Total responses	50	100

Table 3. Answers obtained in the relationship between Chemistry and the student's daily life

Cited Answers	Number of Citations	Percentage (%)
Water and its physical states	15	30
Medicines	04	8
Chemicalelements	04	8
Chemical reactions (hair products, fire, soot)	10	20
I don't know or they didn't answer	17	34
Total responses	50	100

Taking into account the answers obtained in Table 1, it is possible to see that among them, there is a percentage of 12% that justifies that a reason to study Chemistry is because of it is associated with day-to-day, which is possible to realize that this same portion of responses comes to the fore when asked whether or not it is present in everyday life (Santos and Santos, 2020). In question 6, students were asked about the relevance of chemical concepts for society, showing that about 98% of the answers that there is relevance, although it is little or much, but they understand that Chemistry brings benefits. When comparing the results, it is observed that there is a divergence regarding the responses of both, in terms of the following passage, where a percentage of 16% of the students stated that Chemistry is not present in everyday life, but when asked about the relevance of same for society, we found that only 2% of students claimed not to be relevant. That is, a part of the students does not associate chemical concepts with everyday life, but that same part of students affirms that Chemistry is, yes, very important for society. In question 7, in an open way, students were asked to relate some chemical concept with something from their daily lives. Thus, Table 3 presents the citations made by the students, which, at first, already shows that about 34% did not know how to relate or left the answer space blank, becoming quite contradictory with question 5, as only 16% of students said there is no relationship between Chemistry and everyday life, that is, a part of the students mentions that Chemistry is present in everyday life, however, when asking for an example, they cannot make this association (Sousa et al., 2015). It is also observed that water, together with its physical states, were mentioned a lot, equivalent to about 30% of the answers, this result is quite pertinent, because in many cases water is mentioned as an example of several chemical concepts and it is consumed by all students and, in fact, daily. Another widely cited answer was about chemical reactions, where students associated it with hair products, soot and fire, generating a percentage of 20% on these quotes. Then, the responses less mentioned addressed some chemical elements and drugs, where both percentages were 8%. With regard to question 8, the students were asked if they had already participated in any experimental activity in Chemistry, and the result was quite expressive, as 98% said they had participated and 78% of them even mentioned that it was more than once. This result was already expected, as five experimental activities were designed and worked with them, mentioned in Table 1. However, this percentage of 2% who claims not to have participated in any may be due to having missed all the classes that were experimental practices, which took place once a month. Students were also asked if they knew what the Pegagogic Residency Program was, and the result was surprising, as around 60% said they did not know what this program was, 26% said they knew little and 14% said they knew. However, this percentage is impressive because the school presents the subprojects of Chemistry, Physics, Biology and Mathematics, all of which have been developed for approximately 1 year and yet students do not recognize the program through its nomenclature. When students were asked about their participation in activities developed by residents, the result showed that 27% of students say that they always participate in activities, 51% participate sometimes and 22% did not participate at all. However, this result was also expected, as, as described in Table 1, there is a series of pedagogical practices developed with and for high school students, however, the percentage of 22% affirming that they did not participate at all is quite contradictory, because when asked if they

had already participated in experimental activities, only 2% said that, therefore, this same percentage does not match that of question 10. Question 11 referred to the presence of residents in classes, whether or not it interfered in the students' behavior and, if so, they were asked to justify it. Thus, the results show that 82% of students do not think that the presence of residents interferes with behavior, on the other hand, 18% say yes, choosing that they paid more attention to the class and because the class did not mess up so much. In question 12, the students were asked whether they had already sought any of the residents of the Chemistry subproject to clarify doubts, thus, it appears that 26% of the students said they had sought the residents more than once to clarify doubts, 24% said they had sought once and 50% said they had never looked. However, despite the fact that half of the students did not seek the residents to clear up any doubts, still, the other portion shows that there is an open space in the relationship between residents and students for this type of pedagogical practice. The results of the question that asked if the residents' assistance contributed to teaching-learning, indicate that it contributes a lot to 40% of the students, that it contributes little to 58% and that a tiny portion of 2% affirm that they contribute nothing. In general, this result was very significant, as it shows that the activities developed provide a positive meaning for the teaching-learning of most students and that the work developed is being accepted by them in a positive way. Finally, students were asked about the residents' language, whether or not it was understandable and the answers show that 44% say yes, 46% say sometimes and 10% say no. Therefore, this result is quite satisfactory, as most students are able to understand the residents' language, which facilitates the development of future activities.

CONCLUSION

In view of the results obtained in the research, it was possible to verify a great variation in the answers, where it was observed that some answered that they study Chemistry for being obliged, for being in the curriculum. Others find the discipline legal, but complicated. Regarding the residents, it was evidenced that all students agree on the importance of the residence and of the residents at the school, because even some have not sought the residents to answer questions or have not understood the language well, they say that the residents have a share contribution, because they collaborated largely with the understanding of the theoretical content, making the learning become significant, especially from the moment in which the practice is contextualized with its daily life. Therefore, it was clear that from the series of pedagogical practices addressing various contents, it was possible to observe that these practices, hand in hand with the students, are more effective for teaching and learning them, it is worth mentioning that through differentiated classes the student is able to concentrate better in class because it is something more dynamic and attractive, relating the contents and practices to your daily life.

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