Journal of Positive School Psychology http://journalppw.com
2022, Vol. 6, No. 6, 5678 – 5689

Environmental education programs and the formation of inquiry competencies in Peruvian students

[1]María Estela Manco-Villaverde, [2]Judith Soledad Yangali-Vicente, [3]José Luis Rodríguez-López

[1]Department of Education, Norbert Wiener University. Lima, Perú. E. mail: marimanco.32@gmail.com.
[2]South American center for education and research in public health, Department of Education, Graduate School, Norbert Wiener University, Lima, Perú. E. mail: Judith.yangali@uwiener.edu.pe.
[3]Department of Education,CEFICI, National University of San Marcos, Perú. E. mail: luisjoserodriguez1512@gmail.com.

Abstract

The last standardized evaluations in basic education showed disappointing results, evidencing the need for science education through innovative programs related to the context as part of the students' integral formation. This study examined the influence of the Scientific Inquiry Methodological Strategies (SIMS) program on the achievement of competencies and academic performance in 840 high school students from an educational institution in Cañete, Lima, Peru. A quantitative approach was adopted, with an experimental design and a longitudinal quasi-experimental sub-design, with a pre-and post-test for both groups, to evaluate the achievement of inquiry competencies after the application of the MSSI; obtaining that the MSSI did contribute significantly to the development of competencies in Science and Technology (ST) and the improvement of school performance, through experimental and simulated activities and the use of technological resources and materials in the daily environment.

Keywords: Inquiry, competence, experimentation, virtual environments.

1. Introduction

At present, basic education worldwide has become an important point of growing concern and challenge for many researchers, pedagogues, and educational policymakers, because it plays a fundamental role in the formation of the human person as an active member of society. During this stage of formation, a quality educational system is required, under the new advances in science, technology, innovation, and commitment to the environment; which links the levels of Regular Basic Education (RBE) with the higher level, allowing future professionals to perform efficiently and effectively in society and to enter the labor market with solvency (Monarca, 2018; Vaillantt & Rodríguez Zidán, 2018; Ministerio de Educación del Perú, 2018; Crespo Argudo & Palaguachi Tenecela, 2020).

Science education has become the basis of education in the XXI century and is considered the axis that guides the integral formation of future citizens with awareness and commitment to the world around them, participating in a critical, practical, and responsible way in the scientific and technological world to achieve its sustainable development (Ascencio - Cabot, 2017; Aguado Ochoa & Campo Fuentes, 2018). Undoubtedly, the globalized world and today's society are full of products obtained as a result of scientific research and inquiry, making scientific literacy a necessity for human beings because everyone needs updated scientific information to be able to understand and explain with scientific rigor the phenomena that

occur in their natural and cultural context (Cuevas Romo et al., 2016; Macedo, 2016; Ministerio de Educación de Perú, 2018; Balastegui et al., 2020).

The current situation in Latin American countries is worrisome because the results of national and international evaluations show a minimum percentage of students who can develop scientific inquiry competencies in basic education, which is why governments establish goals in their educational policies that seek to reverse these results in the short, medium, and long term (Ortega et al., 2017; Furman, 2018; Aguado Ochoa & Campo Fuentes, 2018). Thus, they direct efforts to generate a gradual change in the educational system, with trained teachers, educational materials, technological resources, the contextualization of the curriculum, learning communities, as well as student participation in problematic situations of their real context.

In Peru, the development of inquiry skills was almost nonexistent or was not considered in the curriculum in the past; however, today emphasis is being placed on the development of these skills at all levels of basic education to train future productive citizens, who acquire and use scientific knowledge in their development, as stated by the Peruvian Institute for Evaluation, Accreditation, and Certification of Quality in Basic Education - IPEBA in 2013.

The incorporation of activities and actions in favor of these competencies were carried out to reverse the results of the last census evaluation ECE - 2018 and Regional Census Evaluation ECER - 2019, whose results were unfavorable in the area of Science and Technology (Huaita Acha et al., 2019; Huauya Quispe, 2020). The results of the ECE - 2018 test applied to secondary students in the province of Cañete, Lima (Peru), show limited strengthening in inquiry skills, with 6.9 % of students at the satisfactory level, 40.3 % in the process, and 53.1 % in beginning or before beginning (MINEDU, 2018).

In this regard, the study found it necessary to apply a program that contributes to the achievement of inquiry competencies in basic education students, focused on the execution of experimental, experiential, and remote activities, during this situation of isolation and health emergency due to the pandemic caused by COVID 19; using virtual platforms and resources for everyday use, since knowledge comes from real facts or phenomena within their natural and sociocultural context, allowing them to integrate into the knowledge society and take on the new challenges of the modern world through scientific and technological research. The objective of this study was to determine the influence of the “MSSI” program on the achievement of inquiry skills and improvement of academic performance in science and technology in second-grade high school students of a public educational institution in the province of Cañete, located in the south of the Lima Provinces region in Peru.

People's learning should take place in interrelation and harmony with nature, as Pestalozzi stated, being more enriching and meaningful when the student interacts or gets in contact with the external environment that surrounds him, finding meaning in what he learns (Valdés Agrazabal, 2017; Arellanes Alvarado et al., 2019). The research included in the intervention program - MSSI, learning sessions that took as a reference the context of the student during the experimental activities carried out at home, virtual and technological using educational resources such as Moodle, Educaplay, simulators, Google form, videos, among others; which allowed to observe, explore and understand the phenomena of nature (Zavala, Antoni y Arnau, 2007; Arellanes Alvarado et al., 2019). The activities focused on the inquiry and scientific and technological literacy approach required by the area of Science and Technology under the new Basic Education Curriculum.

The adaptation to the environment and organization of the students' knowledge or experiences, making use of memory, perception, or other activities generated instability or cognitive conflicts in the students and managing to form mental structures or ideas under their stage or evolutionary development and promoting the achievement of scientific inquiry competencies considering the age and stage in which the students were, as Piaget refers to (Saldarriaga-Zambrano et al., 2016; Berni Moran & Olivero Sánchez, 2019; Sánchez Sánchez, 2019). On the other hand, the study incorporated important aspects of Jerome Bruner's theory of learning by discovery, considering the teacher as a facilitator or person

who induces students to acquire their learning actively and constructively, being the student the manager and constructor of his knowledge (Abarca Cordero, 2017; Bravo-Cedeño et al., 2017).

The incorporation of didactic strategies such as experimentation at home and eco-environmental practices using recycling resources and materials from the environment, virtual materials such as interactive materials, simulators, videos, recreational activities, and programs, allowed the interaction between previous experiences or knowledge with the new information or knowledge, resulting in the so desired significant learning of David Ausubel (Matienzo, 2020) (Córdova Silva & Donoso López, 2019) The study incorporated activities aimed at the manipulation of concrete reusable materials to promote an environmental culture, starting at home and with the participation of the members of the educational community; interactive virtual activities such as games, simulators, and forums in the classrooms allowed for integration through teamwork (Guerra García, 2020; Escallón Largacha et al., 2019). The adequacy of the means of the environment must be oriented and guided by the teacher so that the students can discover new learning by themselves, as stated by Lev Vygotsky (Woolfolk, 2010).

1.1. Review of the Literature

The intervention program Methodological Strategies for Scientific Inquiry - MSSI is a set of innovative strategies, focused on experimental activities from home, virtual resources through the interaction of students with their natural and social context, the manipulation of everyday materials, and recycling that contribute to environmental care; technological resources, platforms, teamwork, in the middle of remote distance education, taking advantage of the potential, experiences and the accompaniment of the family during the process of acquiring their learning. Its purpose was to teach to think and teach to learn and do science, through inquiry and interaction of resources and materials of the environment and collaborative work with their peers, to learn and develop cognitive skills with which the contents are learned, banishing rote learning (Baena Paz, 2017).

1.1.1. Inquiry Competencies

Inquiry is a process that involves the study and exploration of the natural and socio-cultural environment to provide explanations for the phenomena and facts observed by students (Dyasi et al., 2015). It is a dynamic process that used scientific procedures and previous experiences of the students to build their knowledge, as a result of the understanding of their natural and socio-cultural environment, promoting their curiosity and scientific interest by observing and exploring their environment, problematizing situations in the search for possible answers or the formulation of hypotheses, design of strategies that allowed them to select and manipulate materials, experiment and record data resulting from their experimentation, validate hypotheses, issue conclusions and socialize them with their peers to obtain information to solve a problem of the context, awakening the desire to know and learn even more during the process (MINEDU, 2015).

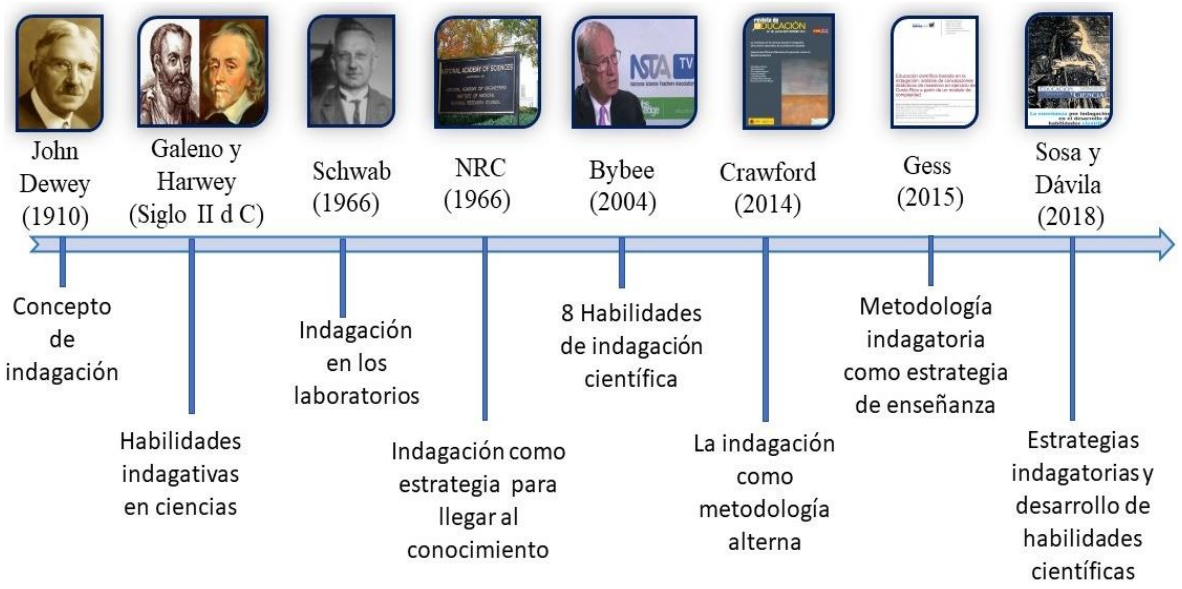

Figure 1. Historical evolution of inquirí.

The research focused on the achievement of inquiry competencies and scientific skills in students, based on the contributions of John Dewey to promote learning situations of the present or real life of students from school (Zavala, Antoni y Arnau, 2007). Starting from the previous ideas and scientific interest of the students to investigate, formulate hypotheses for questions or practical facts from home, the environment, school, or friends to adopt positions aimed at a continuous process of restructuring and reconstruction of learning; starting from external stimuli from the environment and learning based on the real experience of the students (Vasquez & Sargiotto, 2017). Inquiry is not only limited to experimental activities in the classroom but in the daily environment of the students and being part of the scientific activities that allow the mobilization of skills and confrontation of ideas to reach knowledge (Ortíz viviescas & Suárez Ortega, 2019).

The inquiry competencies constitute a set of capacities, knowledge, abilities, and skills that mobilize students to manage scientific knowledge comprehensively and responsibly, allowing them to explain facts and phenomena that occur in nature within a real context, acting competently by exploring facts or phenomena through a scientific methodology (Espinoza Tronconi et al., 2016). These competencies seek that students build their knowledge about the natural and cultural environment that surrounds them, its structure, functioning, and dynamics; through the application of the scientific method, formulation of questions, hypotheses, recording of data, their own experiences, and the reflection of what they know and what they still need to know, demonstrating curiosity and scientific interest (Sosa Lozano & Dávila Sanabria, 2019).

Taking into account the contributions of (MINEDU, 2018) (Mariños Castillo & Apolaya Sotelo, 2021) among the scientific inquiry skills developed in the study are the following:

(a) The scientific ability to problematize situations allowed the questioning of facts and phenomena that occur in nature and to interpret situations, identifying variables from direct observation to establish predictions that provide a possible solution to the problem.

(b) The scientific ability to design strategies allowed the student to choose the sequential design of procedures or steps to be followed to test or reject a hypothesis.

(c) The scientific capacity to generate and record data allowed for the collection, gathering, and recording of reliable quantitative and qualitative data in the inquiry.

(d) The scientific ability to analyze data and information allowed students to organize and interpret the data obtained in the process of inquiry experimentation and to draw their conclusions.

(e) The scientific capacity to evaluate and communicate results implied the reflection of

the whole inquiry process, to explain with reasoned scientific arguments, the results obtained in his inquiry, which he socialized with his peers.

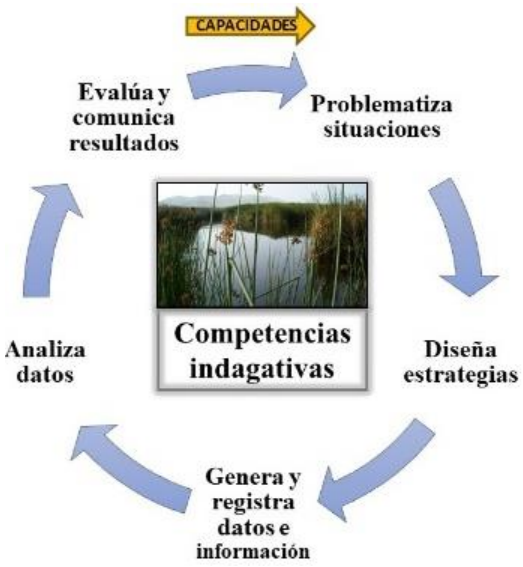

Figure 2. Dimensions of inquiry competencies.

Note: The figure was elaborated by the authors and shows the capabilities that allow students to achieve the inquiry competencies.

1.1.2. Academic Performance

Academic performance is the result of the quality, effectiveness, and relevance of the learning achieved by students after constructing their knowledge, with the pedagogical assistance of the teacher, and is evidenced by qualitative or quantitative grades, depending on the student's level (Tapia Sosa, 2019; Estrada García, 2019). This process involves factors external to the student, such as the environment, the family, the quality of the teacher, the design of strategies, and the work group, while internal factors or variables include the student's interest or motivation toward the curricular area. The study considered the academic performance of students in three dimensions: cognitive or conceptual, psychomotor or procedural, and affective or attitudinal.

1.2 Research Objective

The objective of the study was to determine the influence of the EMIC Program on the achievement of inquiry skills and academic performance in Science and Technology in high school students from an educational institution in Cañete, Lima, Peru.

2. Method

The research was developed under the quantitative approach because it involved the collection and analysis of data to establish inferences about the study, allowing conclusions to be drawn from the facts studied, using data collection, measurement of variables, and research instruments to solve the research problem and validate the hypothesis initially proposed (Ñaupas Paitán, 2009; Hernández-Sampieri & Mendoza, 2018; Arispe Alburqueque et al., 2020). The study applied a causal explanatory level, with experimental design, quasi-experimental sub-design, and cross-sectional.

2.1 Participants

The study was aimed at 840 students of regular basic education, considering as inclusion criteria to determine the sample that they were enrolled in the secondary level during the year 2021, attend Science and Technology classes, are in average age between 12 and 15 years old, have a laptop, computer, tablet, or cell phone at home with an internet connection to perform remote classes remotely from their homes. The sample consisted of 840 students, distributed into experimental group and control group, applied a non-probabilistic sampling type, because it respected the needs and distribution of students in the respective sections and grades, formed with criteria of the educational institution taking into account the reality and social environment of students.

2.2 Instruments

The content test of inquiry competencies arises from a process of adaptation of the tests developed by the Peruvian Ministry of Education, based on the competency-based approach in the area of Science and Technology, incorporating questions aimed at the development of the capacity, problematizes situations, designs strategies, generates, records and analyzes data, evaluates and communicates. The content validity of the test instrument was carried out, directed to the level of knowledge through items directed to the achievement of the five inquiring capacities that comprise the competency “Inquire through scientific methods”. The content validity was determined through Aiken's V coefficient with the participation of ten expert judges with doctoral degrees in education, specialists in

pedagogy, and in the teaching of Natural Sciences.

The tests were applied to 840 students who were part of the experimental and control groups. The evaluation of the items was from 0 to 20, considering 0 for the correct answer and 1 for the incorrect answer, establishing scales from 0 to 10 for the beginning or insufficient level, 11 to 13 for the level in process or regular, 14 to 17 for the achieved or good level and from 18 to 20 points as maximum for the satisfactory, outstanding or excellent level. Before the application of the instrument, students were informed that the collection of information would be carried out strictly for educational purposes and improvement in the achievement of their competencies in the area.

2.3 Data Collection

The data collection was carried out by the 3 researchers and 1 volunteer teacher, due to the pandemic situation, the content test instrument was applied virtually through the Google Forms form synchronously or asynchronously. The experimental group consisted of 420 students, distributed in 2 subgroups of 228 (8 sections) and 192 (6 sections), and the control group consisted of 2 subgroups of 212 and 208 students distributed in 6 sections each. The study consisted of applying a pre-test to both groups (GE and GC) and, subsequently, the MSSI program was applied, consisting of 30 duly planned learning sessions, which included innovative and creative strategies, and environmental and technological materials, under an environmentalist approach. Once the application of the program was completed, a post-test was applied to both groups, which made it possible to compare and organize the results obtained for their respective processing and analysis. It should be noted that the application of the instrument was carried out with the prior informed consent of the students and the informed consent of the parents, with the commitment to safeguard the integrity of the participants and the strict compliance with the criteria contemplated in the code of ethics for research, it should be noted that the research had the approval of the Ethics Committee of the University.

2.4 Data Analysis

The research applied descriptive statistics for the collection, description, and treatment of the information and its respective organization in percentages, tables, and figures (Córdova, 2014). It also used the SPSS 25 program for the processing and analysis of quantitative data, duly supported by the normality test of Kolmogorov and Smirnov, which determined a significance of 0.01, less than 0.05, so the Mann-Whitney U test statistic was used to contrast the hypothesis using the test with the data obtained from the pre and post-test applied to the experimental group and the control group (Hernández-Sampieri & Mendoza, 2018).

The data were obtained from the 840 participating students to whom a survey was applied using the content test instrument based on inquiry competencies, pre-test, and post-test type. For data processing, a set of descriptive and inferential statistical operations were carried out to determine the accuracy and validity of the quantitative variables, as well as the interpretation and understanding of the information obtained in the study (Ñaupas Paitán, 2009).

3. Results

According to the results shown in Table 1, the implementation of the EMIC program in the experimental group significantly influenced the development and strengthening of inquiry skills in high school students.

Table 1. Levels of distribution of inquiry competencies in the pre-and post-tests

Group	Inquiry competencies Pre-test						Inquiry competencies Post-test					
	Low		Mean		High		Low		Mean		High	
Control	85	4.05	99	7.38	6	.57	74	1.43	46	8.57		.00
Experimental	18	8.10	76	5.71	6	.19		.00	9	8.81	41	1.19

Note: The table was elaborated by the researchers and shows the results of the students in the application of the pre-and post-test.

For the hypothesis validation process, the nonparametric Mann-Whitney U test statistic was used to determine whether the value of the observed significance (sig) ($p \leq 0.001$) was lower than the value of the theoretical significance $\alpha = 0.05$, generated by the intervention (Table 2). The pretest, applied to all students, had a theoretical significance of 0.045 since the participants had similar initial conditions and the intervention had not been applied. After performing the posttest with both groups, different conditions were observed for the experimental group based on the nonparametric Mann-Whitney U test. Generated by the intervention program, the observed significance value (sig) $p \leq 0.001$ was lower than the theoretical significance $\alpha=0.5$ in the posttest.

Table 2. General hypothesis test

Test statistics[a]		
	Pre-test inquiry competencies	Post-test inquiry competencies
U of Mann-Whitney	81233,500	4496,500
W of Wilcoxon	169643,500	92906,500
Z	-2,001	-23,950
Sig. asymptotic (bilateral)	,045	,000

a. Grouping variable: Group

Therefore, there is scientific evidence to conclude that the application of the EMIC program significantly improved the development of inquiry skills in high school students of a Peruvian educational institution, allowing to accept the alternative hypothesis: the EMIC program contributes significantly to the achievement of inquiry skills in the improvement of academic performance in the area of Science and Technology in high school students of basic education in a public educational institution of Cañete - 2021 and reject the null hypothesis that stated the opposite.

4. Discussion

Scientific and technological advances respond to the demands of the new knowledge society and require the integral formation of students, based on inquiry competencies that should be developed from regular basic education. The study proposed the application of an intervention program for the achievement of these competencies, whose effectiveness was proven with the fulfillment of the objectives and validation of the hypotheses through a statistical analysis of the results and the analysis of the data on the impact generated by the application of the program in the students.

The objective of the research was to determine the influence of the EMIC Program on the achievement of inquiry competencies and improvement of academic performance in Science and Technology in high school students of a public educational institution of Cañete - 2021, demonstrating that the EMIC program did have a significant influence on the achievement of inquiry competencies in high school students, as shown in Table 2, which shows a significance value (sig) $p= 0.000$, which is less than the theoretical significance value $\alpha = 0.05$ in the post-test, allowing to point out that the difference between the control group and the experimental group is statistically significant; Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted, i.e., the EMIC program significantly improves the development of inquiry skills in high school students of a public educational institution in Cañete - 2021.

The processes of scientific inquiry developed in the research, taking into account the educational context and the experiences lived by students in the real world, have contributed to improving learning in Science and Technology; from the understanding and active

participation of students with the natural and cultural environment that surrounds them daily, as stated by Lev Vygotsky in 1982 (Mollenedo Laime, 2019). Intervention programs that consider innovative and creative strategies with experimental activities and resources based on the needs and contexts of the students, contribute to the achievement and strengthening of inquiry skills, interest in learning science, and, therefore, improved academic performance (Hernández Suárez & Salamanca Meneses, 2017).

The results of the research show that the EMIC intervention program, based on the development of learning sessions with innovative and creative strategies, environmental materials, and technological resources that the student was able to use taking into account the inquiry, environmental and scientific and technological literacy approaches; allowed the development of scientific skills and competences in the students of basic education of an educational institution of the Peruvian coast, located in the district of San Antonio, characterized for being an agricultural valley with a subtropical climate, beautiful beaches, scenic places and natural ecosystems such as the Puquiales de Esquivilca and the Wetlands of Puerto Viejo. The application of the program starts from the experiences and the real context of the students towards the achievement of scientific inquiry competencies, constituting an important contribution in the educational field since it can be applied in other studies and contexts (Imbert Romero & Olósegui Bandera, 2020).

The development of inquiry skills in the study involved the problematization of real situations to hypothesize, design strategies, experiment with materials and resources from the student's daily environment, generate and record data to interpret them, analyze them and reach conclusions that the student shares with his peers, demonstrating the achievement of significant learning in students, from their homes due to the pandemic situation, refuting the ideas of some teachers who do not perform experimental activities due to lack of laboratory equipment and materials (Briceño et al., 2019).

The EMIC program contributes to the achievement of scientific skills and abilities to problematize situations and question a fact or phenomenon in a real context, design strategies, generate and record data, analyze data and information, and evaluate and communicate, developing their scientific and creative thinking, as well as their interest in learning science (Montes de Oca, 2022). Learning by discovery helps students to solve problems in their social and cultural environment, and is more enriching when there is interaction and harmony between the student and nature (Rodríguez-Arteche et al., 2019).

For (MINEDU, 2018) Inquiry based on experimentation has better results when significant resources and materials from their daily environment are used, but not necessarily in a strict manner. Synthesizing, it can be affirmed that an important aspect for the achievement of inquiry competencies is the strengthening of the capacity to experiment, generate and record data, being more productive when the resources and materials are taken from the context or real environment of the students, because they find meaning in what they learn in a fun and interesting way, with materials and resources from their familiar and local environment.

5. Conclusions

Scientific and technological advances result from the demand for new knowledge and require the integral formation of students based on research competencies that should be developed starting in regular basic education. The study reported here implemented a program to develop these competencies, and its effectiveness was verified through the fulfillment of objectives and validation of hypotheses. The main objective was to determine the influence of the EMIC program in the development of inquiry skills and the improvement of academic performance in science and technology in high school students of a public educational institution in Cañete. The results demonstrated the effectiveness of the program in the experimental group. By adapting to the students' real-life contexts to achieve meaningful learning, interest in science is awakened and scientific, critical, and reflective thinking is developed, allowing them to understand the phenomena occurring in nature. Future studies should apply this program to other curricular areas or in other

educational institutions to further prove its effectiveness.

Inquiry competencies constitute a set of capacities, knowledge, experiences, and scientific skills used by students to construct their knowledge, through the exploration of facts, analysis of situations, design of strategies, recording of data and issuing their conclusions, using resources and materials from their natural and social context in the process, thus achieving meaningful learning as a result of their research. During the study, the effectiveness of the EMIC program in the achievement of inquiry skills in the students of the experimental group was demonstrated, serving as an important tool in future studies or applications to other curricular areas or educational institutions; taking into account the adaptation to their context, to achieve significant learning in students, to awaken their interest in learning science, to develop their scientific, critical and reflective thinking that will allow them to understand the phenomena or facts that occur in nature.

The health emergency caused by the pandemic caused by COVID-19 has exposed the inequality gaps that exist in our country. The educational sector is no stranger to this situation since during the research the lack of technological resources and the Internet has been a limitation by preventing some students from benefiting from the MSSI program; counting the researchers, to opt for a voluntary sample, whose inclusion criterion is to have a computer, laptop, tablet, or cell phone and connectivity at home. In this sense, it is suggested to establish strategic alliances with public and private entities so that students have access to this type of program that contributes to their integral formation.

Despite the aforementioned limitations, the challenge and challenges of virtual distance learning within the S&T area are assumed, which translates into students showing curiosity and scientific interest. Specifically, they were interested in continuing to learn science through the application of the EMIC program, because it is a dynamic, interactive, and fun approach. It consists of a set of learning sessions that incorporate innovative and creative strategies that focus on experimental activities and the use of technological resources and materials from the environment in which the students live. This approach allows them to explore the world around them to gain new knowledge and achieve quality learning through the interaction of scientific skills and abilities. All of the latter contribute to an integral education, consequently improving the quality of life of students and, therefore, the development of Peru.

Acknowledgments

Special thanks to the Universidad Privada Norbert Wiener for funding the development of the research. To the vice-rectorate of research of the university for all the advice received during the elaboration of the article.

References

[1] Abarca Cordero, J. C. (2017). In Memorian de Jerome Seymour Bruner (1915-2016). Revista de Psicología (PUCP), 9. https://revistas.pucp.edu.pe/index.php/psicologia/article/view/18802/19023

[2] Aguado Ochoa, A. M., & Campo Fuentes, Á. A. (2018). Desarrollo de competencias científicas en biología con la metodología del aprendizaje basado en problemas en estudiantes de noveno grado. Revista Biografía. https://revistas.pedagogica.edu.co/index.php/bio-grafia/article/view/8594/6511

[3] Arellanes Alvarado, E., Andrade López, B. G., & Reyes Ortiz, T. (2019). El método de Pestalozzi para el desarrollo de competencias en la Nueva Escuela Mexicana. Zenodo, 3, 14. https://doi.org/10.5281/ZENODO.3385233

[4] Arispe Alburqueque, C. M., Yangali Vicente, J. S., Guerrero Bejarano, M. A., Lozada de Bonilla, O. R., Acuña Gamboa, L. A., & Arellano Sacramento, C. (2020). La Investigación Cienctífica : Una aproximación a los estudios de posgrado (1era ed.). https://repositorio.uide.edu.ec/bitstream/37000/4310/1/LA INVESTIGACIÓN CIENTÍFICA.pdf

[5] Ascencio - Cabot, E. de la C. (2017). La educación científica: percepciones y retos actuales. Universidad de la Sabana, 15. https://educacionyeducadores.unisabana.e

du.co/index.php/eye/article/view/5828/4521

[6] Baena Paz, G. M. E. (2017). Metodología de la Investigación (3.a ed.). Grupo editorial Patria. http://www.biblioteca.cij.gob.mx/Archivos/Materiales_de_consulta/Drogas_de_Abuso/Articulos/metodologia de la investigacion.pdf

[7] Balastegui, M., Palomar, R., & Solbes, J. (2020). ¿En qué aspectos es más deficiente la alfabetización científica del alumnado de Bachillerato? Revista Eureka sobre Enseñanza y Divulgación de las Ciencias, 17(3), 3302. https://doi.org/10.25267/Rev_Eureka_ensen_divulg_cienc.2020.v17.i3.3302

[8] Berni Moran, L. R., & Olivero Sánchez, F. R. (2019). La investigación en la praxis del docente: Epistemología didáctica constructivista The investigation in the praxis of the teacher: Constructivist didactic epistemology. Revista Espacios, 40, 7. https://www.revistaespacios.com/a19v40n12/a19v40n12p03.pdf

[9] Bravo-Cedeño, G. del R., Loor-Rivadeneira, M. R., & Saldarriaga-Zambrano, P. J. (2017). Las bases psicológicas para el desarrollo del aprendizaje autónomo. Revista Científica Dominio de las Ciencias, 14. https://doi.org/10.23857/dc.v3i1.368

[10] Briceño, J., Rivas, Y., & Lobo, H. (2019, septiembre 26). La Experimentación y su Integración en el proceso Enseñanza Aprendizaje de la Física en la Educación Media. RELACult - Revista Latino-Americana de Estudos em Cultura e Sociedade, 5(2). https://doi.org/10.23899/relacult.v5i2.1512

[11] Córdova Silva, R., & Donoso López, E. (2019). Metodologia de enseñanza indagatoria para la promocion de aprendizaje significativo en fundamentos de la teoría cuántica / Methodology of indagatory teaching for the promotion of significant learning in basis of the quantum theory. Brazilian Journal of Development, 5(1), 699-717. https://www.brazilianjournals.com/index.php/BRJD/article/view/983

[12] Crespo Argudo, M. del C., & Palaguachi Tenecela, M. C. (2020). Educación con Tecnología en una Pandemia: Breve Análisis. Revista Scientific, 19. https://doi.org/https://doi.org/10.29394/Scientific.issn.2542-2987.2020.5.17.16.292-310

[13] Cuevas Romo, A., Hernández Sampieri, R., Leal Pérez, B. E., & Mendoza Torres, C. P. (2016). Enseñanza-aprendizaje de ciencia e investigación en educación básica en México. Revista electrónica de investigación educativa, 14. http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1607-40412016000300014

[14] Dyasi, H., Harlen, W., Figueroa, M., Léna, P., & López, P. (2015). La enseñanza de las ciencias en la Educación Básica: Antología sobre Indagación. https://innovec.org.mx/home/images/antologia sobre indagacion-vol.1.pdf

[15] Escallón Largacha, E., Gonzales, B., Peña Bravo, P. C., & Rozo-Parrado, L. J. (2019). Implicaciones Educativas de la Teoría Sociocultural: el Desarrollo de Conceptos Científicos en Estudiantes Bogotanos. Revista Colombiana de Psicología, 19. https://doi.org/https://doi.org/10.15446/rcp.v28n1.68020

[16] Espinoza Tronconi, M. A., Cintra Lugones, Á., & León Robaina, R. (2016). Competencias indagativas en el proceso formativo venezolano. Dialnet, 12. https://dialnet.unirioja.es/servlet/articulo?codigo=6651444

[17] Estrada García, A. (2019). Estilos de aprendizaje y rendimiento académico. Revista Boletín Redipe, 11. https://revista.redipe.org/index.php/1/article/view/536/509

[18] Furman, M. (2018). Aprender ciencias en las escuelas primarias de América Latina: ¿dónde estamos y cómo podemos mejorar? (UNESCO-MONTEVIDEO (ed.)). UNESCO. http://creativecommons.

[19] Guerra García, J. (2020, enero 1). El constructivismo en la educación y el aporte de la teoría sociocultural de Vygotsky para comprender la construcción del conocimiento en el ser humano. Dilemas contemporáneos: Educación, Política y Valores, 1-21. https://doi.org/10.46377/DILEMAS.V32I1.2033

[20] Hernández-Sampieri, R., & Mendoza, C. P. (2018). Metodologìa de la

Investigaciòn. Las rutas Cuantitativa Cualitativa y Mixta. En universidad tecnologica laja Bajio. http://repositorio.uasb.edu.bo:8080/handle/54000/1292

[21] Hernández Suárez, C. A., & Salamanca Meneses, X. (2017). Fortalecimiento de Competencias Científicas: La investigación como Estrategia Pedagógica. Horizontes Pedagógicos, 19, 91-100. https://horizontespedagogicos.ibero.edu.co/article/view/hop.19205/1018

[22] Huaita Acha, D. M., Luza Castillo, F. F., Benavente Ayquipa, R. M., & Dolorier Zapata, R. (2019). Vista de La competencia indagatoria y el uso de estrategias para su desarrollo, en estudiantes de educación inicial de dos universidades peruanas. Scientific ournal Education: EDUSER, 124-133. https://revistas.ucv.edu.pe/index.php/eduser/article/view/337/320

[23] Huauya Quispe, P. (2020). Aprendizaje de ciencias basada en indagación científica en estudiantes de Educación Básica Regular | Revista Educación. Revista Educación, 1-23. https://doi.org/https://doi.org/10.51440/unsch.revistaeducacion.2019.17.45

[24] Imbert Romero, N. D., & Olósegui Bandera, E. (2020). Mejoras en el desarrollo de la competencia científica científica en estudiantes de primer año de secundaria de un liceo de Uruguay. MLS Educational Research, 22-40. https://doi.org/10.29314/mlser.v4i1.247

[25] Macedo, B. (2016). Educación científica. http://creativecommons.

[26] Mariños Castillo, G. A., & Apolaya Sotelo, J. P. (2021). Aprendizaje de las ciencias físicas en el estudiante universitario: aportes de la indagación científica en el desarrollo de las competencias | SCIÉNDO. SCIÉNDO, 17-25. https://doi.org/: https://doi.org/10.17268/sciendo.2021.002

[27] Matienzo, R. (2020). Evolución de la teoría del aprendizaje significativo y su aplicación en la educación superior | Dialektika: Revista de Investigación Filosófica y Teoría Social. Dialektika: Revista de Investigación Filosófica y Teoría Social, 2, 17-26. https://journal.dialektika.org/ojs/index.php/logos/article/view/15/14

[28] MINEDU. (2015). ¿Qué y cómo aprenden nuestros estudaintes? (Primera). http://www.minedu.gob.pe/DeInteres/pdf/documentos-primaria-cienciayambiente-iii.pdf

[29] MINEDU. (2018). Orientaciones para la enseñanza del área curricular de Ciencia y Tecnología: Guía para docentes de Educación Primaria (Primera ed). Quad Grphis Perú. http://repositorio.minedu.gob.pe/handle/MINEDU/6399

[30] Ministerio de Educación de Perú. (2018). Orientaciones para la enseñanza del área curricular de Ciencia y Tecnología : guía para docentes de Educación Primaria (Primera Ed). https://repositorio.minedu.gob.pe/handle/20.500.12799/6399

[31] Mollenedo Laime, E. L. (2019). La Aplicación del Proceso de Indagación Científica y su Influencia en el Aprendizaje del Área de Ciencia y Ambiente en los Estudiantes del 3° Grado de Educación Primaria de la I.E. N° 2055 “Primero de Abril” - UGEL 04 – Comas. UNIVERSIDAD NACIONAL DE EDUCACIÓN Enrique Guzmán y Valle.

[32] Monarca, H. (2018). Calidad de la Educación en Iberoamérica: Discursos, políticas y prácticas - Dialnet (Dykinson (ed.)). https://dialnet.unirioja.es/servlet/libro?codigo=716469

[33] Montes de Oca Rojas, Y., Barros Bastidas, C. I., & Castillo Cabeza, S. N. (2022). Metodología de investigación en emprendimiento: Una estrategia para la producción científica de docentes universitarios. Revista De Ciencias Sociales, 28(2), 381-391. https://doi.org/10.31876/rcs.v28i2.37945.

[34] Ñaupas Paitán, H. (2009). Metodología de Investigación Científica y Asesoramiento de Tesis (RETAI (ed.); Primera Ed). Editorial RETAI.

[35] Ortega, C., Passailaigue, R., Febles, A., & Estrada Vivian. (2017). El desarrollo de competencias científicas desde los programas de posgrado. Revista Electrónica de Veterinaria REDVET, 18, 1-16. https://www.redalyc.org/pdf/636/63653574007.pdf

[36] Ortíz viviescas, C. I., & Suárez Ortega, M. (2019). La indagación guiada como estrategia metodológica para el desarrollo de competencias científicas en estudiantes de Educación Media. MLS Educational Research, 7-24. https://doi.org/10.29314/mlser.v3i1.175

[37] Rodríguez-Arteche, I., Bárcena, A. I., Rosa, D., & Martínez-Aznar, M. M. (2019, junio). Aprendizaje indagativo sobre los cambios físicos y químicos en la formación inicial del profesorado de secundaria. Ápice- Revista de Educación Científica, 3, 1-20. https://doi.org/10.17979/arec.2019.3.2.4657

[38] Saldarriaga-Zambrano, P. J., Bravo Cedeño, G. del R., & Loor Rivadeneira, M. R. (2016). La teoría constructivista de Jean Piaget y su significación para la pedagogía contemporánea | Saldarriaga-Zambrano. Revista Dominio de las ciencias. https://dominiodelasciencias.com/ojs/index.php/es/article/view/298/355

[39] Sánchez Sánchez, R. (2019). Influencia de la teoría de Piaget en la enseñanza de la Física. Latin-American Journal of Physics Education, ISSN-e 1870-9095, Vol. 13, No. 3, 2019, 13(3), 7. https://dialnet.unirioja.es/servlet/articulo?codigo=7553950&info=resumen&idioma=ENG

[40] Sosa Lozano, J. A., & Dávila Sanabria, D. T. (2019). La enseñanza por indagación en el desarrollo de habilidades científicas. Educación y Ciencia, 605-624. https://doi.org/https://doi.org/10.19053/0120-7105.eyc.2019.23.e10275

[41] Tapia Sosa, E. V. (2019). La Incidencia de las Inadecuaciones de la lectura y escritura en el aprendizaje y el rendimiento escolar. Universidad, Ciencia y Tecnología, 2, 75-83. https://www.uctunexpo.autanabooks.com/index.php/uct/article/view/222/327

[42] Vaillantt, D., & Rodríguez Zidán, E. (2018). Perspectivas de UNESCO y la OEI sobre la calidad de la educación. En Calidad de la Educación en Iberoamérica: Discursos, políticas y prácticas (pp. 136-154).

[43] Valdés Agrazabal, J. (2017). Importancia de la Educación inicial. Revista Oratores, 22, 89-100. https://revistas.umecit.edu.pa/index.php/oratores/article/view/93

[44] Vasquez, L., & Sargiotto, V. (2017). Educación, Democracia y Cambio Social. Aporte de John Dewey y Paulo Freire. Revista del Instituto de Cultura, Identidad y Comunicación, 2, 50-65. https://publicaciones.unpa.edu.ar/index.php/icic/article/view/278

[45] Woolfolk, A. (2010). Psicología Educativa (PEARSON (ed.); Onceava ed). Pearson. https://crecerpsi.files.wordpress.com/2014/03/libro-psicologia-educativa.pdf

[46] Zavala, Antoni y Arnau, L. (2007). 11 Ideas Clave. Cómo aprender y enseñar competencias - Antoni Zabala Vidiella, Laia Arnau Belmonte - Google Libros (E. Grao (ed.); Primera Ed). https://books.google.com.pe/books?id=2h08NJ4fDwgC&printsec=copyright#v=onepage&q&f=false