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The teaching of natural sciences in the demonstration of experimental tasks in the upper basic

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Abstract---The research aims to analyze the teaching of natural sciences in the demonstration of the experimental tasks in the upper basic students of the Gil Alberto Rivadeneira Arteaga Educational Unit of the Chone canton in 2022, this represents the practical and experimental criterion of learning from the first years, where they promote concrete experiences related to theory and practice, to reach the acquisition of new knowledge that is manifested in its responsible relationship with the natural environment. The applied methodology had a qualitative approach, the applied methods were inductive-deductive and experimental, the most appropriate technique was the interview where the theoretical and methodological criteria were considered. As a result, it can be stated that the teaching of natural sciences influences the demonstration of experimental tasks in upper basic students.

Keywords---Natural Sciences, Experimental Tasks, Theory, Practice, Learning.

Introduction

The teaching of the natural sciences subject, together with the experimental tasks in the upper basic of the Gil Alberto Rivadeneira Arteaga Educational Unit of the Chone canton of the province of Manabí in Ecuador, presents a great need for being a common trunk of basic sciences and represents the practical and experimental criterion of learning from the first years of schooling, its main

objective is to promote concrete experiences relating theory with practice, to reach the acquisition of new knowledge that is manifested in its responsible relationship with the natural environment.

The efforts made by the educational community continue to observe education based on rote learning, analysis, self-criticism, and the construction of new knowledge is not evidenced, in addition the experimental activity is one of the key aspects in the teaching process and science learning both for the theoretical foundation they can provide to students, and for the development of certain abilities and skills for which experimental work is fundamental (García, 2016). The teachers of the educational institution have as a fundamental duty to instruct themselves how to use in the classroom the strategies, methods and techniques that are most suitable to arouse in the students the interest in learning in a theoretical and practical way that is reflected through experimentation, provoking creativity in students and the need to create projects based on technology, allowing the establishment of a dynamic environment between the student and the educator.

Educators are learning guides, creators of new strategies that allow the passage of enjoyable experiences in the teaching-learning process. In Ecuador, most teachers in public educational institutions base their classes on traditional and academic systems, which prevent a paradigm shift, making it impossible to incorporate new teaching-learning methods associated with information and communication technologies (Meneses, Yáñez, & León, 2022).

At present, the educational community presents a problem since master training is based on traditional and rote education. The construction of new knowledge is not evident, the teacher limits himself to transferring predetermined knowledge to the student, the objective of which is to pass the exam at the end of the academic period (Guzman & Ortega, 2019).

The natural sciences belong to the factual sciences because they are based on the facts, on the experimental and material, therefore they are those that in their investigation act on reality, where the processes and events that modify the functioning that must be tested are observed. The factual sciences are divided into natural ones that are concerned with nature, physics, chemistry, biology, geology, individual psychology and resort to observation, experimentation, and verification until the end (Naranjo & Mercedes, 2019).

The learning of natural sciences generates little interest in middle school students, due to multiple abstract concepts and few skills in other areas such as mathematics. University careers related to chemistry present little interest in society, and this worries the pedagogue, since it is an important subject for globalization and environmental problems (MEN, 2017).

In the Educational Unit, teachers develop classes both in the classroom and in the laboratory, but they do not have materials for experimentation, generating problems in upper basic students, which is incompetent to generate new knowledge on specific topics, with greater depth due to the lack of information since the scientific methodology used by teachers does not allow the development

of conceptual and procedural knowledge, for the capacities of students in critical and creative thinking.

The experimental practices offer students the possibility of understanding how knowledge is built within a scientific society, where it is appreciated how researchers work to reach agreements and how values influence the sciences that are related to society and science. culture (Izquierdo, Sanmartí, & Espinet, 1999). Experimental activity is one of the key aspects in the science teaching and learning process due to the theoretical foundation that is provided to students for the development of certain abilities and skills (García, 2016).

The opinions and studies that are presented to favor laboratory practices, in terms of their value to promote objectives related to conceptual and procedural knowledge, aspects that are related to scientific methodology (Hodson, 1992). Due to the above, the main objective of this work is to promote concrete experiences related to theory and practice to reach the acquisition of new knowledge that is manifested in the responsible relationship with the natural environment.

Method

The applied methodology had a qualitative approach, the applied methods were inductive-deductive and experimental, the most appropriate technique was the interview, where the theoretical and methodological criteria were considered. The exploratory level was used since the limited development of learning in the natural sciences of the upper basic students in the Gil Alberto Rivadeneira Arteaga Educational Unit of the 3 Marias campus of the Chone canton was examined and investigated, considering that it is a little subject. studied in the institution and needs to be addressed for further analysis.

The descriptive level was used to detail the reality that was observed in the institution and thereby determine the degree of intensity of the problem raised. Two bibliographical modalities were used, the documentary because access to books and magazines with scientific content was required for the theoretical bases of the same, and the field, since it was inexcusable to go to the study site to carry out the application of the research techniques.

Among the methods used, the scientific method was considered because it was a methodological and systematized research process that demands theoretical foundation. While the analytical-synthetic method, an analysis of the results obtained when applying the technical research instruments in relation to the learning of experimental sciences was carried out.

The techniques that were applied were the survey, to obtain important information and that were applied to fathers, mothers and family representatives, teachers in the area of natural sciences of the campus, while an observation sheet was applied to the students to evaluate the development of theories and practices in accordance with the understanding of the contents.

For the respective investigation, the population consisted of 1 director, 14 teachers, 42 students, 42 representatives of the higher sublevel of the "Gil Alberto Rivadeneira Arteaga" Educational Unit.

Discussion

Teachers and students intuitively associate laboratory practices with the scientific work that facilitates the change of laboratory practices, where they allow the student to develop cognitively and demanding more of himself to produce knowledge and improve the already acquired (Gil & Valdez, 2016). The practical experimental works are of greater importance of open statements since they can generate a resolution in accordance with the characteristics of scientific work and data closed that specifically invite to validate theoretical principles (Gil & González, 2017).

The realization of laboratory practices is what constitutes a valuable opportunity in the cognitive and motivational development of students, since it serves as a didactic strategy to achieve the construction of school scientific knowledge, where it is possible to mediate between the student's knowledge, the teaching and scientific knowledge to develop investigative skills in students (Espínosa, González, & Hernández, 2016).

Knowledge and its construction have an idiosyncratic component when considering the rhythm, way of learning and previous knowledge, in addition to adapting the materials and contents to the reality of the subjects. The importance of techniques and diversity of resources integrated with the techniques of workshops, laboratories, and inductive thinking (Ocaña, 2018).

The learning process has as its essential purpose the development of professionals, seeking their growth as a human being and as a social subject with which it becomes the didactics of natural sciences. Being necessary to analyze other resources and didactic procedures of the productive methods such as flexibility, independence, originality, and elaboration where it stands out for its close relationship with the self-management of teaching (Venet, 2017).

In the first three years of basic education, the approach of the natural sciences must be paused, gradually generating knowledge, in such a way that this circulation of ideas contributes to the construction of new knowledge, through the manipulation of concrete materials to complement the explanations verbal (Tacca, 2011). It is important to promote research and discovery as they are bases for students to learn to formulate questions and issue tentative answers as well as making observations, collecting information, qualitative and quantitative exploration to describe the experiences of what has been observed.

Learning originates from the modifications of ideas, so new data is increased that allows a better understanding of what happens around the educational context. The natural sciences are those sciences whose object is the study of nature, following the modality of the scientific method known as the empirical-analytical method that supports logical reasoning and the methodological apparatus of the

formal sciences, especially mathematics and logic, whose relationship with the reality of nature is indirect (Herradón, 2015).

Unlike the applied sciences, the natural sciences are part of basic science, but they have their practical developments in them and interact with them and with the productive system in the so-called research and development and innovation systems. Figure 1 shows the teaching materials used by teachers with their respective results (Rooney, 2013).

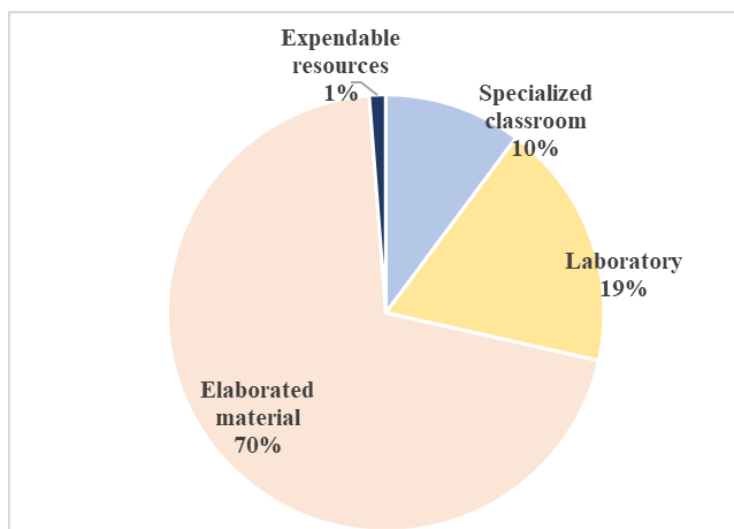


Figure 1. Materials used by teachers

The instrument most used by teachers is the material produced with 70%; laboratories with 19%; specialized classrooms with 10% and expendable resources with 1%. All teaching resources are important for student learning, but as can be seen, the materials produced are the most requested by educators when teaching their classes, since they are generally characterized by their provisional nature, their adaptability, their optimization, its organizing character in the process, its theoretical, investigative, technological, and practical usefulness. Learning can be improved when innovations consider the characteristics of and pedagogical design as well as the context in which learning takes place with the characteristics of the students as well as their previous experience and familiarity with the technological processes involved (Meinardi, 2015). According to the experimentation of the subject of natural sciences, the results are reflected in table 1.

Table 1. Experimentation of the subject of natural sciences

Alternatives	Frequency	Percentage (%)
Yes	35	95
Sometimes	2	5

In relation to what was exposed by the students according to the degree of experimentation that they give to the subject of natural sciences, it can be seen

that 95% of these do affirm that they like to experiment with the subject of natural sciences and the remaining 5% only sometimes. 90% like to easily solve experimentation tasks, which makes us consider that participation in the natural sciences class is very active since the teacher encourages participation. In the experimental field, it is necessary to start with the teaching method proposed by the teacher. The realization of the experiment as a fundamental element is the fundamental means to obtain decisive information in the solution to project all the actions (Meneses, Yáñez, & León, 2022).

The work of the teacher demonstrates what must be done, where the student describes what he observes and must reach his own conclusions in a critical and reflective manner, serving as a model for the student to carry out experimental activities (Folina, Palomeque, & Carriazo, 2016). This is how in the class experiment predominates the independent work of the student since he is the executor of the activities, while the teacher guides and controls the diligence that is carried out for the laboratory practice where cognitive independence is developed. The teacher is attentive and points out errors, warns of possible accidents, demands compliance with safety measures for savings and protection of the environment and all this is achieved with an appropriate and participatory methodology. (Machado, 2016)

The experimental task can be developed as a class rehearsal and organized frontally depending on the objective that is proposed with the realization of the laboratory practice, which is generally organized by teams in which the students certify it according to frame. The natural sciences must rely on the empirical method, logical reasoning and the methodological apparatus of formal sciences, especially mathematics and logic, whose relationship with the reality of nature is indirect (Herradón, 2015).

The statistics showed that the students stated that the teacher uses materials from the environment in the experimental activities in natural science classes, establishing the importance of this point within the approach to education, since it is necessary for the student to recognize the feasibility of observation, manipulation, experimentation and research as a didactic strategy, which allows you to strengthen teaching in your learning. The experimental practice in laboratories must reinforce the theoretical contents that are learned in class together with the material of the environment so that they learn to value nature for the preservation of the environment.

Within this aspect it can also be mentioned that the materials can be found in the immediate environment, making them make or elaborate their own materials that help them in their educational practice and that through their use they learn to be creative, inventive and above all help to develop educational projects that will serve them in their later studies.

When the development of theories and practices was observed in accordance with the understanding of the contents, the theory was delved deeper, but the class experiment was not deepened, nor did the independent work of the student, who is the executor, predominate. of the activity, although the teacher guided and controlled the activity carried out in the classroom laboratory together with his

cognitive experience. The student designs, executes and self-controls his activity and the teacher are attentive to what the student is doing where he points out errors, warns of possible accidents, demands compliance with safety measures for savings and protection of the environment (Machado, 2016).

Conclusion

The teaching of natural sciences in the demonstration of the experimental tasks in the upper basic students of the Gil Alberto Rivadeneira Arteaga Educational Unit of the Chone canton in 2022, represents the practical and experimental criterion of learning from the first years, constituting the basis essential for students to start with adequate knowledge at the level studied. The teaching of natural sciences influences the demonstration of experimental tasks in upper basic students, based on laboratory practices and classroom experimentation.

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References

- Baque Reyes, D. L. (2018). Materiales didácticos para el área de ciencias naturales. Obtenido de <https://sites.google.com/site/materialdidacticoparampl/materiales-didacticos-para-el-area-de-ciencias-naturales>
- Carranza, J. L. (2017). Enciclopedia Didáctica de Ciencias Naturales. Barcelona: Editorial, Carlos Gispert. <http://biblioteca.udelas.ac.pa/cgi-bin/koha/opac-detail.pl?biblionumber=3803>
- Deming. (1989). Calidad, productividad y competitividad. <https://books.google.com.pe/books?id=d9WL4BMVHi8C&printsec=frontcover>.
- Espinosa, E., González, K., & Hernández, L. (junio de 2016). Las prácticas de laboratorio: una estrategia didáctica en la construcción de conocimiento científico escolar*. *Entramado*, 12(1), 26-281. doi:<http://dx.doi.org/10.18041/entramado.2016v12n1.23125>
- Folina, M., Palomeque, A., & Carriazo, J. (julio-diciembre de 2016). Experiencias en la enseñanza de la química con el uso de kits de laboratorio1. *Entre Ciencia e Ingeniería*, 10(20). Obtenido de http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S1909-83672016000200011
- García, P. (2016). Evaluación de los trabajos prácticos mediante diagramas V. *Revista Electrónica de Enseñanza de las Ciencias*, 2(1), pp. 45-57. . Obtenido de En: <http://www.saum.uvigo.es/reec>
- Gil, D., & González, E. (2017). Las prácticas de laboratorio de física en la formación del profesorado. (II) Un análisis crítico. *Enseñanza de la física*, 35-47. Obtenido de <file:///X:/Users/Usuario/Downloads/admin,+Journal+manager,+5-LAS++PRACTICAS.pdf>
- Gil, D., & Valdez, P. (2016). La orientación de las prácticas de laboratorio como investigación: un ejemplo ilustrativo. *Enseñanza de las Ciencias*, 2(14), pp.

- 155-163. Obtenido de <https://raco.cat/index.php/Ensenanza/article/view/21444>
- González, I. (11 de Julio de 2012). Calidadgestion.wordpress.com. Obtenido de Herramientas para la mejora continua: <https://calidadgestion.wordpress.com/2012/07/11/herramientas-para-la-mejora-continua/>
- Grinschpun, & Ríos. (2016). Recursos didácticos en la educación. Obtenido de Lugar de publicación: Blogspot. Recuperado de: <http://rosairygarcia.blogspot.com.es/>
- Guzman, R., & Ortega, S. (2019). Didáctica de la física mediadas por las TIC orientada al desarrollo del pensamiento creativo. (O. M. Palmera, Ed.) Barranquilla, Colombia : Corporación universitaria de la costa . Obtenido de <https://repositorio.cuc.edu.co/bitstream/handle/11323/3117/72243928%20-%2072019576.pdf?sequence=1&isAllowed=y>
- Herradón, B. (2015). La Química y su relación con otras ciencias. Journal of Feelsynapsis (JoF). , 1, 81-86. https://educacionquimica.files.wordpress.com/2018/10/herradon_cv_100518_ed.pdf
- Hodson, D. (1992). Assessment of practical work. Some considerations in philosophy of science. Science and Education, , 1(2), pp. 115-144. Obtenido de <https://link.springer.com/article/10.1007/BF00572835>
- INEA. (2016). El cambio de modelo. México: Mevit Folleto 2.
- Izquierdo, M., Sanmartí, N., & Espinet, M. (1999). Fundamentación y diseño de las prácticas escolares de ciencias experimentales. Enseñanza de las Ciencias, 17(1), 45-59. Obtenido de <https://redined.mecd.gob.es/xmlui/handle/11162/22292>
- Kaizen. (1986). Un análisis teórico de la Mejora Continua. http://gide.unileon.es/admin/UploadFolder/07_285_311.pdf.
- Machado, B. (2016). El método de solución de las tareas experimentales en el laboratorio químico. http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S2224-54212022000100019
- Meinardi, E. (2015). Comunidades de práctica profesional del profesorado para una educación en ciencias en escuelas inclusivas. Revista Educação em Foco. En Prensa, 11.
- MEN. (2017). Competencias TIC para el desarrollo profesional docente. Obtenido de Competencias TIC para el desarrollo profesional docente: <https://eduteka.icesi.edu.co/articulos/competencias-tic>
- Mendoza Ortega, S. (2018). ¿Quién no puede aprender? México: INEA. <https://www.gob.mx/inea/acciones-y-programas/nuestra-institucion-57139>
- Meneses, K., Yáñez, A., & León, J. (octubre-diciembre de 2022). Escuelas efectivas: el caso de la educación básica de Ecuador. Problemas del desarrollo, 52(207). doi:<https://doi.org/10.22201/ieec.20078951e.2021.207.69726>
- Naranjo, J., & Mercedes, L. (enero-julio de 2019). Las ciencias naturales como un saber integrador. Sophia, Colección de Filosofía de la Educación(2), 199-221. doi:DOI: <https://doi.org/10.17163/soph.n26.2019.06>
- Ocaña, A. (2018). Modelos pedagógicos y teorías del aprendizaje. Ediciones de la U. Obtenido de <https://tallerdelaspalabrasblog.files.wordpress.com/2017/10/ortiz-ocac3b1a-modelos-pedagc3b3gicos-y-teorc3adas-del-aprendizaje.pdf>

- Rooney, A. (2013). De la filosofía natural al enigma de la materia oscura. La historia de la Física. México D.F.: Grupo Editorial Tomo. Obtenido de <https://es.b-ok.lat/book/3507210/3871fc>
- Tacca, D. (17 de julio-diciembre de 2011). La enseñanza de las ciencias naturales en la educación básica. Investigación de la enseñanza , 14(26), 139-152. Obtenido de <https://educrea.cl/wp-content/uploads/2016/07/DOC1-ensenanza-de-las-ciencias.pdf>
- Venet, R. (2017). Estrategias y recursos didácticos en el Proyecto Curricular Institucional. Santiago de Cuba: Universidad de Ciencias Pedagógicas. Frank País García. <https://redipe.org/wp-content/uploads/2020/09/LIBRO-3.-VIII-CIDEP-Matanzas-Cuba-2020.pdf>