INVESTIGATIVE ACTIVITY AND INTEREST IN CHEMISTRY THROUGH AN INVESTIGATIVE ACTIVITY

Cristina Caetano da Silva[1], Alessandra Dutra[2] and Alcides Goya[3]

ABSTRACT

The study investigated the influence of investigative activity in the teaching of Chemistry, focusing on everyday chemical reactions, using the theme "electronic cigarette". The research adopted the interest development model of Hidi and Renninger (2006) and the levels of openness of experimental activities of Pella (1961), to evaluate student engagement and the different levels of autonomy in investigative activities. Data analysis was carried out through audio-recorded interviews, transcribed, and categorized according to the phases of interest and the levels of openness of the activities. The study found that investigative activities encourage greater involvement and autonomy of students, promoting the development of interest and critical thinking in learning Chemistry.

Keywords: Investigative activity. Development of interest.

INTRODUCTION

The investigative activity involves the active participation of students in the construction of knowledge, under the guidance of the teacher. Carvalho et al. (2013) state that the educator must go beyond the transmission of content, encouraging reasoning with questions and problems. Leite (2014) highlights the teacher as a mediator, considering the profile of the students and different learning theories. Carvalho (2018) points out that teaching by inquiry develops skills such as structured thinking, argumentation, critical reading, and authorship, promoting intellectual freedom. Monteiro et al. (2023) add that this approach stimulates creativity and autonomy, making students protagonists of their learning. Zampieron (2021) argues that student autonomy is favored when investigative activities start from a problem situation. Paiva (2020) argues that science teaching should be based on investigation, creativity, and autonomy, as opposed to the traditional model. For these authors, dialogue, and problematization are fundamental to developing scientific thinking and citizenship.

Understanding the development of students' interests is essential. Hidi and Renninger (2006) propose the Four Phase Model of Interest Development, from initial engagement to autonomous involvement, reinforcing the role of the teacher as a mediator. In this study, the

---

[1] Federal Technological University – Pr
[2] Federal Technological University – Pr
[3] Federal Technological University – Pr

phases were adapted into three: Triggered Situational Interest (Phase 1), with the first contact with the theme through challenges and investigative activities; Maintained Situational Interest (Phase 2), when experiences prolonged engagement; and Emerging and Well-Developed Individual Interest (Phase 3/4), when the student consolidates his autonomy in the search for knowledge.

The transition from traditional to investigative teaching is explained by Pella's Levels of Openness of Experimental Activities (1961). In the traditional one, the teacher conducts the entire process; in the investigative phase, there is greater autonomy for the student. In Level 1, the teacher defines the problem and procedures, and the student collects data and starts the conclusion. In Level 2, the student gains more autonomy in analyzing data and drawing conclusions. In Level 3, the student takes a leading role in the formulation of the problem and interpretation of the results. This model is connected to the development of interest (Hidi & Renninger, 2006), as greater openness of the activity enables the evolution from a situational interest to a well-developed individual. By balancing autonomy and guidance, the teacher stimulates critical thinking and motivation for learning.

This study analyzed an investigative activity on "electronic cigarettes" developed by high school students (AI-C group), based on the model of Hidi and Renninger (2006) and the levels of openness of Pella (1961), to understand how these strategies influence engagement and the construction of knowledge in the teaching of Chemistry.

OBJECTIVE

The general objective of this study is to analyze the influence of an investigative activity in arousing the interest of students in the chemical reactions of everyday life. Specifically, the research seeks to: Analyze the levels of investigative activities achieved by the students, according to the classification of Pella (1961), divided into three levels (1, 2, and 3). And to evaluate the degree of interest shown by the students, using an adaptation of the Hidi and Renninger (2006) Model, also in three phases (1, 2 and 3).

METHODOLOGY

Data were collected through audio-recorded interviews with each of the group members. To facilitate the analysis of the data on interest, the interviews were audio-recorded, transcribed and analyzed according to Bardin (1999) and categorized according to the Interest Development Model of Hidi and Renninger (2006), adapted: (1) Triggered Situational Interest – characterized by initial involvement and momentary curiosity; (2) Maintained Situational Interest – evidenced

by the continuity of engagement throughout the activity; and (3) Emerging and Well-Developed Individual Interest – representing the student's predisposition to delve into the theme in an autonomous and lasting way.

In addition, through the investigative activity of the AI-C group on the "Electronic Cigarette", the levels of openness of the experimental activities were analyzed based on the classification of Pella (1961), which divides the investigative autonomy of the students into three levels: **Level 1:** Problem and procedures defined by the teacher; **Level 2:** Hypotheses and analysis conducted by the student, with guidance from the teacher; **Level 3:** Students responsible for all stages of the investigation.

The research took place over ten weeks, involving everything from the choice of the class and the presentation of the virtual environment to the execution and evaluation of the investigative activity on the "electronic cigarette".

DEVELOPMENT AND RESULTS

In the initial weeks, students participated in theoretical classes on chemical reactions and investigative methodologies, preparing themselves for the development of practical activity. Between the third and eighth weeks, the AI-C group, composed of students E1, E8, and E10, investigated the impacts of electronic cigarettes. The choice of the theme came after reading a report about a young influencer hospitalized due to the use of the device, arousing the interest of students in understanding the chemical and biological risks associated with its consumption. As a first result, the analysis of the interviews showed different phases of interest, following the model of Hidi and Renninger (2006). As shown in the table below:

Table 1 Analysis of Individual Interest

Student	Phase	Phase of interest	Interview evidence
E1	2	Situational Interest Maintained	"Knowing that we can solve a problem that is usually happening to a lot of people."
E8	1	Situational Interest Triggered	"It was good because of the research we did."
E10	3	Emerging and well-developed Individual Interest	"We didn't even know it was possible to have certain outcomes."

Source: authorship 2025

As a second result, the Investigative activity of the AI-C group followed the following procedures: **Elaboration of the Problem:** "What is the level of knowledge of students about the risks of electronic cigarettes to health?"; **Formulation of Hypotheses:** Hypotheses were raised about the low knowledge of the risks, the negative attitude of the individuals, and the possible influence of the device on the beginning or end of the smoking habit; **Procedures and Data**

Collection: The students defined reflective questions and applied a questionnaire to fifty adolescents, whose answers enabled the analysis of knowledge and perceptions on the subject; **Analysis and Conclusion:** The data collected and analyzed indicated that students recognize the risks of electronic cigarettes.

In this way, the AI-C group reached Level 3 of Pella's proposals (1961), allowing students full autonomy in research. The investigative activity not only promoted the learning of chemical contents but also developed the autonomy, responsibility and critical capacity of the students, essential characteristics to face the challenges of the contemporary world.

FINAL CONSIDERATIONS

The results of this research demonstrate that the investigative activity positively influenced the students' interest in everyday chemical reactions, meeting the proposed objectives. The analysis of interest, based on the model of Hidi and Renninger (2006), revealed a progressive evolution of the students, from situational interest to a deeper and more autonomous involvement. Regarding the level of openness of the activity, according to Pella (1961), the AI-C group reached Level 3, showing autonomy in the formulation of the problem, in the elaboration of hypotheses, and in the conduct of the investigation. These findings reinforce the importance of investigative methodologies in the teaching of Chemistry, demonstrating that active learning stimulates critical thinking, autonomy, and student engagement (Carvalho, 2018; Paiva, 2020). This study contributes to the reflection on innovative pedagogical practices, highlighting teaching by inquiry as an effective way to make learning more meaningful and motivating.

REFERENCES

1. BARDIN, Laurence. Content analysis. Lisbon: Edições 70, 2011.

2. CAMPOS, Maria Cristina da Cunha; NIGRO, Rogério Gonçalves. Science didactics: teaching-learning as research. São Paulo: FTD, 1999.

3. CARVALHO, Anna Maria Pessoa de. Theoretical and methodological foundations of teaching by inquiry. Brazilian Journal of Research in Science Education, v. 18, n. 3, p. 765-794, 2018. Available at: https://doi.org/10.28976/1984-2686rbpec2018183765. Accessed on: 11 Nov. 2024.

4. CARVALHO, Anna Maria Pessoa de et al. The teaching of sciences and the proposition of investigative teaching sequences. In: CARVALHO, Anna Maria Pessoa de (ed.). Science teaching by inquiry: conditions for implementation in the classroom. São Paulo: Cengage Learning, 2013. v. 1, p. 1-19.

5. HIDI, S.; RENNINGER, K. A. The four-phase model of interest development. Educational Psychologist, v. 41, n. 2, p. 111-127, 2006. Available at: https://doi.org/10.1207/s15326985ep4102_4. Accessed on: 12 Mar. 2025.

6. LEITE, Bruno Silva. M-learning: the use of mobile devices as a didactic tool in chemistry teaching. Brazilian Journal of Informatics in Education, v. 22, n. 3, p. 55, 2014. Available at: https://www.researchgate.net/profile/Bruno-Leite-9/publication/273312177_M-learning_o_uso_de_dispositivos_moveis_como_ferramenta_didatica_no_Ensino_de_Quimica/links/550306aa0cf2d60c0e64c630/M-learning-o-uso-de-dispositivos-moveis-como-ferramenta-didatica-no-Ensino-de-Quimica.pdf. Accessed on: June 12, 2023.

7. PAIVA, Maria Angela de. Survey of scientific academic production in teaching by investigation and its contribution to science teaching. 2020. 50 f. Monograph (Specialization in Science Teaching) – Federal Technological University of Paraná, Medianeira, 2020.

8. PELLA, M. O. The laboratory and science teaching. The Science Teacher, v. 28, p. 20-31, 1961.

9. ZAMPIERON, Tainara. Guide with proposals for investigative activities. State University of Santa Catarina – UDESC, 2021.