

Environmental Literacy and Its Impact on Sustainable Pedagogical Behaviors of Basic Education Teachers, Lima-Peru

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Abstract: - Environmental literacy is the ability to perceive environmental conditions, become aware, make decisions and carry out actions to reestablish balance in the living environment and, through sustainable behaviors, protect the environment, guaranteeing the quality of life of people. The purpose of the study was to determine the incidence of environmental literacy in the sustainable pedagogical behaviors of basic education teachers. The research was carried out under a quantitative approach with the participation of 650 teachers from private and state schools in Metropolitan Lima, who, through the survey technique and instruments such as the questionnaire and the behavior scale, were able to determine their predominant level of literacy, as well as the type of sustainable pedagogical behavior. The results indicate that 385 teachers (59.23%) have a medium level of literacy, while 503 teachers (77.08%) have very adequate sustainable behaviors, concluding that environmental literacy has a 21% impact on the sustainable pedagogical behaviors of teachers.

Key-words: - Environmental literacy, sustainable behaviors, environmental education, environmental culture, environmental attitudes, ecological awareness.

Received: July 25, 2021. Revised: May 18, 2022. Accepted: June 9, 2022. Published: June 23, 2022.

1 Introduction

Environmental education aims to enable teachers to understand environmental problems over time (Álvarez & Vega, 2009) [1], and to develop environmental awareness related to the set of knowledge and experiences that they will use to responsibly interact with the environment (Aguilar & García, 2006) [2]. Cited by Lopera (2019), Goldman et al. specify that an environmentally literate person is prone to tackle environmental conflicts with responsibility, commitment, and respect for life and the sustainable development of natural systems, as shown by their skills, attitudes, and knowledge. In turn, [3]. Poblete & López (2019) define sustainable behaviors as actions put into practice for the protection and responsible use of environmental resources, ensuring their sustainability [4]. Accordingly, teachers must enhance their environmental values, such as respect, co-responsibility, solidarity, austerity, empathy, sensitivity, collaborative work, initiative, and environmental participation for a sustainable lifestyle.

In this context, this research is considered relevant because teachers, responsible for educating students, should be the first to demonstrate and put into practice their sustainable behaviors in the natural environment. However, valuing and acting to

protect the environment requires knowing how socio-ecological systems function and the various relationships around resources available for life and, above all, understanding the causes of the problems that affect these systems (Ostrom, 2009 cited in Urquiza & Cadenas, 2015) [5], thereby reaching an acceptable level of environmental literacy. Teacher training institutions must commit to provide a solid environmental education that strengthens the values and behaviors of environmentally literate teachers (Yangali et al., 2021) [6].

This quantitative research was conducted based on a correlational-causal analysis. The purpose of the study was focused on evaluating the level of incidence of environmental literacy on the sustainable pedagogical behaviors of teachers in private and public schools in the city of Lima. The study showed the impact of environmental literacy on teachers' sustainable pedagogical behaviors and their importance as factors for developing students' environmental attitudes. Data were collected by applying two instruments, one to assess literacy in its nominal, operational, and functional dimensions, and another to measure sustainable pedagogical behaviors of 650 early childhood, primary, and secondary education teachers from both private and public schools in the metropolitan area of Lima. The results demonstrated the teachers' levels of environmental literacy in these categories and the

percentage of influence and their assessment as essential factors for environmental education.

2 Literature Review

2.1 Environmental Literacy

For Roth (1992), environmental literacy is defined as the ability of an individual to perceive and interpret problems of the environment and its systems toward taking the actions necessary for maintaining, restoring, or improving the health of these systems [7]. A person knowledgeable about environmental issues is aware and able to make decisions to provide alternatives for improving the environment and solutions to the problem of ecological systems. Thus, such a person has adequate environmental literacy.

Ecological literacy is a way to develop emotional and social intelligence from the construction of knowledge and values, in addition to enhancing people's skills, allowing their connection with nature (Aranda, 2015) [8]. For his part Capra (1996), defines deep ecology as a paradigm based on a holistic view of the world, where the individual establishes a connection with nature through his values and experiences conceiving a feeling of protection that is evidenced in his actions and behaviors [9]. For Capra, an ecologically literate individual is one who understands the principles of organization that govern ecosystems and that are essential to generate sustainable communities. In Parra's (2018) interpretation these principles are fundamental to build sustainable societies based on: (a) Interdependence, where the organisms that are part of the environment are connected, in such a way that survival depends on the relationships established between them. In a sustainable community this principle ensures biodiversity and availability of resources. (b) Recycling; nature being cyclical and the constant use of matter and energy generates wastes that are used by organisms in a natural way, this principle is practiced in society because of the need to obtain a benefit, while counteracting pollution by reducing waste. (c) Association; this principle leads us to the reflection of using the available resources in a conscious and responsible way, promoting the participation of human beings to regenerate and avoid excessive consumerism. (d) Flexibility; organisms are capable of generating mechanisms of adaptation to diverse environments; however, failure to adapt to a given context generates conflicts and stress for the individual, impacting and limiting their sustainable lifestyle. (e) Diversity; a diverse ecosystem is

resilient, because it is able to reorganize itself to survive, a diverse human community has the strength to face conflict situations, adapt and propose alternative solutions [10].

Segura, Rodríguez & Esquivel (2015) point out that environmental literacy should be understood from the following three dimensions, which individuals should put into practice in their daily work [11]: (a) nominal, where human beings are able to understand interactions in natural and social systems while putting into practice reflection, awareness, conscience, and attitudes, demonstrating respect and responsibility for the environment, (b) functional, where individuals are involved with natural systems, and their knowledge on environmental issues prepares them to recognize problematic situations and to face environmental issues, and (c) operational, where teachers must be able to assess the impact of environmental problems on natural and social systems, demonstrating their commitment to changing—and improving these systems by proposing and taking actions to safeguard the environment [11].

This entails that teacher literacy begins in their initial training stage, which means aligning the curriculum with the professional profile in order to have committed and responsible teachers (Cebrián & Junyent, 2014) [12].

2.2 Sustainable Behavior

Sustainable behavior is regarded as effective and expected actions taken to preserve natural resources and biodiversity ensure future generations' individual and social well-being (Corral-Verdugo & Queiroz, 2004) [13]. As pedagogical leaders and facilitators of knowledge, teachers should be models of sustainable pedagogical behaviors in the school, demonstrating, through their actions, their concern and interest in conservation and responsible consumption of resources, which ensures the balance of the various systems that interact in natural ecosystems. González & Bonan, (2017) define environmental behaviors as conscious behaviors that people practice to establish relationships between social and natural systems with the purpose of generating balanced environments [14].

Psychology establishes the relationship between knowledge and behavior, where the human being by his rationality assumes certain social behaviors product of the information and beliefs he has of a context, but this relationship is mediated by the attitudes and consciousness of the individual (Fishbein & Ajzen, 2011) [15]. In the model of responsible environmental behavior proposed by

Hines, Hungerford & Tomera (1987), they point out that individual responsibility, commitment, individual expectation to achieve a goal through their actions and knowledge are factors for adopting sustainable behavior [16].

For their part, Stern et al. (1999) established the theory of the value-belief-norm of environmentalism, where it is established that environmental problems are considered by many as intolerable situations that provoke a reaction and that, associated with their values and beliefs, motivate diverse environmental behaviors in the individual [17]. For authors such as Kollmuss & Agyeman (2002), attitudes, values, knowledge and the emotional bond constitute environmental awareness. However, personal habits can become obstacles to environmental action [18]. In Wagner's proposal (2003), the individual's knowledge is a necessary factor that directly influences the adoption of behaviors, although it is not considered a determining factor [19]. In short, the more significant knowledge is for the individual, the more he or she will be able to act and commit to achieve a favorable outcome.

For authors such as Díaz & Spiaggi (2007), behaviors have the following dimensions: (a) ecological, when individuals show respect for resources and are aware of the need to produce in natural ecosystems to avoid the extinction of biodiversity; (b) social, when ensuring that justice and equity are the pillars of sustainability and that humans are responsible for the equitable distribution of environmental resources; (c) economic, when the state seeks to meet the needs of the population based on resources available in the environment; and (d) political, when encouraging the participation of neighbors and residents in decision-making and resource management actions [20]. Other authors, including Corral (2010), regard the dimensions of fairness, altruism, and austerity of sustainable behaviors as characteristics that all environmentally literate individuals demonstrate in their daily lives [21]. Acting with equity ensures that others have access to natural resources without any preference, whereby resource sustainability should meet current needs without neglecting those of future generations (Artaraz, 2002) [22]. An altruistic teacher acts in caring for the social and physical environment, helping to solve problems, and contributing to the benefit of others (Eisenberg & Miller, 1987) [23]. Austerity is defined as the responsible use of resources while avoiding waste, strengthening a prudent ecological behavior that benefits the planet. Population growth and technological advances have contributed to the development of consumer

behaviors, generating excessive use, waste of environmental resources, and, therefore, environmental deterioration. As a result, a new perspective has emerged, a simple lifestyle involving responsible environmental consumption (Iwata, 2006) [24].

2.2.1 Types of Sustainable Behaviors

Herrera-Mendoza et al. (2016), argue that achieving sustainable lifestyles means practicing pro-ecological behaviors, which mitigate environmental pollution [25]. Accordingly, consuming ecological products, recycling, saving energy and water, composting, caring for the soil and its components, generating living spaces (green areas), and reusing materials, among others, are some of the behaviors that teachers should demonstrate in their pedagogical practices and their work with students. In conclusion, sustainable or pro-ecological behaviors stem from the ability to make decisions and take actions of conservation, care, and preservation of the environment that strengthen pro-environmental attitudes (Vásquez et al., 2020) [26].

For Moyano & Jiménez (2005), pro-ecological behaviors can be differentiated into individual actions, such as saving resources, separating waste, and consuming non-harmful products, into collective actions, including collaborating on any manifestation of environmental protection [27].

In the study conducted by Perales & Aguilera (2018) in university students with training in education, it was found that their adequate favorable behaviors prevailed in 57% over 43% of environmentally unfavorable behaviors, which allows concluding that they are in the process of improving their behavior with respect to consumption, saving and protection of their environment by assuming commitments in their lifestyle [28].

3 Methodology

This research of quantitative approach non-experimental design and correlational-causal level had the purpose of determining the percentage of incidence of environmental literacy in the sustainable pedagogical behaviors of basic education teachers in Lima-Peru. The hypothetico-deductive method was used to test the hypotheses and reach conclusions that would contribute to expanding knowledge in this field (Sánchez & Reyes, 2018) [29]. The collection of information was carried out from the application of two instruments, a structured questionnaire in the dimensions of nominal, operational and functional

literacy. In addition to a test to measure the level of sustainable pedagogical behaviors of the 650 teachers belonging to early, primary and secondary education of private and public schools of the Local Educational Management Units (UGEL) of Lima.

4 Results and Discussion

With the data collected from the group of teachers surveyed in this study, a descriptive and inferential analysis was performed using linear regression, determining the causal relationship between two variables, environmental literacy, and sustainable pedagogical behaviors.

Table 1. Distribution levels of environmental literacy (EL) dimensions

	Low		Medium		High	
	n	%	n	%	n	%
Nominal EL	109	16.77	385	59.23	156	4.00
Functional EL	20	3.08	127	19.54	503	77.38
Operational EL	80	12.31	413	63.54	157	24.15

Source: the author

The descriptive results in Table 1 show that, of the 650 basic education teachers surveyed in this study, 385 or 59.23% have a medium level of nominal environmental literacy, indicating that this group of teachers is aware of the different natural systems and anthropogenic impact. In addition, 413 or 63.54% of the teachers have a medium level of operational environmental literacy, meaning that this percentage of teachers work with their students on the analysis and reflection of the effects and damages caused by environmental imbalances. They also motivate their students and involve them in actions to preserve their immediate environment. Another key result is that 77.38% of the respondents have a high level of functional environmental literacy. That is, in addition to learning about environmental issues, teachers plan and execute learning experiences and environmental projects with proposals for actions aimed at strengthening the culture of recycling, the generation of living spaces (green areas) in the school and locality, among other environmental conservation activities, with the purpose of developing students' ecological awareness.

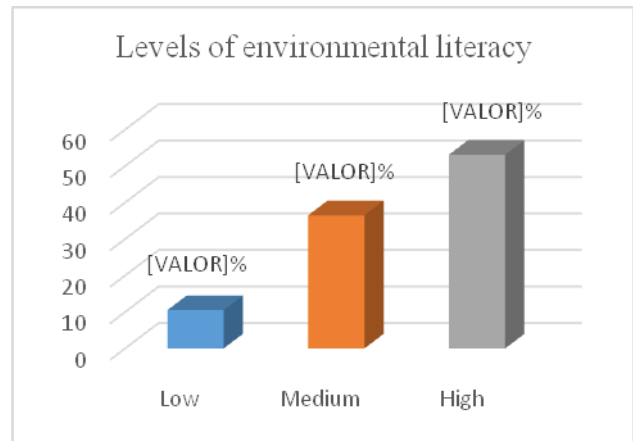


Fig. 1: Distribution levels of environmental literacy

Figure 1. shows the level of environmental literacy reached by the teachers surveyed after completing the questionnaire, the results showed that 10.5% reached a low level, 36.5% a medium level and 53.1% a high level in the knowledge of environmental issues.

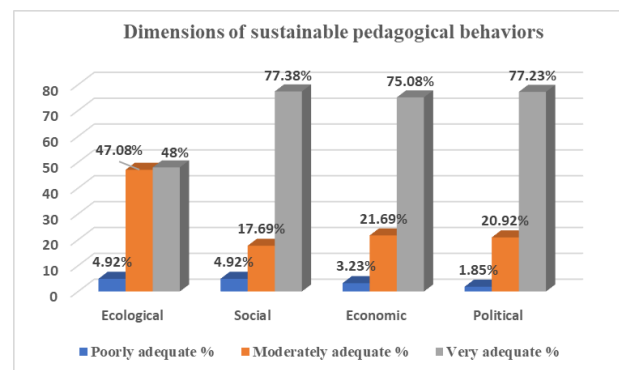


Fig. 2: Levels of distribution of the dimensions of sustainable pedagogical behaviors

Figure 2 shows that of the total of 650 teachers surveyed, the highest values were reported as very adequate in the following dimensions: ecological 48%, social 77.38%, economic 75.08% and political 77.23%. This means that teachers demonstrate ecological behavior by being responsible for generating resources to ensure biodiversity in natural systems. A social behavior because they assume a commitment to sustainable consumption in their environment. Economic because they respect the policies implemented by the state for the conservation of ecosystems. Political because they participate as citizens in decision making and actions in favor of the environment.

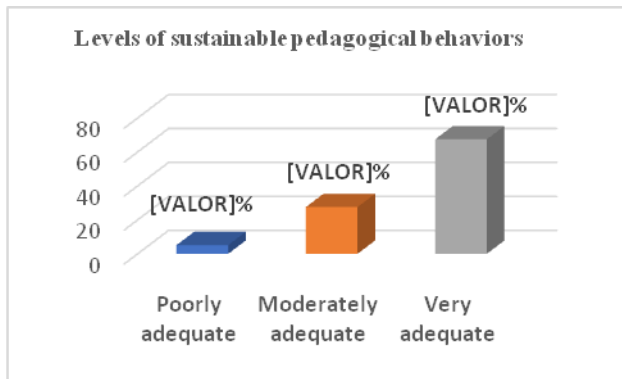


Fig. 3: Levels of sustainable pedagogical behaviors

The results shown in figure 3 are favorable for the environmental education of students, considering that the teacher plays the role of tutor and is responsible for reinforcing values and attitudes. 67.4% of the teachers surveyed stated that they have very adequate sustainable pedagogical behavior, demonstrating it by practicing recycling, product reuse, energy and water saving, among other activities that benefit the environment.

Table 2. Environmental literacy impact on sustainable pedagogical behaviors

Model	Log Likelihood -2	Chi-squared	gl	Sig.
Only intersection	172.962			
Final	55.819	117.143	2	0,000

Link function: Logit

This value represented in table 2 shows that environmental literacy has a significant impact on the sustainable pedagogical behaviors of teachers at the three levels of basic education in Lima. These results reveal that teachers who master environmental knowledge and recognize the problems generated by human activities are in a position to propose alternative solutions and participate in activities to mitigate the effects of environmental deterioration in their locality.

Table 3. Level of environmental literacy impact on sustainable pedagogical behaviors

Cox and Snell	0.165
Nagelkerke	0.210
McFadden	0.117

Link function: Logit

The results in table 3 indicate that environmental literacy influences 21% of the sustainable pedagogical behaviors of basic education teachers, this would reveal that there is a high percentage of teachers who consider that the cognitive domain of environmental issues is not relevant to develop

sustainable behaviors in students.

Table 4. Nominal literacy on sustainable pedagogical behaviors

Model	Log Likelihood -2	Chi-squared	gl	Sig.
Only intersection	55.667			
Final	32.093	23.574	2	0.000

Link function: Logit.

The values obtained in the surveys suggest that the nominal literacy dimension has a significant impact on the sustainable pedagogical behaviors of basic education teachers. Respondents consider that knowledge on topics related to ecosystems, biodiversity and pollution are relevant to understand the chaotic environment around us and consequently develop sustainable lifestyle activities (see table 4).

Table 5. Level of nominal literacy impact on sustainable pedagogical behaviors

Cox and Snell	0.036
Nagelkerke	0.045
McFadden	0.023

Link function: Logit.

According to the Nagelkerke value represented in Table 5, the nominal literacy dimension influences 4.5% of sustainable pedagogical behaviors. The percentage of teachers in this group are clear that environmental knowledge, skills and attitudes are important to implement appropriate and sustainable behaviors to improve their quality of life and the ecosystem. These results obtained should be analyzed and reflected upon by other teachers, considering that they are responsible for training people with sustainable behaviors that guarantee the survival of living beings and ecosystems.

Table 6. Functional literacy on sustainable pedagogical behaviors

Model	Log Likelihood -2	Chi-squared	gl	Sig.
Only intersection	151.031			
Final	27.427	123,604	2	0,000

Link function: Logit.

In the table 6, the significance value shows that the functional literacy dimension has an impact on the sustainable pedagogical behaviors of teachers at three levels of basic education in the city of Lima. This confirms that the interaction between literacy and environmental practice should be part of the professional training of future teachers.

Table 7. Level of functional literacy impact on sustainable pedagogical practices

Cox and Snell	0.173
Nagelkerke	0.220
McFadden	0.123

Link function: Logit.

The Nagelkerke value shows in table 7 that the functional literacy dimension affects 22% of the sustainable pedagogical behaviors of basic education teachers. These results would reveal the connotation given by teachers to execute educational experiences related to environmental issues, develop projects and mobilize people. In addition, they face the challenge of changing students' attitudes and behaviors, especially when they are faced with schoolchildren with a weak formation in values.

Table 8. Operational literacy on sustainable pedagogical behaviors

Model	Log Likelihood -2	Chi-squared	gl	Sig.
Only intersection	62.346			
Final	36.677	25,669	2	0.000

Link function: Logit.

The values in table 8 confirm that the operational literacy dimension has an impact on sustainable teaching behaviors and that teachers agree to participate in conservation activities and to carry out environmental educational experiences to reinforce their sustainable teaching behavior in the classroom.

Table 9. Level of operational literacy impact on sustainable pedagogical behaviors

Cox and Snell	0.039
Nagelkerke	0.049
McFadden	0.026

Link function: Logit.

4.9% of the respondents consider that the operational literacy dimension influences the sustainable pedagogical behaviors of teachers in educational institutions in Lima. The results in table 9 confirm that the respondents know the problems, the causes and the actors responsible for environmental impact, all of which commits them to participate in the benefit and protection of the environment. However, the values obtained lead us to reflect on the need to consolidate a solid environmental education that should be assumed by

teacher training institutions and basic education curricula.

5 Discussion

The environmental problems of the environment require immediate involvement of society to reduce their impact and the irreparable loss of biodiversity. In this sense, teachers are the first to assume the challenge of becoming responsible for providing environmental education based on meaningful learning experiences that awaken their students' interest in environmental conflicts in their environment. In this sense, the results obtained in the study suggested that environmental literacy (E.L.) has an impact on a certain percentage of the sustainable pedagogical behaviors of basic education teachers in Lima-Peru. These findings reinforce the model of responsible environmental behavior advocated by Hines, Hungerford & Tomera (1987), where knowledge of nature, personal commitment, the value of individual responsibility, skills to act and face adverse situations, are indicators of environmental behaviors that teachers are expected to develop since their initial training and strengthen with their pedagogical practice.

The study revealed that there is a percentage of incidence of nominal, operational and functional literacy in the pedagogical behaviors from the perception of the surveyed teachers. Agreeing with the findings of Alarcón & Lorente (2019) who point out that the variables knowledge and behavior maintain a positive relationship in the individual in front of a circumstantial context. In addition, the theoretical contributions of Fishbein & Ajzen (2011) ensure that there is a direct relationship between knowledge and behavior, this they explain based on the conception that the social behaviors of human beings are the product of the information they receive from their environment, causing concern and interest that lead them to act in their environment and therefore adopt environmental behaviors. The contributions of these authors and the results found lead us to reflect on the need to strengthen the teacher's level of environmental literacy based on the mastery of information in this thematic field, which allows him/her to understand environmental problems in order to act and adopt sustainable behaviors to be put into practice in his/her daily life and at school. This analysis responds to the contribution of Baber and Mourshed (2007), who argue that the degree of training and professional quality of the teacher contribute to the development

of skills, attitudes and values in students. For O'Neill, et al. (2020) developing environmental literacy means putting into practice field-based experiential learning that will awaken commitment and interest in acting in environments that have lost their ecological balance affected by environmental pollution [32]. For this reason, it is recommended that environmental education be worked under this model in teacher training centers ensuring the acquisition of sustainable behaviors of future education professionals.

6 Conclusions

Environmental literacy has an impact of 21% on sustainable pedagogical behaviors in basic education teachers; this percentage obtained allows us to ensure that respondents consider that mastery of environmental issues is relevant in the formation of their sustainable behaviors. While for 79% it is not important to have a vast knowledge of the subject in order to demonstrate sustainable behavior. However, when contrasted with the contributions of other authors, they coincide in affirming that the knowledge, attitudes and values of a person ensure the adoption of environmental behaviors.

Regarding the levels of environmental literacy, the findings showed that nominal A.A. has a 4.5% impact on sustainable pedagogical behaviors, indicating that the teachers surveyed consider that having a limited knowledge of environmental aspects has a minimal impact on their sustainable behaviors. At the functional A.A. level, teachers indicate that this has a 22% impact on sustainable pedagogical behaviors. Because they are responsible for executing educational experiences related to environmental issues, elaborating projects that mobilize the educational community in defense of the environment.

The results of the operational A.A. show that 4.9% of the surveyed teachers consider that this level has a limited impact on pedagogical behaviors, which are not evident in their educational practice.

It is the teacher's responsibility to sensitize students and the community to develop concrete tasks and preventive actions to reduce the impact of the environmental problems that afflict schools and the locality. To this end, it is necessary to include in their learning sessions all the information concerning natural systems, environmental conservation, responsible and sustainable consumption of natural resources, contributing to the environmental education of children and adolescents. For this reason, it is suggested that professional teacher training institutions should

consider within their curriculum a subject related to environmental culture to ensure the acquisition of knowledge and the strengthening of environmental attitudes and behaviors in future teachers.

References

- [1] Álvarez, P., & Vega, P., Environmental attitudes and sustainable behaviors. Implications for environmental education, *Psicodidáctica*, Vol.14, N° 2,2009, pp.245-260.
<https://www.redalyc.org/pdf/175/17512724006.pdf>
- [2] Aguilar Luzón, M. & García Martínez., Prediction of recycling behavior from the theory of planned behavior and from the model of value, norms and beliefs towards the environment. Granada University, 2006
<https://dialnet.unirioja.es/servlet/tesis?codigo=107188>
- [3] Lopera Pérez, M., Environmental literacy and teacher professionalization: design and iteration of a training model. *Semantic Scholar*, 2019 DOI: 10.35376/10324/40062
- [4] Poblete Trujillo, E., & López Vázquez, E., Sustainable behavior: an intergenerational approach, *Revista Digital Universitaria*, Vol. 20, N°1, 2019, pp. 1-13.
<http://doi.org/10.22201/codeic.16076079e.2019.v20n1.a4>
- [5] Urquiza Gómez, A., & Cadenas, H., Socio-ecological systems: theoretical and conceptual elements for the discussion around water vulnerability. *Open edition journals*. 2017
<https://doi.org/10.4000/orda.1774>
- [6] Yangali Vicente, J. S., Vásquez Tomás, M. R., Huaita Acha, D. M., & Baldeón De La Cruz, M. D., Ecological behavior and environmental culture, fostered through virtual education in students from Lima-Peru. *Social Science Journal*, Vol.22, N°1, 2021, pp.385-398.
<https://doi.org/10.31876/rcs.v27i1.35321>
- [7] Roth, C., *Environmental literacy; its roots, evolution and directions in the 1990s*, Education Development Center Newton, Massachusetts, 1992.
<https://eric.ed.gov/?id=ED348235>
- [8] Aranda Sánchez, J.M., Ecological Literacy as a new pedagogy for the understanding of living beings. *Journal Blue Moon*, Vol.40, 2015, pp.365-384.
http://200.21.104.25/lunazul/index.php?option=com_content&view=article&id=119

- [9] Capra, F., *The web of life. A new perspective on living systems*. Anagrama. Barcelona, 1996, ISBN: 84-339-0554-6. <http://isfdmacia.zonalibre.org/trama%20de%20la%20vida%20de%20F%20Kapra.pdf>
- [10] Parra, S. C., *Eco-literacy. Childhood Images*, Vol.17, N°1, 2018, pp.117-124.
DOI: 10.14483/16579089.11621
<http://revistas.udistrital.edu.co/ojs/index.php/infancias>
- [11] Segura, C., Rodríguez, F. & Esquivel, C., *Educación ambiental para la conservación del recurso hídrico a partir del análisis estadístico de sus variables*. Journal *TEC*, Vol. 28. N° 3, 2015, pp. 74-85.
<https://doi.org/10.18845/tm.v28i3.2413>
- [12] Cebrián, G. & Junyent, M., *Professional competencies in Education for Sustainability: an exploratory study of the vision of future teachers*. *Science Education*, Vol. 32, N°1, 2014, pp. 29-49.
<https://doi.org/10.5565/rev/ensciencias.877>
- [13] Corral- Verdugo, V. & Queiroz, J., *Approaches to the study of sustainable behavior*. *Environment and Human Behavior Journal* . Vol 5, N° 1y2, 2004, pp.1-26.
https://mach.webs.ull.es/PDFS/Vol5_1y2/VOL_5_1y2_a.pdf
- [14] González, E. & Bonan, L., *Knowledge is not enough to act: review and reflections on the relationship between knowledge and the adoption of environmental behaviors*. *Science & Education* Vol. 23, N°2, 2017, pp. 357-372. <<https://doi.org/10.1590/1516-731320170020005>>. ISSN 1980-850X.
- [15] Fishbein, M. & Ajzen, I., *Predicting and changing behavior: the reasoned action approach*. New York: Psychology Press, 2011. ISBN 978-0-8058-5924-9
- [16] Hines, J. M., Hungerford, H. R. & Tomera, A. N., *Analysis and synthesis of research on responsible environmental behavior: a meta-analysis*. *The Journal of Environmental Education*, Philadelphia, Vol. 18, N°2, 2010, pp. 1-8.
<http://dx.doi.org/10.1080/00958964.1987.9943482>
- [17] Stern, P. C., Dietz, T., Troy, A., Guagnano, G. & Kalof, L., *A value-belief-norm theory of support for social movements: the case of environmentalism*. *Research in Human Ecology*, Bar Harbor, Vol. 6, N°2, 1999 pp. 81-97.
<https://humanecologyreview.org/pastissues/her62/62sternetal.pdf>
- [18] Kollmuss, A. & Agyeman, J., *Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior?* *Environmental Education Research*, Abingdon, Vol. 8, N°3, 2002, pp. 239- 260. <<http://dx.doi.org/10.1080/13504620220145401>>.
- [19] Wagner, S., *Understanding green consumer behaviour: a qualitative cognitive approach*. New York: Routledge, 2003
- [20] Díaz, C. & Spiaggi, E., *Rurality and development in the Pampas region: strategies for sustainability*. Rosario, Argentina: UNR Editora, 2007.
<https://bibliotecas.uncuyo.edu.ar/explorador3/Record/OAG-000660>
- [21] Corral, V., *Psychology of sustainability: an analysis of what makes us pro ecological and pro social*. México, D.F: Trillas, 2010.
- [22] Artaraz, M., *Theory of the three dimensions of sustainable development*. *Ecosystems Journal*, Vol. 11, N°2, 2010.
<https://doi.org/10.7818/ECOS.614>
- [23] Eisenberg, N., & Miller, P., *The relation of empathy to prosocial and related behaviors*. *Psychological Bulletin*, Vol.101, N°1, 1987, pp.91-119. DOI:10.1037/0033-2009.101.1.91
- [24] Iwata, O., *Some psychological correlates of environmentally responsible behavior*. *The Human Science Research Bulletin of Osaka Shoin Womens University*, Vol. 1, 2002, pp. 31-41. DOI: 10.2224/sbp.2004.32.8.703
- [25] Herrera-Mendoza, K., Acuña, M., Ramírez, M. & De la Hoz, M., *Pro-ecological attitude and conduct of university students*, *Serbiluz*, Vol. 13, 2016, pp. 456-477.
<https://produccioncientificaluz.org/index.php/opcion/article/view/21609>
- [26] Vásquez, M., Yangali, J., Huaita, D., Cubas, N. & Granados, M., *Environmental education program in the pro-environmental attitudes of basic education students*, *Contemporary Dilemmas*, Vol.6, 2020, pp.1-21.
<https://doi.org/10.46377/dilemas.v7i.2378>
- [27] Moyano, E. & Jiménez, M., *The Andalusians and the Environment*. *Ecobarometer of Andalusia*. Sevilla, Environmental council, 2005
<https://www.juntadeandalucia.es/servicios/publicaciones/detalle/45379.html>
- [28] Perales Palacios, FJ. & Aguilera Morales, D., *Can we change our environmental behaviors? A descriptive study with university students*, *ReiDoCrea*, Vol. 7, 2018, pp.151-166
<https://www.ugr.es/~reidocrea/7-14.pdf>

- [29] Sánchez, H. & Reyes, C. (2018). Methodology and designs in scientific research. Business Support Aneth S.R.L. ISBN 978-612-46842-2-7
- [30] Alarcón, D. & Llorente, K., Environmental attitudes and sustainable behaviors. Implications for environmental education, 2019.
<https://repositorio.unicordoba.edu.co/handle/unicordoba/2206>
- [31] Barber, M. & Mourshed, M., *How the world's best-performing school systems come out on top*. McKinsey & Company, 2007.
<http://mckinseysociety.com/how-the-worlds-best-performing-schools-come-out-on-top/>
- [32] O'Neil, J.M., Newton, R.J., Bone E.K., Birney, L.B., Green, A.E., Merrick, B., Goodwin-Segal, T., Moore, G. & Fraioli, A., Using urban harbors for experiential environmental literacy: case studies from New York and the Chesapeake Bay, 2020 Estudios Regionales en Ciencias Marinas. 33 pp
<https://doi.org/10.1016/j.rsma.2019.100886>.

Contribution of Individual Authors to the Creation of a Scientific Article (Ghostwriting Policy)

- Melba Vásquez conceived the study and were responsible for the design and development of the data analysis. And wrote the first draft of the article.
- Judith Yangali reviewed the first draft of the article and provided supervision.
- Maruja Baldeón & Delsi Huaita were responsible for data collection and editorial review.

Sources of Funding for Research Presented in a Scientific Article or Scientific Article Itself

This research has been self-funded by the authors.

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